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ALTERNATIVE EXPLANATIONS OF UNDER-PRICING

OF CHINESE INITIAL PUBLIC OFFERINGS

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ABSTRACT

The thesis contains an empirical study designed to reveal why initial public offerings (IPO) of common stocks (A-share) in China are on average under-priced from alternative angles as opposed to more established theories, using a dataset of 880 IPOs from January 1996 to December 2003.

A much higher degree of under-pricing compared to developed markets and even other emerging markets is a distinct feature of China's A-share IPOs. Previous literatures based on classical hypotheses have not been able to fully explain such high level of under-pricing. Hence, alternative explanations have been put forward by academics as well as practitioner. It is said that the Chinese government has big influences in China's primary market through tightly controlled issuing system and opaque regulatory constraints. People speculate that such influences have been both intentionally and unintentionally exerted, causing IPO under-pricing. A major contribution of the thesis is to test some new hypotheses based on three untested statements in China's IPO literatures i.e. speculation effect, "Western Region Development" policy effect and government protection effect, which are all associated with government direct or indirect influences. More specifically, speculation effect hypotheses assume that the government constraints and regulator drawbacks have caused high level of speculation, which in turn drives the IPO under-pricing. "Western Region Development" policy effect hypotheses claim that government intentionally uses IPO under-pricing to lure investments into less developed and thus less favourable western region companies. Government protection effect hypotheses conjecture that IPO under-pricing is a compensation for investors'

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concern of potential government interference in the government-protected firms. The thesis finds that speculation effect hypothesis is largely supported by empirical data while the other two are not.

The thesis has also re-tested hypotheses advanced in previous literatures including classical information asymmetry hypotheses, ex ante uncertainty hypotheses, investors' behaviour hypotheses as well as existing China-specific hypothesis such as listing time lag hypothesis. Proxies such as government retention rate that have emerged in privatisation IPO literatures are also borrowed by Chinese researchers looking into China-specific institutional settings such as dominant government control. The thesis finds that information asymmetry hypotheses in general show more strength in explaining China's IPO under-pricing while empirical evidence for other hypotheses are either mixed or weak. In the end, the thesis finds that alternative angles emerging from the tests of the three statements combined with some classical hypotheses supported by empirical data have a greater power to explain China's high IPO under-pricing.

The so-called "floatation game" hypothesis has been put forward by researchers such as Tian (2003) who claims that the Chinese government makes use of IPOs with different lengths of IPO listing time lag i.e. the time lag between IPO announcement date and actual listing date to adjust the equity market cycle. In other words, the government let go public the IPOs with longer listing time lag thus more likely higher initial returns in the bear market and vice versa. The thesis does not find support to the "floatation game" hypothesis, although the thesis does find that the market cycle is closely related to the IPO under-pricing and the number of IPOs issued.

Acknowledgement

I would like to thank my supervisors Dr. Beat Reber and Professor Robert Berry. Throughout my four years PhD study we had numerous meetings and discussions. Without their enlightening instructions, constructive critics and precious advices, I would not be able to finish the research. Especially, they took great pain reading the draft and pushed me hard through the writing up of the thesis.

The thesis is dedicated to my wife, my parents and my family.

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Chapter 1 Introduction

1.1 Research Question

> "To facilitate such a process [1] and lure retail investors to companies of dubious quality - Beijing set rules that ensured initial public offerings were under-priced, thus guaranteeing investors handsome gains in the first few days of trading."
>
> --- *Financial Times*, March 28th 2005

The proceeding comment from the renowned *Financial Times* attracts our eyeballs once again to a well known phenomenon in finance that has confused researchers and practitioners for many years - the initial public offering (IPO) under-pricing. Feeding this puzzling phenomenon since the 70's of last century, the ever going debate why the IPOs are on average under-priced is still waiting for a conclusive ending. Even with a short history of less than two decades, Chinese stock market has witnessed its IPOs inevitably being involved in the same debate. As early as in the 1990s researchers such as Datar and Mao (1998) have recognized and studied the average under-pricing of Chinese IPOs [2] and more researchers have joined them later on. However, a conclusive explanation is yet to be made, which prompts the core research question the thesis intends to answer: why Chinese IPOs are under-priced?

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[1] The process is described in the same article by the news paper as "The listed companies raised money from moms and pops rather than from the banking system, which did the banks a huge favour by taking the burden of financing mediocre companies away from them." Clearly, this quoted news report directly attributes the under-pricing of Chinese IPO new shares to the government interference and in fact it is one of the many publicly seen statements expressing the similar point of views. As the thesis goes on, some of these statements will be demonstrated accordingly.

[2] To be precise, the under-pricing in this thesis ought to be understood as an average measure. Indeed, this thesis finds that only a very small proportion of Chinese IPOs are over-priced or priced at par in the sample dataset. Detailed discussion about previous findings and the number of under-priced IPOs in this study's sample can be found in the later chapters of literature review and data analysis.

Before embarking on the exploration for the answers, it is essential to recognize the importance of answering the question and it is even more imperative to clearly identify appropriate directions in which the exploration will be heading to. The following section will make obvious the reasons why answering the questions is important from both the academic and practical point of views. Indeed, for these same reasons this thesis is motivated. The next section of this chapter will sketch out the objectives of the thesis and the map this thesis is going to follow in order to find the answers.

1.2 Research Motivations

As said the IPO under-pricing is not a unique feature to the Chinese stock market. Besides, the topic has been studied by many researchers. The question is why it is still necessary and important to carry out research on this seemingly old enough topic. This section will demonstrate that in general IPO under-pricing has big economic, financial, geographic, political and academic implications. Also this section will show that the topic has specific implications to China in particular.

1.2.1   General motivations for IPO under-pricing study in any country

The practical economic implications of IPO under-pricing have been the major and ultimate motivation for any research on the topic in general. More specifically, the puzzling phenomenon presents a big inefficiency to nowadays financial market. Let us take a retrospective look at how IPO under-pricing happens. When financial sources such as private funding and bank loan are limited, a private company may resort to the pubic capital through the initial public offering to sustain its organic expansion or finance its new project. Ideally the IPO issuing company would like its new shares to be priced as high as possible in order to raise maximum capital from the

market, but in practice most IPO new shares are on average priced relatively lower than their subsequent trading price in the secondary market. Apart from conjectures of market imperfection (Benveniste and Spindt 1989 etc) or even market failure (Chambers 2005 etc), a common perception of this phenomenon is that the under-pricing of IPOs is a challenge to market efficiency and it may hurt rising firms trying to raise capital for expansion (Loughran et al. 1994). Ljungqvist (2004) estimates that in 1999 and 2000 US issuers left an aggregate of 62 billion dollars on the table in IPOs in these two years alone. Since the new share discount is an immense cost to issuing firms in terms of the wealth loss to the IPO firm's founding entrepreneur or shareholders (Ljungqvist 1999 and Ritter 1987), the IPO under-pricing has huge implications for issuing firms. On the other hand, as Schwert (2003) points out, although most of the literature on high average initial returns of IPOs focuses on the effects on the issuing firm, the evidence that the large returns are available to investors in the IPO[3] has equivalent implications for abnormal profits to IPO investors. Simply speaking, the research on IPO under-pricing is beneficial to all the players in the game no matter sellers or buyers.

Besides financial implications, the wide spreading nature of IPO under-pricing also prompts researches on the country-specific basis. It is not an exclusive attribute of Chinese IPOs. IPO under-pricing has been a notable feature in developing as well as in developed markets. In the US, IPO under-pricing has been documented as early as in the 1970's by researchers, notably Logue (1973) and Ibbotson (1975). Levis (1990) has reported that IPOs are on average under-priced in the UK. Meanwhile, empirical papers reveal that IPO under-pricing is a widespread trend in emerging markets too.

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[3] Schwert (2003) is more specific to refer to firm commitment IPOs here, but as later will be seen, because the Chinese IPOs are mostly through online fixed price offer or firm commitment offer, this motivation has the same implication for the Chinese IPO under-pricing research.

Among them are studies from Thailand (Allen, Morkel-kingsbury and Piboonthanakiat 1999), Indian (Krishnamurti and Kumar 2002), Hong Kong, Singapore and Malaysia (Dawson 1987, Paudyal, Saadouni and Briston 1998), Chinese Taiwan (Huang 1999) and Korean (Kim, Krinsky and Lee 1995). As a result, the IPO under-pricing research has implications to a wide range of markets and geographic regions. That said, since all these markets presumably have different IPO pricing and issuing systems independent researches into individual markets or regions will help understand these markets and improve their financial systems. At the end of the day, all these countries and markets will benefit from the research. The research on Chinese IPO under-pricing is too justified in this sense.

Thirdly, the IPO under-pricing has big political implications too. The privatisation waves since last century in the world join calls for researches of IPO under-pricing, as not only a private firm can seek public funding through IPO but a state-owned firm can also privatize itself through IPO. Even though the majority of IPO literatures concentrate on privately-owned IPOs, some researchers have noticed the crucial implication of privatisation IPOs to the government and the society. Politically speaking, any government trying to privatise state-owned enterprises through IPOs cannot ignore the impact of under-pricing to the government itself, to the employees in the firm, to the voters and literally to all walks of people in the country. Some noteworthy papers about privatisation IPOs are written by Perotti (1995) and Jenkinson and Mayer (1988). The privatisation issue is a quite encouraging motivation for the Chinese IPO under-pricing study because the vast majority of China's IPOs are privatisation IPOs[4].

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[4] See footnote 6 for the information about China's privatisation IPOs.

Lastly, being a long-time unsolved puzzle IPO under-pricing continuously attracts attentions from academic researchers around the world. Given that the IPO under-pricing is a financial cost to the issuing firms, the question then boils down to why the issuing firm still allows this hurt to happen persistently. This puzzling phenomenon presents a big challenge to modern finance theories. A variety of theories have been put forward to address this apparently paradoxical corporate behaviour, such as Leland and Pyle's (1977) insider signalling hypothesis, Baron's (1982) principal-agent hypothesis, Rock's (1984) "Winner's Curse" hypothesis, and Grinblatt and Hwang's (1989) signalling hypothesis etc. The explanations, however, remain elusive. Under certain circumstances, one theory seems to get prevailing support from the market data while it may lose explanatory power to competing theories when circumstances have changed. Meanwhile discrepancies sometimes occur between the existing theories and the empirical evidence. One such example in particular in the Chinese IPO literature is the debate of the relationship between under-pricing and market cycle i.e. whether the market status has impact on the IPO under-pricing; if the market cycle does influence IPO pricing then what the real impact is? In fact, empirical evidence in reality may not only give little support to some existing theories but occasionally may even show contradictory implications to the theories. An example in the early IPO under-pricing literature is that empirical studies found that even investment banks that often work as underwriters under-price their own IPOs, which is conflicting with the original information asymmetry theory. To this end, researches on IPO under-pricing should never stop until a conclusive and definitive answer to the puzzle has been found. Chinese IPO under-pricing is therefore a case study for this thesis in above sense.

1.2.2   Particular motivations for Chinese IPO under-pricing study

The most direct motive for Chinese IPO under-pricing study is that current under-pricing theories are either insufficient or inapplicable to explain the under-pricing of Chinese IPOs. The reason for this is a combination of unique features of China's primary market and IPOs, and the lack of consistency in Chinese IPO literature. Equally, this presents opportunity for the thesis to carry out further research on the topic. Meanwhile, the research on Chinese IPO under-pricing has its specific economic and political implications, which will all be discussed in this section.

A striking fact about China's IPOs is their high level of under-pricing compared to other markets. The under-pricing magnitude is so huge that maybe the word "handsome" in the opening remark of *Financial Times* is too modest to depict the enormity. For instance, Mok and Hui (1998) report an average under-pricing of 289% for a sample of 87 Shanghai IPOs listed from 1990 to 1993. Su and Fleisher (1999) find the under-pricing level as high as 948.6% for A-share IPOs before January 1, 1996. A more recent study by Liu (2003) reports an average market-adjusted initial return of 132.49% for a sample of 354 issues from 1 January 1999 to 31 December 2002. All these studies show an astonishingly higher IPO under-pricing degree than the normally perceived up to 17.4% under-pricing in the UK or 18.4% in the US (Loughran et al 1994), and the under-pricing level is even higher than the average level of 60% in the emerging markets (Jenkinson and Ljungqvist 2001). These numbers from the China's stock market indicate that a thorough investigation of the Chinese IPOs is necessary if the existing theories are only based on analysis of much less under-priced IPOs in the developed markets. For instance, test of "Winner's

Curse" theory by Chi and Padgett (2005) and Liu (2003), test of signalling theory by Su and Fleisher (1999) and test of ex ante uncertainty theory by Yu and Tse (2003) using China's IPO data all fail to fully explain the Chinese IPO under-pricing.

Secondly, now that most of the classical IPO theories emerged from the more developed and hence more efficient markets, they may not be applicable in the newly emerged markets as these emerging markets such as China usually has totally different institutional and market settings, regulatory constraints and investors' behaviours. For instance, later chapters will demonstrate that the classical advising agent quality theory and the western market-rooted theories such as legal issue and management strategic under-pricing theories are not suitable for explaining China's IPO under-pricing. The lack of convincing theories based on the developing markets is also due to the short history and instability of these markets. Such instability may be somehow caused by the lack of consistency in the country's government policy. One such example is the China's transaction stamp duty tax change and it will be discussed in detail in the later parts of this thesis. Naturally all these insufficiency and inapplicability provide motivations to carrying out research on IPO under-pricing particularly in the fast developing China's stock market.

When more established theories failed to explain the extra under-pricing magnitudes, people tried to look for explanations from alternative angles. People try to explain China's high degree of under-pricing from several possible perspectives such as regulatory constraints, supply and demand imbalance and investors' irrational behaviour. Apparently, the government-imposed under-pricing referred to by the opening mark represents one such alternative view. It is not a fresh idea that the

Chinese government is responsible for China's IPO under-pricing, as practitioners and academics such as Li Shi Quan (2004) and Chi and Padgett (2005) have come up with similar claims pointing fingers to the Chinese government. Trying to approach the explanations in different ways, Tian (2003) looks at supply and demand imbalance imposed by the government and some practitioners even claim that investors' speculative behaviour is the suspect. Researchers even went beyond existing theoretical framework, looking for China-specific explanations for IPO under-pricing. For instance, the listing time lag between offering and listing dates is proposed by Tian (2003) as a policy tool for the government to adjust the market cycles, and he believes that this listing time lag accounts for the Chinese IPO under-pricing. But whether or not all these hypotheses are robust in explaining the phenomenon in addition to more traditional hypotheses? Only empirical test can prove that, which is exactly what this thesis intends to do.

Despite of the immaturity of the developing markets and the lack of associated mis-pricing theories, the IPO under-pricing implications are crucially important to economy policymakers of the developing markets, not only because IPO plays such key role in the privatisation process but also it fuels the economic growth of these markets by feeding the great capital demand. In this sense, studies focusing on the emerging markets IPOs become essentially indispensable. Being the world's largest developing country China has seen its equity market expanding rapidly with the total number of listed companies increased more than 20 times within 10 years (China's stock market started from the early 1990s)[5] but still the IPO supply is lagged far behind the demand. In 1997, the Chinese government endorsed a plan to transform

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[5] Exact numbers can be found in Sayuri (2002)'s paper, which includes firms that issue only A-shares, both A- and B-shares, and both A- and H-shares.

more than 10,000 state-owned enterprises (SOEs) into publicly listed companies. Yet as of year 2007, there are only about 1,500 companies listed in China's two stock exchanges. The huge gap makes China potentially the largest IPO market in the world. Since the beginning of China's stock market, IPO has become one of the most important capital sources for China's state-owned enterprises (SOEs). If the under-pricing is such a great cost to the issuing firm as mentioned and if the market is so enormous as China, then the research on the phenomenon is indispensable.

China's stock market stands for the biggest representative case of developing markets and is attracting research attentions increasingly. Meanwhile, being a traditional investment vehicle IPOs are getting more and more popularity in China especially after the country became one of the biggest foreign investment destination (FID) countries in the world. This trend has been strengthened after the Chinese government allows joint venture between foreign and domestic financial service companies. Therefore understanding the Chinese IPO pricing behaviour is beneficial to both the domestic and overseas investors who wish to invest in Chinese enterprises currently or in the future.

Besides above economic implications, the Chinese IPO under-pricing could have some China-specific political implications too because of the unique government background of China's stock market and Chinese IPOs. As China is being transformed from a previously government tightly controlled market into a semi-open market and because the vast majority of Chinese IPOs are privatisation IPOs that shift

ownership from previously government-controlled state companies to private sectors[6], government influence is believed to be inevitably intervening with the IPO process. In the later part of this thesis, it will be shown that although the IPO shares are issued to the public the majority shareholder of most issuing companies are still the state. Therefore Chinese IPO under-pricing cases may well demonstrate the government politic influences in the IPO pricing process.

In respect of the privatisation IPO, researchers have presented theories regarding political motives. For example, government could use the IPO under-pricing as a compensation for employees' misgivings about the privatisation. Also researchers have indicated that the market-oriented government can allocate under-priced IPOs to median-class voters and align their interest with the government so that it won't be voted out in favour of a left-wing government. Such theories basically come from western world and the Chinese IPO under-pricing may have different implications, but the research on Chinese IPO under-pricing will help us to gain a deeper understanding of the relationship between government's political motive and the impact especially on the IPO pricing process. For example, researchers believe that Chinese government used IPO under-pricing to achieve dispersed distribution of shares in order to create a viable capital market.

In fact, the government influences are born with the mission of the Chinese stock market, which is declared by the Chinese government as "to reform the unprofitable, inefficient state-owned enterprises"[7]. As well as the *Financial Times* comment at the

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[6] Above 90% of Chinese IPOs are privatisation IPOs. See the next page for the number of privatisation IPOs. But as Chi and Padgett (2005) pointed out, in China the vast majority of IPOs are partial privatisations, which are different from the privatisation IPOs in western countries.
[7] See footnote 8 for more details.

very beginning of this thesis, in the same article the author stated that "the problems started with the companies chosen to list. From the very beginning of the China's stock market, the authorities saw the primary market as a new source of funding for state-owned companies, including many struggling ones, and therefore a way to relieve the banks from their onerous role as providers of cheap funds to government corporations." That said, the article claimed that although "estimates vary only between 30 and 130 of the 1,300 companies listed on the Chinese market have a private-sector background - and even some of those are in reality controlled by branches of the state."

With such huge state dominance in the Chinese stock market, many practitioners in the field believe that the Chinese government exerting power on the IPO process has led to the severe under-pricing of China's IPOs. The prestigious *Financial Times* has only expressed an opinion broadly shared by many practitioners. For instance, equity analyst Li Shi Quan (2004) is quoted as saying in *Cai Jing Times* that "too much government interference in the Chinese IPO pricing process leads to the imbalance between the supply and demand at the China's stock market, and it leads to the deviation of the IPO prices from the fair market price…and bad performance companies have wrongly got the market support." His conviction about government's powerful influences seems to be proved by a piece of news from *Financial Times*. When reporting on a government ban of IPOs, the newspaper says that "…when[8] the authorities decided to introduce a fairer system for IPO pricing, they placed a six-

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[8] Here the time that the news paper refers to is year 2004.

month ban on new listings[9]. Yet it reinforced the impression that nothing in Chinese markets, not even an IPO, happens without Beijing's say-so."

Although the majority of academic researchers are still looking at the issue from classical theories' perspectives which are focusing more on economic rationale rather than government influences, some others do have raised the question of whether or not the government have played active role in Chinese IPO pricing. For example, Tian (2003) suggests that the Chinese government frequently intervenes in the market in order to control investment risks. A vivid example of government intervention given in his paper is that a policy commentary on the high P/E ratios of the stock market at the end of 1996 brought down the stock index by 32% in two weeks. In respect of IPO pricing particularly, he suggests that the government may use administrative tools such as listing quotas and flotation delays to adjust the market in order to reach certain policy targets. Holding the similar viewpoints about government interference, Chi and Padgett (2005) emphasize that "in privatisation, the success of any IPO not only affects the individual company's reputation but also the government credibility. The government cannot afford any possible failure in the IPO markets. That is why the government has to make the supply much less than the demand, even at the cost of under-pricing." All these statements sound enlightening to understand the Chinese IPO under-pricing but apparently they need prudent investigation.

All in all, to answer the question what causes the Chinese IPOs to be under-priced on average and furthermore whether or not the Chinese government has played direct

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[9] The news paper claims that by doing so, the Chinese government is trying to give the regulators enough time to devise the new rules.

role of affecting the IPO prices, this study intends to use empirical dataset to testify the hypotheses that are set up according to existing theories and unproved statements.

1.3 Research Objectives and Contributions to Literature

1.3.1 To test brand new hypotheses based on unproved statements

In Chinese IPO literature, people have related factors such as regulatory constraints, excess demand or irrational investors' behaviour with the under-pricing. They believe these factors are all explicitly or implicitly government-driven. In particular, three statements regarding the causes of Chinese IPO under-pricing i.e. Western Region Development policy effect, government protection effect and investor speculation effect have come out of media reports and academic publications. The thesis will test these statements and the tests will show whether these claims are sensible or just purely speculative.

In next chapter, background information about Western Region Development policy will be given in detail. As the policy is viewed as the start of a major shift of the Chinese government's economic development emphasis from eastern coast regions to western inland regions, it is said that the government intentionally uses the IPO under-pricing as a policy tool to encourage investment into western region companies. If this statement is proved to be correct by the empirical data, it is a significant progress towards proving the claim that the Chinese government does play active role in bringing the IPO under-pricing. At a higher level, it would also provide sensible alternative angles to explain Chinese IPO under-pricing.

Secondly, since China's economy is being transformed from socialist central-planned economy to capitalist market-oriented economy, it is believed that the government

still carries protection over certain companies that are usually of great strategic importance to the nation. When these companies go into the partial privatisation process via IPOs, some believe that the government protection will lead to under-pricing due to government signalling intention etc. However, others argue that the opposite is true. No matter which statement is supported by the data, a link between the government protection and IPO under-pricing can be established in either case if the empirical test shows significant statistics. To this end, even if we are still not able to directly point finger at government interference in IPO pricing after the test, we can at least obtain evidence of whether or not the government behaviour has affected the IPO pricing.

A third statement is based on the fact that the Chinese government's control on IPOs has led to the imbalance between new share demand and supply and thus caused intensive short term speculation in the stock market. People believe that China's highly speculative stock market pushes up the share price in the secondary market, together with the huge demand from retail investors causing the IPO under-pricing. If this statement can be tested, it is promising to demonstrate that the government policy has indirectly caused IPO under-pricing by introducing an artificial shortage of stock supply.

By testing all these statements, we can investigate whether the government's direct or indirect influence has been piped through to the issuing system thus causing IPO under-pricing. In fact, these three blocks of hypotheses represent the major original contributions of this thesis. If any test of these statements is successful, it is reasonable to believe an alternative hypothesis may be credited to explain the Chinese

IPO under-pricing in the future. On the other hand, if the empirical data does not support the test, it is also a progress to distinguish speculative assumptions from the true causes.

1.3.2 To test existing classical and some China-specific hypotheses

Meanwhile, classical theories are not excluded from the hypotheses test. With the largest dataset among all previous Chinese IPO under-pricing literatures at hand this thesis is going to test the hypotheses formulated according to the classical IPO under-pricing theories such as Winner's Curse theory, signalling theory and information revelation theory etc. As will be discussed in literature review, although these classical hypotheses have been put to test in early empirical studies the results are not quite consistent or sometimes even contradicting each other. Therefore, re-test of these classical hypotheses have two-folded meanings. The test can add more consistency to previous literature in addition to clarifying some contradictions. At the same time, the test of classical hypothesis provides a good starting point which naturally leads to tests of some hypotheses that are less frequently tested in Chinese literature such as the book building hypothesis.

Early studies also try to borrow hypotheses of privatisation and government political motives to explain Chinese IPO under-pricing, although researchers normally categorize such hypotheses into China-specific hypotheses. The reason is that some of the proxies used to test these hypotheses such as government retention rate and IPO allocation rate (or IPO lottery winning ratio in China's context) are extremely high or low in China. Researchers believe these extreme levels of ratios are unique characteristics of China's stock market and they have led to Chinese IPO under-

pricing. For instance, Mock and Hui (1998) relate the "Chinese characteristic" of high government retention rate to the IPO under-pricing. What is more, models in previous studies with some real China-specific factors such as listing time lag hypothesis will be tested too. Comprehensive investigation and comparison of these models will demonstrate whether they are supported by the latest dataset, and whether these hypotheses provide credible alternative explanations to Chinese IPO under-pricing besides the classical hypotheses.

In addition to above major objectives, this research will endeavour to testify and clarify some debate among previous studies. A good example is the debate of so-called "floatation game". Basically, it is about whether or not the government has used IPOs with different length of listing time lag – the period between the IPO announcement date and the actual listing date – to adjust the equity market cycle, because supposedly IPOs with longer listing time lags (and hence possibly higher IPO initial returns) will be given priority for floatation during bear market and vice versa. Some researchers believe the government has played such floatation time game to control the market volatility. It is claimed that because of the government intention the listing time laps of different IPOs vary and hence influence the IPO initial return, while other researchers decline to accept such statement based on their own studies. Therefore, it is necessary to find out which statement proves to be true by the empirical data. Along with test of listing time lag hypothesis, this thesis will examine whether this "floatation game" statement is a sensible claim.

In summary, this thesis tries to shed light on the IPO under-pricing rationale from both general and China-specific perspectives. Researchers already have put forward

some hypotheses according to various IPO under-pricing theories. Some of these hypotheses have been tested by using the Chinese IPO data, while others are not. Meanwhile, in the Chinese literature some China-specific hypotheses have been proposed by researchers. This thesis will carry out tests on these hypotheses. In the mean time, because of the unique characteristics of Chinese IPOs empirical data have produced ambiguous or inconsistent evidence with regard to these hypotheses. This thesis will try to clarify the debates. Apart from the existing theories and hypotheses, there are several widely circulated statements and concepts. These statements or concepts have not been tested yet. For example, some people believe that China's IPO under-pricing is partly speculation driven. Government protection is also sometimes regarded as one cause of China's IPO under-pricing. Another example is that some people believe the Chinese government has used IPO under-pricing to lure investment into the western region companies. As yet no established hypotheses/theories have been set up based on these statements/concepts, to set up testable hypotheses in line with the statements would be a big step forward by the thesis. Alternative angles to explore the causes of Chinese IPO under-pricing hopefully would emerge from the empirical tests. Or otherwise, the tests could demonstrate that the statements are unfounded from the empirical evidence point of view.

1.4   Thesis Structure

Chapter 1 starts with the introduction of the IPO under-pricing phenomenon in general and specific Chinese IPO under-pricing respectively. The chapter reveals how this research is motivated by the puzzling phenomenon and it addresses what research questions this thesis is going to answer in the end. In detail, chapter 1 lists all the objectives this research is pursuing and briefly outlines how these objectives are going

to be achieved. To draw a big picture of the whole thesis, this chapter goes through the layout and the structure of this thesis.

As the Chinese stock market is very different from the developed western markets, it is absolutely necessary to familiarise those, who have little knowledge about Chinese stock market, with some background information of the market. Chapter 2 will pave the way for later parts of literature review, hypothesis setting and data analysis by giving an introduction of the Chinese stock market's history, characteristics, institutional and IPO procedural settings. Many of these characteristics will be mentioned repeatedly in the later chapters but only briefly when needed.

Chapter 3 summarises all the previous literature about IPO under-pricing. It categorises existing theories and hypotheses of Chinese IPO under-pricing and it looks at the suitability or unsuitability of these theories in explaining Chinese IPO under-pricing.

Chapter 4 summarises all empirical studies about China's IPO under-pricing. Especially, this chapter collects all the related literatures and documents about the three statements that this thesis is going to test, i.e. the speculation effect, the Western Region Development Policy effect and the government protection effect. Chapter 3 and chapter 4 build the foundation for hypothesis settings in chapter 5.

Following the literature review, chapter 5 lists all the hypotheses to be tested. These hypotheses are grouped into basically three different categories. They are the classical general IPO under-pricing hypotheses, the existing China-specific hypotheses and

nascent China-specific hypotheses formulated in this study. All the alternative explanations proposed by this thesis will be put together in the nascent China-specific hypotheses.

Chapter 6 shows how and from which sources the data are collected. It describes the dataset in more details such as data volume, observation period and selection criterion etc. The chapter also illustrates the basic benchmark model and variables to be used in the hypothesis test. Besides, the chapter makes a light touch on the data analysis by showing descriptive statistics of individual variables and possible indications of these data characteristics. The general data description leads to specific hypothesis test in the following chapters.

From chapter 7 to chapter 11, all the hypothesis test results are demonstrated and explained one by one. Especially, the first three chapters will show the original findings of nascent hypotheses that are major contributions of this study. More specifically, chapter 7 will focus on the speculation effect hypotheses. Chapter 8 is devoted to the Western Region Development Policy hypotheses. Chapter 9 will concentrate on the government protection hypotheses. Apart from that, chapter 10 summaries test results of all classical theories that can be adopted in the Chinese context and chapter 11 includes tests of the existing China-specific hypotheses. The different schools of theories and hypotheses contained in these five chapters will hopefully construct the main body of the Chinese IPO under-pricing theory universe.

Chapter 12 is supposed to take an overview out of the box. This chapter shows how much extra power the alternative hypotheses emerging from the tests of the three

statements have added to the existing models. Meanwhile, it reveals the close tie between IPO under-pricing and market cycle in China, paving way for summary from a broader sense of the economy.

Chapter 13 concludes the main body of text with all the findings and results. It summarises the contribution this thesis has made to the existing literature. It threshed out the implications the study has to a broader economy. In addition, this chapter also gives rise to future research questions sparkled during the hypotheses tests.

Chapter 2 Introduction of China's Primary Market

The China's stock market was set up following the models of developed markets such as US, UK and Japanese and even Hong Kong stock market[10] but at the same time it has many unique features. It is therefore worthwhile to give a brief introduction of the China's stock market settings and the initial public offerings process before the literature review so as to avoid any misunderstanding or confusion of these plain facts afterwards.

2.1 Institutional Settings

In the early 1980s, China initiated a series of economic reform policies to help restructure its economy from a Soviet-style centrally planned socialist economy into a more market-oriented economy while remain within the political framework provided by the communist party[11]. Of all these policies, privatization of state owned enterprises (SOE's) is the most fundamental step taken towards the reform objective. The privatization process involves carving out productive units which gradually become independent, profit-oriented entities with limited liability. The ownership of these carve-outs is represented by share capital. Then these privatized units issue new shares to the public through IPOs. But this scenario only exists in theory because these supposedly independent units are in fact still controlled by their parental companies or the state. For instance, Tian (2000) claims that he found the government directly owns 28% of all the shares of China's public listed companies and ultimately controls 44% of China's public listed companies, based on the method of La Porta et

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[10] In his article *The Development Path of China's Stock Market* (2005) Nian Qing Yuan, a significant figure among those specialists who participated in the drafting of China's first stock market regulatory document - *The Temporary Rules of Stock Issuing and Security Exchange* (1989), recalled that the establishment of China's stock market and relevant regulations have borrowed experience from the US, UK, Japan and Hong Kong stock market. The whole article can be found at www.business.sohu.com (November 28th, 2005).

[11] The system has been called "Socialism with Chinese characteristics".

al (1999). The first privatization wave took place in 1984 and there were less than 100 issues before 1990. At that time since there was no organized stock exchange to trade the new shares and also because the companies' leaders, who are at the same time government officials, were not willing to give up absolute control of the companies to shareholders, the IPOs were quite unpopular until the beginning of 1990s when the two stock exchanges were built up.

The Shanghai Security Exchange (SSE) was founded in December 1990 and the Shenzhen Stock Exchange (SZSE) in April 1991 respectively. The two exchanges are self-regulated and cross listing is forbidden. The stock exchanges were established mainly in two purposes as stated by the government itself, "1) to tap the domestic savings; and 2) to reform the unprofitable, inefficient state-owned enterprises"[12]. Both exchanges are non-profit legal entities. Originally when the two stock exchanges came into place, they were governed by the State Planning Committee, the People's Bank of China (China's central bank) and the China Security Regulatory Commission (CSRC). Later on the CSRC was granted the sole regulator status of the two exchanges. Nowadays, under the direct administration of the Chinese State Council the CSRC functions as an authorized government department to oversee the whole security and future markets. Since the very beginning of China's stock market, the authority of approving IPOs has always been with the government and more specifically the CSRC. The stock exchanges themselves do not have the power to approve IPOs.

Through stock market the state owned enterprises (SOE's) disperse their share

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[12] The stock market mainly serves to raise capital for enterprises and to reform the SOE's, according to the speeches of Liu Hong Ru, the then CSRC chairman in January 1994 (e.g. SSE working conferences) and Li Peng, the then Prime Minister in September 1997.

holdings among both domestic and foreign investors, both state-owned and private-owned firms. To separate, the government introduced five major categories of shares, which are: 1) State Shares (sometimes called Government Shares), shares obtained by an institution as a representative of the central government, on behalf of the state, and in exchange for the capital contribution made by the state. The institution can be the central government itself, local governments, or wholly government-owned institutions. State shares are not available for trading at the two stock exchanges but can be transferred to other domestic institutions on approval of the CSRC. 2) Legal Person Shares (sometimes called Legal Entity Shares or C-shares)[13]. Legal Person Shares are not tradable at the two stock exchanges but can be transferred to other domestic institutions upon approval of the CSRC. 3) Employee Shares, shares that are offered to workers and managers of a PLC, usually at a substantial discount. Employee shares are registered under the title of the labor union covering that company, which also represents the shareholding employees trying to exercise their rights. After a holding period of 6 to 12 months, the company may file with the CSRC to allow its employees to sell the shares at the open market, but the directors, supervisors and the general managers cannot transfer such shares during their tenure of office. 4) Ordinary Domestic Shares or A-shares. Tradable A-shares are held and traded mostly by domestic individuals and some by domestic institutions. There is no restriction on the number of shares that can be traded, but it is required that tradable A-shares should account for no less than 25% of total outstanding shares when a company makes its IPO. Tradable A-shares are the only shares allowed to be publicly traded on the Shanghai and Shenzhen Stock Exchanges. And 5) Foreign Shares, shares denominated in a foreign currency. This group of shares includes B-shares on

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[13] A legal person is defined as a non-individual legal entity or institution.

domestic stock exchanges, H-shares on the Hong Kong Stock Exchange and N-shares on the New York Stock Exchange. B-shares are available exclusively to foreign investors and some authorized domestic securities firms[14]. The B-share market is separated from A-share market, with SHSE B-shares denominated in US dollars and SZSE B-shares denominated in Hong Kong dollars. H-shares and N-shares carry the same rights and obligations as A-shares and B-shares, but they cannot be traded at domestic stock exchanges. In this way, the tradable A-shares are deliberately separated from other shares. Although there are some changes to these shares during the later stock market development, the main structure and definition of the shares remain the same. This research only focuses on the A-shares because the vast majority of Chinese tradable shares in China's domestic market are A-shares.

2.2 Listing Requirements

According to the China's Corporate Law, the following requirements have to be satisfied in order for a firm to go public. Firstly, the new issuance to the public has been proved by the State Council's security regulator authority i.e. CSRC. Secondly, the total capitalization of the firm should not be less than RMB ¥50 million. Thirdly, the issuing firm has been in operation for more than 3 years and it should be profitable in the latest 3 consecutive years. If the issuing firm is a legally established state-owned enterprise, or if the issuing firm is formed after the Corporate Law came into effect and the primary issuer is big or middle-sized state-owned enterprise, then the 3 year rule can be calculated continuously from the year even before the corporation of

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[14] Since February 19th 2001 the B-share market has been open to the domestic residents. Nevertheless, the B shares in Shanghai Security Exchange (SSE) are traded in US dollars and the B shares in Shenzhen Stock Exchange (SZSE) are traded in Hong Kong dollars. To trade B shares, the investor needs to have foreign currency deposit account with banks. The total trading volume and value of B shares are both very small compared to A shares, so A share is still the major tradable share in the Chinese stock market and thus the subject of this research.

the firm. Fourthly, there should be no less than 1000 shareholders whose shares' face value is more than RMB ¥1000. The shares issued to public should account for more than 25% of the total shares of the firm. If the issuing firm's capitalization is bigger than RMB ¥400 million, the shares issued to public should account for more than 15% of the total shares of the firm. Fifthly, in the latest 3 years the issuing firm should have no big violation of laws and there should be no misstatements in its financial statements and accounting reports. Sixthly, other criterions set by the State Council. Apart from that, the listed firm should disclose its financial status and operation performance in time according to relevant laws and regulations. The firm should make its financial statements to the public in every half fiscal year.

2.3 Issuing Process

Normally, the issuing process will follow several steps. The issuing firm starts the process by firstly drafting the offering project reports and the offering feasibility reports. Then the lawyer will finish the due diligence regarding the re-structure of the firm's organization and legal issues. Certified public accounts will then accomplish the auditing reports, financial statements and all necessary original certificates. Underwriters will then come in to give their recommendations and guidance. All legal documents and relevant documents will be presented to the CSRC for approval. After the regulatory approval, the firm gets listed in stock exchange. The firm should also receive certified public accounts' auditing in the three years after listing.

During the initial public offerings, the investment banks[15] mostly work as brokers and

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[15] In China's case they are not the real investment banks in the conventional sense but are in fact investment companies and security companies. Some of these companies may be founded by the provincial government and other government controlled local financial institutions to underwrite the

lead the selling of shares to the public. The issuers often have the responsibility for unsold shares. However, the new shares are usually oversubscribed due to huge demand. In China there are more than 100 firms providing underwriting services. Most of them are associated with the government and are very well connected with the issuing regulatory authority, as pointed out by Tian (2003). International underwriters are rare. In most cases, China's issuing firms do not hire international auditors either partly because the cost concerns but mostly because the local auditors have less strict stance on the auditing criterions.

2.4 Pricing and Allocation of New Shares

Before the stock exchanges were founded, there were no regulations about the pricing of issues, and the 90 PLC's that issued shares in 1980's usually took the face value of the shares as issuing price at that time. Since 1991, the lottery system has been established. Since 1994, the disclosure requirements for IPO firms have been enforced. The most commonly used pricing method after 1995 is the online fixed price offering, which was firstly introduced in 1994. By this method, the investors bid for fixed quantities at pre-set price, with prorate allocation in the event of over-subscription. Under-subscription is really rare. But if that happens, the underwriter has the responsibility to buy all unsold shares. Investors need to have a full subscription deposit, which will be refunded for unsuccessful applications in one week after the subscription. The issuer set the issue price but the offer price has to be validated by the CSRC. In fact, the offer price is set according to the product of the after tax profits per share multiplied by a price earning ratio (PE-ratio, the share price divided by the earnings per share in the previous year), the latter being set with the reference to the

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specific IPO. In other words, some of these investment companies were established only to serve the purpose of underwriting certain IPOs.

similar listing firms in the same region and industry. But in fact, the CSRC often imposes a multiplier as the ceiling of the PE ratio, which changes over times. Although CSRC never officially declares the PE ceiling ratio, the practitioners especially the underwriters managed to 'guesstimate' the average PE ceiling ratio across all industries over times. For example, before 1999 the ceiling was fixed at 15. In January 1999, the ceiling restriction was loosened and the PE ratio used in IPO pricing was raised to as high as 50. In 2002 a ceiling of 20 was re-imposed[16]. In this sense, the government effectively has kept to itself the power of say-so with respect to the final IPO price. In case of oversubscription investors are essentially chosen by balloting. The ballot ratio is determined by the amount of shares publicly offered and the amount of shares that investors subscribed.

In July 1999, in the spirit of the Securities Law, the CSRC enacted a rule which permitted companies which were intending to issue more than 400 million total shares to negotiate the IPO price with the underwriter. The 400 million total shares limitation was removed in 2000 April, allowing all firms to negotiate the IPO price. Since 2001, the bookbuilding method has become popular in China's primary market. This involves the company and the underwriter determining the preliminary offer prices range (file price range). The underwriter will then measure the demand of institutional investors for these particular shares, and revise the offer price according to demand. In China, almost all underwriters adjust the offer price upwards after the bookbuilding

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[16] The price ceiling requirement has never been found in any official document but its existence is undoubtedly believed by all the academics and practitioners in the area. How to find this pricing cap in certain time period is another long story which will not be told in depth here. Basically, the underwriters (investment companies) will attempt to apply for an offer price as high as possible from the CSRC and usually this application will be rejected by the government if the application's price exceeds the price cap. Until the price is modified to a reasonable level that the CSRC believes to be the government will not endorse the application. After a number of times of so trying, the industry will get a common and rough idea of what current price cap level is. The price ceiling numbers can be referred to Yu and Tse's (2003) paper.

process.

2.5 Issuing System Changes

The whole issuing system has experienced several changes ever since the market was created. Before April 2001, the IPO procedure was tightly overseen according to a quota control policy. At that time, the Chinese stock market regulatory authorities including State Planning Committee, China's central bank and the CSRC would annually determine the total amount of issues allowed and the total number of firms that could make offers. They only allow certain amount of new shares to be floated at the stock exchanges and then ration the sub-quotas to each of the 29 central government ministries that oversee various industries, and the 32 provinces, municipalities and autonomous regions[17]. Complying with the sub-quota, the local security regulatory authorities would invite enterprises to apply for listing and make selection among them under specific criteria. (Yau and Steele, 2000) Once approval for an issue had been obtained, an investment syndicate would be formed to draw up a detailed plan. Security companies then would perform the standard services of providing advice, underwriting and distributing shares to the public, as well as developing a secondary market.

Since April 2001, the quota control system has been replaced by the recommending and approving system. The CSRC instead, is examining and approving the new IPOs recommended by the local government according to the market conditions rather than administrative quota. This change is considered as a symbol that China's stock market

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[17] The criteria used for allocation among provinces include the assessment of regional needs based on the production structure and industrial base and recognition of balanced regional development to attain distribution objectives. Within each regional quota, the local securities authorities invite enterprises to request a listing and then make a selection based on the criteria that combines good performance as well as sectional development objectives. See Chan et al (2004).

has moved a big step forward from a central-planned market to an economic-driven market. The market conditions driving government IPO decisions could include how volatile the market is, how speculative the market is and how the capital supply and demand balance is, although the government did not specify which particular 'conditions' they would follow. Sometimes, to justify its policies or to clarify its intentions the government would claim which market conditions have prompted its decisions. One such example is the 6-month IPO ban in 2004 mentioned earlier where the government claimed that market speculation was its major concern in relation to the policy.

The bookbuilding method became popular from then on [18]. Soon after that, the "channel system" came into effect. The channel system requires that to issue new shares an underwriting company need at least one empty channel, and in every empty channel only one new share can be issued at any time. Once the first issuing has been done, the channel then will be empty again for the next issuing. The total number of the channels for every underwriting company is allocated by the central government according to the company's firm size, reputation and previous performance, etc. [19]

Furthermore, a latest recommending person policy has been enforced on the base of the existing channel system. Under the recommending person policy the underwriting company has to appoint two qualified recommending representatives to take financial

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[18] Unlike bookbuilding in advanced markets which involves hundreds of thousands of institutional investors, China's domestic bookbuilding process involves only some 190 qualified institutional investors. The issuer eventually has to consult the China Securities Regulatory Commission, the securities watchdog, about the indicative price range. See *China CITIC Bank IPO Draws Keen Overseas Demand*, Daisy Ku, Reuters (April 15, 2007). Effectively, the CSRC's indication of the price range is a more reliable criterion to follow, which is exactly the case of China CITIC Bank IPO described in the Reuters' news. On the other hand, as the majority of China's investors are retail investors, the online fixed pricing method gained more popularity.

[19] An underwriting company can only have up to 8 channels.

and legal advisory responsibilities in every channel. No matter what goals the government originally purported to achieve, these constantly changing regulatory policies reflect China's unstable emerging market nature. And they enhance the practitioners' impression that it is the government policy control rather than the market's demands and supplies that directly influences the IPO process no matter whether these policies have taken into account the market condition or not. For example, Zheng Jing (2007) points out that China's new issuing needs to go through layers after layers of government hierarchy and months after months of approving procedure to go public. He believes the government administrative control has led to the loss of the listing companies' own right of decision making in capital raising related issues due to prolonged and stubborn issuing processes.

In addition to these regulations and rules, the government also directly intervene the IPO market from time to time in for various reasons. For instance, in order to "prevent a flood of equity as companies converted non-tradable, mostly government holdings into common stock" (Bloomberg May 18th 2006) and to give the securities regulator enough time to stipulate new issuing rules, the CSRC halted the sale of all IPO shares in May 2005. Until one year later the ban was lifted after a government program to trade more than $200 billion of mostly state-owned stockholdings was implemented without causing a market slump. An investment expert is quoted in the same Bloomberg news as saying "it's a testimony to the success (that the government successfully sold the non-tradable government stockholdings into market without adversely affecting the market) of their policy. That's what the A share market is there for, to raise money."

Some of the above unique characteristics of China's stock market and issuing system will be revisited in the later chapters because they have unique impacts on China's IPO under-pricing. Now that the market's background knowledge has been given, there shall be a deeper understanding of China's IPO pricing mechanism. It is now straightforward to look into the previous literatures in the field.

Chapter 3 Literature Review - Theories

In general, average short-term IPO under-pricing has been widely noticed in many markets. People hold different views about this puzzle. For example, Loughran et al. (1994) believe that the under-pricing corresponds to a form of market inefficiency and is harmful to young firms trying to raise capital through the issuing. Benveniste and Spindt (1989) stress that the IPO under-pricing happens in imperfect market is due to investment banks' discriminative allocation of new shares. Representing an extreme view, Chambers' (2005) paper argues that IPO under-pricing is the outcome of market failure. No matter which argument is correct the IPO under-pricing is a realistic concern of the issuing firm, which prompts studies on the causes of the under-pricing.

Previous researchers have come up with some classical theories aiming to explain the IPO under-pricing. Although their theories may have gained empirical support from various markets not all these existing theories may suit China's context, as will be discussed in the next chapter where empirical evidences of these classical theories will be explored. However, the existing theories form a solid base for any IPO research in terms of theoretical framework. This chapter therefore will go through the existing theories and especially explore their suitability and implications to the Chinese IPO under-pricing. At the end of the chapter, some literatures comprising China-specific factors and their validity will be explored because they are of particular relevance to the Chinese IPO under-pricing.

3.1 Information Asymmetry Theories

This is the earliest and the best established block of IPO under-pricing theories. Many of later theories are basically derived from the information asymmetry theories.

Broadly speaking, the information asymmetry theories include the "Winner's Curse" theories, the information revelation theories, the principal-agent theories and the signaling theories. The underlying assumption of the information asymmetry theories is that one party in the IPO procedure, for example the underwriter, the issuer or even some investors, asymmetrically possesses some information which is hidden from the other party/parties.

Based on the principal-agent structure in information economics, Baron (1982) points out that an information asymmetry between the underwriters and the issuers causes the large first-day return of IPOs. Because the underwriter possesses superior information concerning the possible demand for the shares being issued while the issuer is unable to observe the distribution efforts of the underwriter, the issuer must compensate the underwriter for the use of his information and the underwriter has an incentive to minimize his efforts in selling the issue by offering the shares at discount. In simple words, the under-priced IPOs provide compensatory discount to underwriters. However, Muscarella and Vetsuypens (1989) find evidence that investment banks also under-price their own shares when going public. Baron's (1982) theory needs more careful examination, but it does give rise to a whole block of IPO theories within the information asymmetry framework.

Unlike Baron (1982) who looks at the information asymmetry between issuer and underwriter, some researchers look at the information asymmetry among investors themselves. Also attributing under-pricing to asymmetrically distributed information, Rock (1986) presents that only uninformed investors will buy the overpriced issues and they receive 100 percent of the shares, but both informed and uninformed

investors will attempt to buy under-priced issues and the shares are subsequently rationed between them. Thus, uninformed investors face a "Winner's Curse" because they have a greater probability of being allocated all of the least desirable issues. To avoid this winner's curse, the uninformed investors will only participate in the IPOs when the informed investors purchase the under-priced issues and the uninformed investors demand the under-pricing, of which the scale is sufficiently large to compensate them for the ex ante uncertainty or adverse selection bias. In other words, IPO under-pricing is a premium to keep the market liquidity by luring the uninformed investors to play along.

The information revelation theories assume that the information asymmetry exists between underwriters and investors but this time the investors are more informed than the issuer, for example about the market demand for shares. During the book building process, the investment banks (as underwriters) collect information about the value of the stock in order to price the issue more accurately. However, in the absence of inducements, revealing positive information to the underwriter is not incentive-compatible for the investors. Doing so would, presumably, result in a higher offer price and so a lower profit to the informed investors. Worse still, there is a strong incentive to actively misrepresent positive information – that is, to claim that the issuer's future looks bleak when it doesn't – to induce the underwriter to set a lower offer price. To compensate the investors who reveal information, the investment bank will favor them when allocating shares. This argument is supported by Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991). They argue that the underwriter may under-price the IPO to induce investors to reveal their valuations of the company during the pre-sale bookbuilding period. Benveniste and

Spindt (1989) also argue that by not announcing the allocation rule, the investment banker can use his discretion to reward regular investors, who act as a form of insurance by buying shares in both badly received and well received issues. Based on the theoretical settings the under-pricing required under the fixed pricing and bookbuilding offering methods, Benveniste and Wilhelm (1990), Spatt and Srivastava (1991) and Benvensite and Busaba (1997) and some other researchers believe the bookbuilding requires on average a lower discount.

The last group of asymmetric information theories is the signaling theory which reverses Rock's (1982) assumption regarding to the information asymmetry between issuing firms and investors. Ibbotson (1975) is regarded as the first researcher to come up with the original intuition for the signaling literature. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) all make contributions to the theory later on. They argue that IPO under-pricing is a mechanism to signal the issuing firms' quality: because the issuers are more aware of their firm values than the investors at the time of offering, high quality issuers purposely under-price IPOs for more successful seasoned equity offerings (SEOs) in the future, which is too costly for the poor quality issuers to follow. The higher quality firms' cost will be rewarded at the time of seasoned offering. In this sense, the firms with SEOs are assumed to be under-priced more than those that do not have SEOs.

The signaling concept could have another implication on the IPO under-pricing. Leland and Pyle (1977) argue that the insider information held by an entrepreneur about the quality of the firm can be transferred to suppliers of capital through owner's willingness to invest in his or her own projects, because it is in the owner's interest to

invest a bigger proportion of his or her wealth in the successful projects. Thus, the value of a firm increases with the percentage of the equity held by the entrepreneur relative to what he or she otherwise would have held given a lower-quality project. If their assumption is acceptable, then the insider ownership should be related to the first trading day under-pricing.

3.2 Ex ante Uncertainty Theories/ Advising Agent Quality Theories

This class of theories is basically variations of information asymmetry theories, but they have gained some popularity in the past.

When firms issue new shares, one of the investors' biggest concerns is the firm's fair value. The investors' concern may in turn affect the face value of the issuing firm, which is reflected by the share price offered. Beatty and Ritter (1986) consider the level of ex ante uncertainty surrounding the intrinsic value of an issue as a critical factor in explaining the under-pricing, and the greater the uncertainty the larger the under-pricing. In other words, the more uncertainty the investors have about the fair value of the firm the more likely they will pay less in terms of face value, which essentially causes new shared to be under-priced. The underlying argument is that higher uncertainty will proportionally lead to more benefit to the informed investors, which will deteriorate the winner's curse problem. In result, greater under-pricing is needed to compensate the uninformed investors. Their theory suggests that smaller firms should have higher under-pricing due to the higher risk associated with the smaller firm size.

Based on the relationship between ex ante uncertainty and under-pricing, many

researchers have elicited some other models. For example, Booth and Smith (1986), Titman and Trueman (1986), Balvers, McDonald and Miller (1988), Carter and Manaster (1990), and Carter, Dark and Singh (1998) suggest that the quality of advising agents (e.g. investment bankers, accountants and auditors) is negatively related to IPO under-pricing levels. It is argued that more prestigious underwriters or advising agents can reduce the information asymmetry and thereby cut the under-pricing cost.

3.3 Institutional Theories

The institutional theories, as pointed out by Ljungqvist (2004), generally consist of the legal insurance or lawsuit avoidance theories, the price support theories and the tax inducement theories. The name of this block of theories comes from the argument that the IPO under-pricing is caused by various institutional settings and behaviors.

The basic idea of legal insurance or lawsuit avoidance theories may go back at least to Logue (1973) and Ibbotson (1975). The assumption is that companies deliberately sell their stock at a discount to reduce the likelihood of future lawsuits from shareholders disappointed with the post-IPO performance of their shares. Tinic (1988) and Hughes and Thakor (1992), and Hensler (1995) stress that the under-pricing represents an insurance premium imposed by issuers and underwriters to avoid legal liabilities under federal securities laws for material misstatements in the offering prospectus or registration statement. Apparently this block of hypotheses is built upon the US market settings.

The second institutional theory is the price support theories, also called price

stabilization theories. Usually when the new shares are issued, according to the pre-signed contract the underwriter will have to prevent the new share price from plunging dramatically right after the issuing by means such as share buy back. According to her investigation of the distribution of initial returns following IPO's, Ruud (1993) claims that the positive mean initial returns may reflect the existence of a partially unobserved left (negative) tail. She finds that most IPOs with zero one-day returns subsequently fall in price, suggesting that underwriter price support may account for the skewed distribution and hence the phenomenon of positive average initial IPO returns, even if offering prices are set at expected market value.

The IPO under-pricing may be advantageous from a tax point of view, which promoted the tax inducement theories. The tax inducement theories are very much country-biased. For example, Rydqvist (1997) explores the tax inducement possibility in the context of Swedish IPOs. His argument is based on a tax differential between the employment income tax and the capital gain tax imposed by the Swedish government before year 1990. The much heavier employment income tax created an incentive for the firms to pay the employees by allocating appreciating assets in lieu of salaries. One such appreciating asset is under-priced stock, allocated preferentially to the firm's own employees at the IPO. Based on the observation of US IPOs, Taranto (2003) puts forward a similar argument. In the US, the capital gain tax rate is typically lower than the income tax rate. The holders of managerial or employee stock options pay both the income tax on the difference between the strike price and the "fair market value" when they exercise the option, and the capital gain tax on the difference between the sale price and the "fair market value" when they eventually sell the acquired shares. The US tax law considers the "fair market value" for options

exercised in conjunction with an IPO to be the offer price rather than the price that will prevail in the market once the trading starts. As a result, the senior managers may have the tax incentive to under-price their company's IPO.

3.4 Ownership and Control Theories

Before a firm goes public, usually the ownership and managerial control are in the same hands. IPO in many cases eventually separate the ownership and the control. When coming to the issue of making optimal operating and investment decisions, the ownership matters considerably to the management's incentives. Jensen and Meckling (1976) find that managers may maximize the expected private utility of their control benefits such as perquisite consumption at the expense of outside shareholders rather than maximizing expected shareholder value when the separation of ownership and control is incomplete. Within the agency cost context, two opposing theories have been put forward to rationalize the IPO under-pricing phenomenon.

Brennan and Franks (1997) view under-pricing as a means to entrench managerial control and the attendant agency costs by avoiding monitoring by a large outside shareholder. They argue that the under-pricing gives managers the opportunity to protect their private benefits by allocating shares strategically when taking their company public. Managers seek to avoid allocating large stakes to investors for fear that their non-value-maximizing behavior would receive unwelcome scrutiny. Small outside stakes reduce external monitoring, owing to two free-rider problems. First, because it is a public good, shareholders will invest in a sub-optimally low level of monitoring (Shleifer and Vishny (1986)). Second, greater ownership dispersion implies that the incumbent managers benefit from a reduced threat of being ousted in

a hostile takeover (Grossman and Hart (1980)). In this view, the role of under-pricing is to generate excess demand, which enables managers to ration investors so that they end up holding smaller stakes in the business. Simply speaking, under-pricing in this theory is a means to retain control.

On the contrary, in the second theory under-pricing is regarded as a means to reduce agency costs. Brennan and Franks (1997) implicitly assume that managers try to maximize their expected private utility by entrenching their control benefits. However, it could be argued oppositely that managers should actually seek to minimize their scope for extracting private benefits of control, because the agency costs are ultimately borne by the owners of a company and the managers as part-owners bear at least some of the costs of their own non-profit-maximizing behavior. When the managers' stakes are large enough so that the agency costs they bear outweigh the private benefits they enjoy, it will be in their interest to reduce, not entrench, their discretion. Based on this intuition, Stoughton and Zechner (1998) observe that it may be value-enhancing to allocate shares to a large outside investors who is able to monitor managerial actions. When the allocation is sub-optimally large from the investor's point of view, for instance because it is easily diversified, an added incentive may be offered in the form of under-pricing.

3.5 Managers' Strategic Under-pricing Theories

Broadly speaking, this school of theories belongs to the ownership and control theory family. Although in the same context of agency cost, this group of theories has slightly different underlying assumptions. The difference somehow makes it justified to list this group of theories separately.

Aggarwal, Krigman and Womack (2002) developed a IPO under-pricing model that regards the under-pricing as an agency cost to issuers, in which the manager strategically under-prices the IPO in order to maximize his wealth from selling shares at lock up expiration. The first-day under-pricing creates information momentum i.e. incremental comments and recommendations by research analysts, especially by non-lead underwriter analysts, which shifts the demand curve for the stock outwards. This generates higher prices at the lockup expiration, when managers have their first opportunity to sell shares. As a result, managers accept substantial under-pricing in order to maximize their personal wealth.

3.6 Behavior Theories

This school of theories is still in its infancy, as Ljungqvist (2004) points out. The behavior theories assume that either the presence of 'irrational' investors who bid up the price of IPO shares beyond true value, or that issuers are subject to behavior biases and therefore fail to put pressure on the underwriting banks to have under-pricing reduced.

Welch (1992) shows that 'informational cascades' can develop in some forms of IPO's if investors make their investment decisions sequentially i.e. later investors can condition their bids on the bids of earlier investors, rationally disregarding their own information. Successful initial sales are interpreted by subsequent investors as evidence that earlier investors held favorable information. As a result, later investors follow to invest irrespective of their own information, forming a snowball effect on the new share demand. Conversely, disappointing initial sales discourages subsequent

investors and the new share demand remains low over time. The possibility of this cascade or 'bandwagon' gives market power to early investors who can demand more under-pricing in return of committing to the IPO's and thus starting a positive cascade. Ritter (1998) suggest that the IPO market may be subject to the bandwagon effects. A positive cascade or bandwagon means that the IPO is under-priced. Amihud, Hauser, and Kirsh (2001) support this hypothesis by showing that IPOs tend to be either undersubscribed or hugely oversubscribed, with very few moderately oversubscribed in Israel.

Assuming the existence of 'irrational' or 'sentiment' investors, Ljungqvist, Nanda, and Singh (2004) advance the investment sentiment theory. They suggest that because sentiment investors hold optimistic beliefs about the future prospects for the IPO firm, the issuer tries to capture as much of the surplus under the sentiment investors' downward-sloping demand curve as possible. The optimal strategy to maximize the excess valuation over the fundamental value of the stock is to hold back stock in inventory to keep the price from falling. But due to regulatory constraints on price discrimination and inventory holding, the issuer's optimal strategy is instead to allocate shares to 'regular' institutional investors for subsequent resale to sentiment investors at prices the regulars maintain by restricting supply. The under-pricing is to compensate for the regulars' risk of holding IPO shares in case of prematurely ended hot market. This mechanism works even in the absence of asymmetry information. Ljungqvist, Nanda, and Singh's (2004) theory suggests that the offer price still exceeds fundamental value, resulting in a negative IPO return in the long-run that is consistent with empirical findings from Ritter (1991) and others.

3.7 Privatization IPO and Political Motives

Dewenter and Malatesta (1997) argue that government may pursue political objectives other than maximizing firm's value in the privatization process. For example, government may allocate under-priced shares to the employees who may otherwise have misgivings about privatization.

Perotti (1995) suggests that a partial sale and (possibly) its under-pricing are signals of commitment, and gradual sales are the signs of government's willingness to bear residual risk. Perotti's (1995) conclusion has shed light on the empirical puzzle why the typically large, well-known privatized firms with a long track record are usually under-priced more than those mostly new or little-known private IPO's, which is difficult to reconcile with the traditional explanation for partial sales and under-pricing based on asymmetric information over asset values.

Another political motive that could enter the IPO under-pricing rationale is related with government election strategy. Biais and Perotti (2002) point out that, to avoid being voted out in favor of a left-wing government that plans to expropriate the gains from privatization, an existing market-oriented government's optimal privatization strategy is to allocate under-priced shares to median-class voters to align their interests with those of the market-oriented government. The greater this country's income inequality, the larger under-pricing needed to persuade median-class voters to reject a left-wing government's policies. As a matter of fact, although government as agent of taxpayers should ensure no unfair wealth transfer has taken place from taxpayers to small group of investors who bought the IPO, political implications of privatization IPO under-pricing may take over this priority and they may be different

from one country to another, as suggested by Paudyal, Saadouni and Briston (1998).

Chapter 4 Literature Review – Empirical Studies

The first question to be raised in any empirical study of IPO under-pricing is how to measure the under-pricing. Ritter (1984) adopts the IPO raw initial percentage return as a proxy to measure the IPO under-pricing degree and the market-adjusted initial return is also used by later researchers such as Chi and Padgett (2005) in Chinese IPO literature especially. Chapter 6 will discuss in detail the difference and the applicability of these two measurements to the Chinese IPO context. Being widely accepted in empirical studies, ordinary least square (OLS) multivariable regression is often adopted as benchmark test model by early researchers such as Dewenter and Malatesta (1997) and Su and Fleisher (1999). Given proper IPO under-pricing measurement as the dependent variable and appropriate regression models, all applicable IPO under-pricing theories or hypotheses are in fact waiting for test against their testable implications based on suitable independent proxy variables to prove their validity.

4.1 Empirical Studies of Existing Theories

4.1.1 Information Asymmetry Theories

Let's roll back a little to the earlier discussion of Information Asymmetry theories. At the heart of the Winner's Curse model is the idea that, if properly adjusted for rationing, uninformed investors' abnormal returns are zero on average. That is to say, the uninformed investors only get just enough return to ensure their continuous participation in the market. This implication is extensively tested in countries that impose strict allocation rules. The earliest empirical study is by Koh and Walter (1989) in the analysis of Singapore's IPO market. They show that the likelihood of receiving an allocation in a random ballot is negatively related to the degree of under-pricing. In

Chinese IPO literature, Liu (2003) and Chi and Padgett (2005) have tested the "Winner's Curse" hypothesis using the lottery winning ratio which measures the likelihood of receiving an allocation in a random ballot. Rock's (1986) "Winner's Curse" argument also implies that the degree of information asymmetry is a decreasing function of profitability and firm age. Indeed, these two proxies are often tested by early researchers including Su and Fleisher (1999). Besides, they also suggest another test proxy of offer price. They believe a higher offer price means a lower profit to the informed investors, which has similar effect of lower profitability.

The information-asymmetry-based information revelation theory prompts researchers to test the difference between fixed pricing and bookbuilding offering methods. In the Chinese literature, Liu (2003) found that China's IPO's are under-priced more under the fixed pricing method than the bookbuilding method.

The adverse selection motivated signaling theory is one of the most successful theories in IPO mis-pricing literature and it is widely supported by the empirical data from many markets. As mentioned earlier, less than 10%[20] of the total Chinese IPO companies are previously owned by private sectors. Leland and Pyle's (1977) insider signaling theory may not be applicable to Chinese IPOs because the private owner or entrepreneur is usually not the issuer who holds the insider information. But if we regard the government as insider seller too, then the signal of the issuing firm's quality can be translated into the government equity retention rate in the new firm. Indeed, Mok and Hui (1998) demonstrate that the 'Chinese characteristic' of high equity retention by the state is one of the key determinants of market-adjusted IPO

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[20] There are 83 previously private-owned IPOs in the thesis' dataset of total 880 IPOs.

under-pricing. By contrast, using a much later dataset Chi and Padgett (2005) stress that the government retention rate has a negative impact on the under-pricing, which they claim shows that the privatization is welcomed by the investors.

In fact, information asymmetry theory is the most frequently tested theory in Chinese IPO literature but the theory seems to have mixed implications. For example, Su and Fleisher (1999) examine the signaling model and find that the Chinese IPO under-pricing is a strategy for issuing firms to signal their value to investors. Furthermore, they claim that the under-pricing is better explained by a signaling model that relates IPO under-pricing to subsequent equity offerings (SEOs) than by the one linking government or employee ownership to equilibrium IPO under-pricing. On the contrary, Yu and Tse (2003) argue that the signaling model cannot explain the Chinese IPO under-pricing. Yu and Tse's (2003) point of view is agreed by Chi and Padgett (2005) and Liu (2003).

Not only the signaling theory, but also the winner's curse theory is causing skepticism among researchers in the Chinese context. For instance, Yu and Tse (2003) address that the winner's curse problem caused by information asymmetry can well explain the Chinese IPO under-pricing and their finding is supported by Chi and Padgett (2005) and Liu and Li (2000), but Liu (2003) argues that his analysis only shows a very weak evidence for winner's curse hypothesis.

As a matter of fact, Yu and Tse (2003) point out that because the Chinese underwriters do not have much market power to seek the information rent due to the intense

competition in the Chinese underwriting industry[21], and also because it is not a problem for underwriters to place all available stocks with investors due to the extremely high demand, the principal-agent model cannot possibly explain the Chinese IPO under-pricing without rent seeking or moral hazard problems.

4.1.2 Ex ante Uncertainty Theories/ Advising Agent Quality Theories

McGuinness (1992) has tested Beatty and Ritter's (1986) hypothesis. In Chinese IPO literature, Su and Fleisher (1999) and Chi and Padgett (2005) have used the issuing firm's market capitalization and offer size as proxies of the firm size to test for ex ante uncertainty under-pricing.

The auditing standards in China's stock market are generally perceived to be low, as pointed out by Aharony et al (2000). The corporate disclosure is far less stringent than in the developed market. Private investors or so-called liquid or retail investors' major source of information is the IPO prospectuses, which unfortunately are not reliable under the existing accounting and auditing standards because the A-share companies only need to follow the disclosure/listing requirements according to the less restrictive Chinese accounting rules (RPC GAAP) instead of the International Accounting Standards (IAS), let alone the forged accounting report problem. Even Zhou Xiaochuan, the governor of China's central bank, ever admitted, "Through the 1990s … there existed large deficiencies in the standards of accounting, information

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[21] There are 129 firms providing underwriting services in China as of year 2003. These firms range from security and investment companies to commercial bank subsidiaries, from state-owned facilities to private financial branches. All of them have very strong government background or relationships. Many of them have various levels of provincial or local governments as their biggest shareholders.

disclosure and financial reporting[22]." Zhou's opinion has been verified by large amount of accounting and auditing literatures in China including Shi and Weisert (2002). On one hand, as Aharony et al (2000) pointed out the state-owned enterprises' managers lack the accounting sophistication to manage their financial statements. On the other hand, they are motivated to manipulate the financial statements to boost their firms' chance of being selected for IPO. Furthermore, the state, which remains the majority shareholder of the IPO firm, may instruct the manager to manage earnings (through financial statements) to influence the offering price. International underwriters and auditors are seldom hired for the offering. The inadequate information disclosure and lack of information sources make it difficult for retail investors to evaluate the intrinsic value of an IPO before investing. The ex ante uncertainty could be exacerbated under such circumstances. For these reasons, a number of Chinese researchers have tested the ex ante uncertainty hypothesis using different proxies. For example, Mok and Hui (1998) test the inverse of new funds raised as a proxy of the ex ante uncertainty, and Yu and Tse (2003) test other 3 proxies including the standard deviation of the IPO share's market returns, the offer size and the age of the firms. Their findings show that the ex ante uncertainty theory may be promising to explain Chinese IPO under-pricing.

On the other hand, the advising agent quality theory is rarely tested in the Chinese IPO literature. Why? The reasons are actually discussed already. As said, because the A-share companies only need to follow the RPC GAAP accounting standards instead of the International Accounting Standards, A-share companies usually do not hire international auditing companies such as Big 4 for the auditing services. While most

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[22] Extracted from the speech *Instability and Evolution of the Financial System* given by Zhou Xiaochun, Governor of the People's Bank of China, in December 2007, full text can be found at The People's Bank of China's official website www.pbc.gov.cn.

of the local accounting and auditing companies are state-owned or previously state-owned, the quality of their services is not easy to differentiate. Meanwhile, seldom does China's IPO issuing firm hire international underwriters[23]. Because there are too many local underwriting companies and the underwriting services are very much segmented by regions due to local governments' interference, the underwriter reputation may not be convincing in suggesting the agent's quality. In fact, as pointed out by Yu and Tse (2003), because the Chinese A-share issues are underwritten by domestic state-owned security companies and there are no prestigious financial institutions with international reputations involved, the underwriter's reputation is not a testable hypothesis in China's context.

4.1.3 Institutional Theories

The earlier discussion about institutional theories shows that the theory only has local suitability for explaining the IPO under-pricing. The lawsuit concern is largely US-centric and the tax hypothesis is applicable only to specific countries too. China's IPOs have a different story. Yu and Tse (2003) once pointed out, because China did not have a complete securities law in force until July 1999, the risk of being sued is not economically significant. Ironically, even after the securities law came into force there are still many stock market scandals due to material misstatements in China's stock market and the lawsuit issue has hardly ever been in the firms' concern[24]. "China's stock market has long suffered from corruption and accounting scandals, but few successful prosecutions have been launched for insider trading", a comment in

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[23] Only very recently, UBS joined Goldman Sachs to become one of the very few international companies earning underwriting fees from Chinese IPO firms for their mainland stock market's listing.
[24] According to the listing rules formulated by the two stock exchanges, they do not have the legal power to punish any fraudulent behaviour. The most serious action they can take is to publish a report to "publicly reprimand" the offender and until the middle of 1999 they had not even issued such report. Even the CSRC has very restrained power to punish any fraud. So far the highest economic penalty enforced by the CSRC is 300,000 Yuan, approximately 20,000 pounds, let alone the lawsuit.

Financial Times that well illustrates such failures[25]. At the same time, academics such as Su (2004) have dismissed the bankruptcy cost as a reasonable concern in the Chinese IPO pricing process. He emphasizes that 'in the absence of rigorous enforcement, the Chinese bankruptcy law is merely an embryonic regulatory regime and may not affect leverage decisions.' Thereby, the legal cost is trivial in general and the lawsuit hypothesis may not apply to the Chinese IPO context.

As for the price support hypothesis, a big difference between China's and western countries' listing rules is that the price support is prohibited in the Chinese stock market. The price support hypothesis is not suitable for Chinese IPO context.

Likewise, the tax inducement hypothesis is not applicable to Chinese IPO under-pricing either. In China, there is no capital gain tax on securities. Hence, the hypothesis' fundamental assumption of personal income and capital gain tax rate differential does not exist.

4.1.4 Ownership and Control Theories

In respect of the ownership and control theory, the earlier introduction of Chinese primary market proves to be necessary. It has been mentioned that the Chinese IPOs are mostly partial privatization and the government retains dominant control power in the post IPO firm. The agency cost influences on IPO pricing diminish in this instance. Su (2004) gives subtle explanations on the agency cost problem when trying to find the insider ownership influences on Chinese IPO under-pricing. He says, 'the degree of separation of ownership and management is quite low in newly privatized Chinese

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[25] "Angola deal sparks China shares probe", *Financial Times*, Monday, April 9 2007.

firms. The average fraction of the number of A-shares sold to the public in our sample is merely 30% of a firm's total equity and the average fraction of shares retained by the government is 45%[26]. A firm going public has much less free cash flow and less managerial entrenchment problem. Typically being the largest stakeholder, the Chinese government has tremendous amount of influence over the selection and dismissal of managers, and serves to check managerial performance. Agency problems have little effect on pre-IPO leverage decisions.' His point of view is strongly agreed by Yu and Tse (2003). They confirm that the ownership and control explanation will not apply to the Chinese IPO under-pricing because the two ownership and control models need rationing discrimination as means to realize the control ends but the major offering mechanism in China does not have any pricing or rationing bias.

4.1.5 Managers' Strategic Under-pricing Theories

As said, the agency cost based ownership and control theories are not applicable to the Chinese IPO literature, neither are the managers' strategic under-pricing theories that are too based on agency cost assumptions. Previous chapters have said that only 30 to 130 out of more than 1300 issuing firms in China are previously private-owned. In the majority state-owned issuing companies, managers are government officials and usually they have neither shareholdings nor stock options in the issuing firms like their western country peers. Sometimes, they do not even buy the new shares because of local government requirement for management not buying shares of their own companies. In fact, Yu and Tse (2003) found that the manager's strategic under-

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[26] This thesis found that in the post-IPO firms average tradable shares sold public is 28.5%, average government shareholding is 46.8%, average employee shareholding is 4.1% and average other legal entity (other than the state) shareholding is 19.2%. The attribution of the post-IPO shareholding is very similar to what Su (2004) found.

pricing model does not stand. However, they admit that their test is preliminary and their topic needs further research due to the lack of data for media coverage. Their statement again shows the common problem of data accessibility in Chinese IPO research.

4.1.6 Behaviour Theories

This block of theories remains the least explored in general IPO under-pricing literature as well as in Chinese IPO literature. Liu (2003) suggests that the share allocation method and investors' demand for shares can be used as proxies for the bandwagon effect on China's IPOs. One of the testable proxy variables is the lottery winning ratio again. Meanwhile, he also uses the lottery mechanisms including money based lottery and lottery based on the market value of tradable shares held as testing proxy. His result is mixed and no decisive conclusion has been drawn.

4.1.7 Privatization IPO and Political Motives

Speaking of IPOs in the privatization process, Jenkinson and Mayer (1988) and Menyah and Paudyal (1996) show that under-pricing in UK privatization sales is greater than in the average public offerings. Choi and Nam (1998) have empirically collected supportive evidence from 30 countries, showing that there is a general tendency for privatizations to be under-priced to a greater degree than the initial public offerings of privately-owned enterprises. In Chinese literature, Tian (2003) has directly tested the privatization IPO hypothesis and he finds no pricing differential between state-owned enterprises (SOE's) and privately owned enterprises.

Datar and Mao (1998) attribute the Chinese IPO under-pricing to the political motive

for the dispersed distribution of shares to create a viable capital market. According to Perotti's (1995) partial sale and government signaling model, a bigger government shareholding would mean bigger risk to the investors and therefore need a stronger signal of government commitment. In other words, the government needs to under-price the IPO with greater magnitude to compensate for the investors' risk. To find implications of Perotte's (1995) theory in Chinese IPO market, researchers have looked at the relationship between government retention rate – a rate measuring government shareholding in percentage in the issuing firm after the IPO – and the IPO initial return. Their results are contradictory and not decisive at all. As already mentioned, Mok and Hui (1998) demonstrate that the 'Chinese characteristic' of high equity retention by the state is one of the key determinants of market-adjusted IPO under-pricing. Their finding may have reflected Leland and Pyle's (1977) hypothesis if we regard the state-owned parental company of the carved out IPO units as another type of insider issuer. And Perotti's (1995) hypothesis seems to be supported by their findings as well. However, Chi and Padgett (2005) stress that the government ownership has a negative impact on the under-pricing, which by their claim shows that privatization is welcomed by investors. Mok and Hui's (1998) test is based on the early period of China's stock market while Chi and Padgett (2005) focus on much later period. The contradiction may be caused by different time horizon and further test is needed.

Apart from government ownership, in terms of the government behavior in the IPO process, Chi and Padgett (2005) believe that the Chinese government does not send signals to the market on the quality of the issuers by under-pricing. But at the same time, they suggest that the Chinese government does capture the market opportunities

to time IPO's to get the best market feedback on offerings.

4.1.8 Miscellaneous China-Specific Explanations

Now that the Chinese stock market is not yet fully developed and is still experiencing many regulation changes, many studies are attracted by some China-unique factors but it is hard to fit these studies into any specific existing theories. These miscellaneous China-specific explanations provide promising perspectives to look at the high under-pricing of China's IPO's.

Su and Fleisher (1999) found evidence that the difference in IPO under-pricing among A and B shares can be explained by the differences in domestic and foreign investors' investment opportunities and investment sentiments. While Liu (2003) argues that the Chinese IPO under-pricing is the result of the interactive process between the offer price and the trading price on the secondary market. In other words, the overpriced secondary market shares under the condition of de facto segmented primary and secondary markets, i.e. in general money from one does not flow to the other, causing the under-priced IPO shares in the primary market. Chan et al (2004) resort to the institutional features of Chinese stock market to interpret their findings. For example, they find that the under-pricing is positively related to the number of investors in the province from which the IPO comes, but negatively related to the number of shares being issued.

Mok and Hui (1998) suggest that the long time lag imposed by the government between the offering and listing dates is another key determinant of China's market-adjusted IPO under-pricing. Chi and Padgett (2005), Tian (2003) and Liu (2003) all

support the hypothesis that the administrative listing quota system has caused the Chinese IPO under-pricing. Furthermore, Tian (2003) suggests that the Chinese government uses this listing time lag as a policy tool to adjust the market cycle. In other words, a firm with a relatively shorter listing time lag is given the priority for floatation in an overheated market and a firm with longer listing time lag is let go public with priority in a sluggish market. Tian (2003) finds that one day delay of the floatation increases the initial return by 0.4 % in China, which captures the general characteristic of lockup risk stressed by Chowdhry and Sherman (1996), and he believes this delay accounts for the Chinese IPO under-pricing.

In addition, Tian (2003) proposes another government imposed limitation – IPO pricing cap i.e. the ceiling of P/E ratio – as a driving force of Chinese severe IPO under-pricing. But these hypotheses have not yet been fully accepted by other researchers.

4.2 Critical Review of Both Existing Theories and Empirical Studies

Researchers have been working on IPO under-pricing theories for four decades. Many of the theories have been put to empirical tests as we have just discussed. However, there are still gaps waiting to be filled in the literature, especially regarding China's IPO under-pricing.

A distinct feature about China's IPO under-pricing is its magnitude. As mentioned earlier, the Chinese IPO's are particularly priced at significant discount. The magnitude is much higher than in the developed markets and other emerging markets as well. Last section has showed that researchers have tried to use classical theories to

explain the Chinese IPO under-pricing but those theories have not been able to fully explain the high under-pricing degree. Therefore, alternative angles to look at the issue are necessary. As we can see, researchers also come up with miscellaneous China-specific explanations. However, these explanations lack consistency and their validity is yet to be proved.

Talking about consistency, the classical theories lack consistent empirical supports too in the Chinese IPO literature. For example, based on the same theoretical framework of signaling hypothesis Mok and Hui (1998) and Chi and Padgett (2005) found completely different implications of high government retention rate on the IPO under-pricing. Su and Fleisher (1999) believe the issuing firm uses IPO under-pricing to signal its quality to the investors in order to achieve a better seasoned offering (SEO) later on. But on the contrary, Yu and Tse's (2003) and Chi and Padgett (2005) do not think the signaling theory has any explanatory power. Neither the Winner's Curse hypothesis is a consensus among researchers. In light of all these inconsistent empirical results, further empirical tests of existing classical hypotheses are necessary.

A third concern regarding previous literatures is some debate among the researchers. More specifically, Tian (2003) believes that the Chinese government uses the listing time lag as a policy tool to adjust the market cycle. Tian's (2003) statement together with Chi and Padgett's (2005) suggestion of government timing seem to ring the bell to the classical debate of whether the dog is chasing its wagging tail or the tail is actually following the dog. The question is whether the Chinese government uses the IPOs with different under-pricing magnitudes (as a function of offer prices) to adjust the market cycle or it times the IPOs according to the market status to get best offer

prices.

According to Tian's (2003) paper, since the offer price is fixed beforehand the government floats the firms with long time lags during the bear market period and the firms with short time lags during the bull market period. But as he and some other researchers have showed, the listing time lag is positively related with the IPO initial return, which means if the listing time lag is longer then the IPO might be under-priced more and vice versa. Yu and Tse (2003) showed that the Chinese IPOs are under-priced more in hot market, which they believe is consistent with conclusions of other researchers such as Davis and Yeomans (1976), Reilly (1977), and McGuiness (1992).

As a matter of fact, after CSRC has approved an IPO application then the time lag between the IPO offering date and the listing date basically depends on the length of the administrative procedure before listing and the numbers of other IPOs in the queue for listing. Normally first in first out rule applies. Exceptions are rare and only happened in two cases. At the very beginning when there was no standardized IPO procedure and even there was no established stock market, first in first out rule did not apply. Later after the stock market was established, when there was an IPO procedural change a few IPOs went to floatation with priority due to special government requirement. One such exception is "Jiu Zhi Tang" (a pharmaceutical company). But generally speaking, these are very rare exceptions because the government does not want to leave an impression that it puts certain issuers at priority over others. Suppose that during certain market cycle period the government has chosen to let one IPO go public, then as long as the IPO is approved it is not the government intention to hold

or speed up the IPO's listing process. Since the price has been fixed beforehand, no government intentional delay or acceleration between the approval and listing means no deliberately caused under-pricing. However, the government does have choices on whether or not to let the IPO go public before it actually approves the application. Logically, Tian's (2003) hypothesis sounds unrealistic, but it provides an enlightening suggestion of taking listing time lag as an explanatory variable to more comprehensively understand the IPO under-pricing.

Finally, there are some untested statements in China about the IPO under-pricing. Like Tian's (2003) statement of floatation game and other miscellaneous explanations, these untested statements could provide alternative but maybe promising perspective angles to interpret China's severe under-pricing. The following section will review these statements and related literatures in the area.

4.3 Untested Statements – Literatures and Articles

In China, there are some untested arguments and statements trying to expand explanations of the under-pricing. Chapter 1 has briefly touched some topics relating to these statements. It is said that the Chinese IPO under-pricing could be caused by speculation in the Chinese stock market, by the intention to implement its Western Region development policy and by the government protection over certain firms. Compared to well-knitted classical theories these statements have not yet been tested. However, a summary of related literatures from both academic researches and practical field would help to understand how these arguments are formulated.

4.3.1 Speculation Effect

To discuss the speculation effect properly, it is necessary to go through some unique features of China's stock market and IPO process. As said, the Chinese government set up the Chinese stock market to meet the huge capital demand of SOEs. However, at the very beginning of China's stock market the local government or even the management level of the listing companies did not want their companies to go public because they were afraid of losing absolute control of the companies. Therefore, the central government introduced the quota system in order to: 1, relatively fairly allocate capital among different regions and industries according to the government agenda; and 2, force the unwilling local governments and managers to let the company go public. But in effect, the quota system eventually serves the government's goal of controlling the supply of new issues as Chi and Padgett (2005) point out. The examining and approving system, the channel system and the recommending person system all in fact have evolved from the quota system. Essentially, they are all kinds of quota systems but in different forms and names. Let us focus on the original quota system for the moment since the implication is applicable to other systems too. In reality, after the first lot of listing companies had financially benefited (and more importantly had not lost any control) from the offering all the other companies rushed into the IPO application queue. The quota system may have achieved its objectives in this sense but at the cost of some unexpected problems.

The story starts with the outdated organizational structure of the old big SOEs before they went public. Besides insufficient capital, a serious problem facing the SOEs is their huge unprofitable burdens formed in the former Soviet-style administratively planned economy, from company-subordinate hospitals to nursery schools, from

kindergartens to high schools and from sports centers to food and retailing chain shops. A famous Chinese saying before at that time is that "you born as a socialist man you die as a socialist ghost", which means the SOE takes care of everything for your whole life. A big SOE is like a small society and it is very difficult for the management level to cope with significantly and usually unnecessarily diversified business lines. Indeed, one major objective of China's economic reform is to release the SOEs from the unnecessary burdens. Then what is the implication of this problem to the IPO system?

As described in chapter 2, the CSRC used to set a certain amount of new shares to be floated at the stock exchanges and to ration the quotas to each of the central government ministries that oversee various industries, and the provinces, municipalities and autonomous regions. To get as many companies as possible to go public within the quota limit, the local government or individual ministries resorted to a unique IPO method: separate to go public. The company might separate the major operating parts from other unprofitable parts and let only the profitable parts go public. Sometimes the company might even cut into pieces the whole business chain or the operation cycle to go public. For example, an iron and steel company might only let its sales department go public and a TV manufacturing company might only let its production department go public. The separation is somehow different from the common units carving out seen in other markets and it led to other problems. Before the company was separated, it was running as a whole unit and the profits and lose were calculated all together. But to fulfill the CSRC requirement of at least three years traceable profit in accounting record, the carved out units have to figure out some bypass to get around this requirement. Because the newly separated part did not have

such records when applying for issuing, it would have to forge the accounting report, called "simulated accounting report" by some professionals and officials. Naturally, the issuing firm would take advantage of this game and decorate its performance as brilliant as it could. This process was completely legal till the central government later published a number of official documents requiring the IPO applying companies to go public in whole units[27]. Furthermore, the CSRC has published new regulations since 2004 to cut the source of the "simulated accounting report" problem[28].

Usually, because only the profitable parts of the company go public in the IPO, it is generally believed among investors that these units would have better performance in future than the whole unit otherwise not separated. The investors would buy the IPO in hope of higher future return. The IPO share would experience short-term increase of share price in the secondary market when the IPO shares in primary market are short of supply and the IPO offering price would be relatively underestimated. Secondly, as the applying company (sometimes even the local government) wants to make its IPO offering price as high as possible, it would naturally describe in its forged accounting disclosure the 'simulated' performance as brilliant as possible. Although the central government has strict rules against such behavior and requiring honest estimation of performance, it was nearly impossible to get rid of this deliberate fraud.[29] Believing in these forged accounting reports, the investors would be eager to buy the IPO shares, pushing up the share price in the secondary market and hence

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[27] For example, on August 23rd, 2005 the CSRC, the State Asset Supervision and Administration Commission (SASAC), the Ministry of Finance, the People's Bank of China and the Ministry of Commerce jointly published a government document supporting whole unit issuing. In November 2005, the CSRC published another document again emphasising the government support of whole unit issuing.

[28] See *The Notice Regarding Further Standardizing the Listing Process*, September 21st, 2003, CSRC.

[29] Such scandals have been explored in numbers by media. Because most of the auditors are state-owned or tightly controlled by local government, and the Chinese accounting standard (GAAP) instead of International Accounting Standard (IAS) is used in the IPO process, the auditing has lost its real value in this instance.

causing the IPO under-pricing in the primary market.

Soon these investors would recognize that they have made very bad decision and the only way to make money or even get some money back is to get out as quickly as they can, which in turn provides a good motive of short term speculation. Why they are wrong? The following paragraphs will follow up with the answer. But for the moment, we can see that the listing quota system suppresses the supply and lifts the demand. Although the government control method has evolved to different systems, the control itself over new share supply is never released.

The inaccurate accounting report is not the only problem. As said in last chapter, the Chinese IPOs are mainly partial privatization IPOs, which means the parental company/companies is still the major shareholder in the new firm after the IPO. Although the profitable part or operating part of the company has been separated to go public, after the IPO unit has cashed out its shares the parental company still has the dominant power to withdraw capital or IPO proceeds from the IPO unit and re-allocate the money for other uses such as paying the bank debt or buying other SOE shares. A Chinese financial newspaper *China Management* (January 31st 2004) ever joked about this phenomenon by saying that "the listed firm is the parental firm's ATM and investors' money is poured into a deep dark bottomless hole." It pointed out that "the purpose for a lot of parental companies to carve out profitable units and separate to go public is sole and pure – to make the listed son company their ATM. This process starts from the very beginning when the first lot of money gets into the listed son company." The newspaper gave an example of "Hei Hua Gu Fen" (SSE600179) being robbed of by its parental firm about 59% of its net assets in just

one year. *Financial Times* (March 28th 2005) ever said that "the corporate [issuers] that stole the money with IPOs put something back by buying shares in other state-owned companies, it is one way to offset those ill-gotten gains." The second way in which the parental company exploits the carved-out units is the so-called "associated transaction". This is also caused by the "separate to go public" methodology. As described previously, the carved-out units are effectively part of the parental firm before the IPO. In order to satisfy the quota system, the unit is carved out as if it is an independent firm. But in reality, the carved-out units normally cannot survival without the parental firm because of their incomplete production or organization structures. Therefore, the carved-out units have to rely heavily on the transactions done with the parental firm. The parental firm could take this advantage and exploit the transactions that are vital to the carved-out units, for instance, by charging unreasonable price for upstream products or materials. All these problems keep happening in great numbers from the beginning of Chinese IPO market till now because IPO is regarded as a cheap way to replace bank debt.

On the other hand, because the capital is withdrawn by parental companies and because the issuing companies do not feel responsible for returning profit to the shareholders, very few IPO companies pay cash dividend to the investors. This is a common phenomenon such that even the profitable IPO firms rarely pay dividend, let alone the fact that many SOEs performs badly after IPO. The fact that IPO SOEs performs badly after IPO actually has two-folded meanings. Firstly, as Aharony, Lee and Wong (2000) pointed out, the SOE managers may manage their firms' earnings to boost their chance of being selected for IPO or they are instructed by the majority shareholder – the state – to do so. Aharony, Lee and Wong (2000) found that in China

IPO firms' performance peak in the IPO year and decline in the post IPO years. Secondly, as a matter of fact, even if some listing firms intend to pay dividend they are actually not be able to do so because their performances are much worse than they have declared in the prospectus. "The cities and provinces deliberately pushed lousy state-owned companies on to the stock market to reduce the pressure on their own finances," quoting Mr. Joe Zhang of UBS Financial Times (March 28th 2005) said so. In result, Zhang and Wang (2003) found that the "IPO effect" – the new shares' performance decline after listing – is evident for China's IPOs especially in the middle-sized IPO group. As Yang (2003) pointed out, the deteriorating profitability of these firms further strengthens arguments that Chinese listed companies are "over-dressed" when initially listed. In light of above factors, the investment opportunities for the retail investors in China have been diluted, i.e. the money has gone beyond the range where the investors originally want to invest but the long-term capital gain is not correspondingly promising due to the bad long-term performance of the parental company. Even worse, there is no dividend.

If the investors try to make profit by holding the IPO shares instead of selling them in short-term, they are wrong. Eun and Huang (2002) have tested a hypothesis pertaining to asset pricing in China that investors will pay a premium for dividend-paying stocks as dividends signal the management's willingness to return cash flows to outside shareholders rather than expropriating them. On the other hand, based on this hypothesis the IPO has to be under-priced to attract investors if the IPO firm does not pay cash dividends. This hypothesis hits right at the heart of the question posed above. As said, Chinese issuing firms regard IPO as a cheap way to raise money but assume no responsibility of returning dividend to shareholders or more precisely the minority

shareholders, because the biggest shareholder is still the parental company. It is not uncommon for the parental company to withdrawn IPO proceeds and re-allocate to something else in its own interest. The investors' investment has been diluted and misused. Also given the situation that the IPO is used by the government to finance lousy SOEs as said, the long-term investment opportunity vanishes.

On the other hand, the short-term speculation opportunities still exist, i.e. the short-term capital gain from IPO under-pricing. "To facilitate such a process - and lure retail investors to companies of dubious quality - Beijing set rules that ensured initial public offerings were under-priced, thus guaranteeing investors handsome gains in the first few days of trading." (*Financial Times* March 28th 2005) Bailey (1994) and Ma (1996) point out that Chinese markets are highly speculative, and domestic investors may be highly risk tolerant and are to earn money in the short run. A formal report on China's stock markets compiled by OECD (2001) states: "The market, which is dominated by small retail investors who are concerned primarily with short-term trading profits, has frequently been marred by speculation and market manipulation."

During decades of double digits economic growth since the economic reform started, household disposable wealth has increased significantly. A long time Chinese family tradition is to save for the future. With a gross domestic annual savings rate of about 40 percent, China has the highest proportions of income savings in the world[30]. However, the relatively high inflation and low deposit rate often push the real interest rates of bank savings into negative territory. On the other hand, alternative investment opportunities are scarce. Prior to the inception of stock market, bank savings and

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[30] The savings rate was reported to be 41.5 percent in 2000 according to Asian Development Bank's Country Economic Review – the People's Republic of China, November 2001.

treasure bonds were the only investment instruments available for Chinese residents[31].
The introduction of stock market provides a brand new investment channel to
investors. With constantly high savings and quite limited investment alternatives,
investors' potential demand for new shares is lofty. But soon the investors find their
IPO investments are trapped in a pool of problems described above. The only way to
get money back is to target at the short-term IPO initial return given as bait by the
government. As a matter of fact, not only in the primary market but also in the
secondary market, investors are betting on the short-term stock price rise (short sell is
not allowed in China) to make profit. Eun and Wei (2002) observe that investors'
desire for quick gains from holding stocks, coupled with lax market regulations, has
fostered a speculative atmosphere in the stock market.

The distinct feature that China's stock market is driven by an army of highly
speculative investors has been noticed by many people. The Wall Street Journal
(August 22, 2001) once vividly depicted the Chinese stock market by likening it to a
casino: "China's stock markets have operated like casinos, driven by fast money flows
in and out of stocks with little regard for their underlying value." Based on interviews
with individual investors, *Financial Times* (July 11, 1997) reports that interviewees
never held shares for more than one month. Similarly, the *International Herald
Tribune* (July 2, 1999) reports that typical small investors held only a couple of stocks
for less than a month before selling them. The *Economist* (June 30, 2001) concurs:
"Trading, not ownership, is the approach of China's investors…" The lack of
investment opportunities, the government control of new share supply and China's

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[31] Mutual funds were not available to Chinese investors until the late 1990s. Even after the government
passed the *Provisional Measures of the Administration of Securities Investment Funds* – the guideline
for institutional stock trading - in November 1997, institutional investors are still playing a rather
limited role in the often-volatile market where long-term investors are scare.

problematic IPO process should be blamed for causing the problem.

At most of the times, the government has a tolerant attitude towards investors' speculation as long as the stock market runs relatively stably. But sometimes, the speculation is so high that the government is forced to take actions to cool the market. In the middle of 1990's, after several years of bear market there was a surge of investments in China's stock market due to a long-time suppressed capital supply and a bright market expectation. The pouring of the hot money into the market leads to great amount of speculative trading and in turn the market disturbance. To cool the investment and stabilize the market, the central government issued an official document announcing its willingness to curb the speculation. Besides, the government loaded its traditional fiscal weapon – tax. The development of this event is described in China Security (www.ctaxnews.com.cn October 10th 2004): "In 1996, huge amount of irrational speculation get into the market after the ending of a 3-year period of bear market. To stabilise the market, the transaction stamp duty tax rate was raised to 0.5% (by the CSRC) to encourage mid and long-term investment." The real situation is that in 1997 the security regulation authority raised the transaction stamp duty tax rate from 0.3% to 0.5% of the total trading value. The logic behind this policy is that the increase of the transaction stamp duty tax would increase the transaction cost and supposedly damper the speculation magnitude. From the very beginning of Chinese stock market until May 2007[32], this is the first and the only time that the government increases the transaction stamp duty tax rate in almost two decades, let alone the big increase that the tax rate was almost doubled. The raise of the transaction tax rate can be seen as a very strong and serious signal from the

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[32] When this thesis is being written, the Chinese government raised the transaction stamp duty tax rate for the second time in May 2007 to slow down the overheated market after a 7 years high economic growth and 3 consecutive years of bull market.

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government in line with its statement of tackling the speculation problem. This government policy change provides a valuable opportunity to examine the speculation effect. Chapter 4 will discuss in more detail how this event forms a testable implication of the speculation effect hypothesis.

It is broadly believed among Chinese stock market practitioners that the high speculation effect in the primary market has caused severe IPO under-pricing. But surprisingly, few academic papers have done research directly based on this assumption. The most authoritative and direct statement about speculation effect comes from Zhang (2006) in his consultation report to the Shanghai Security Exchange Research Institute. He is quoted by *Security Daily* (August 15th, 2006) as saying that one of the sources of China's severe IPO under-pricing is the heavy speculative atmosphere in the primary market. Chen and Zeng (2003) suggest that over-speculation is one of the reasons for Chinese IPO under-pricing. Li and Zhou (2005) put forward that China's IPO under-pricing can be explained by a so called speculative-bubble hypothesis. Although their whole analysis on this hypothesis including literature review, hypothesis setting and conclusion only has less than 10 lines, they do have proposed a testable proxy – the turnover rate in the first trading day after IPO – to test their hypothesis without giving any explanations.

As a matter of fact, Li and Zhou (2005) are not the first researchers to look at the relationship between speculation and turnover rate although others have not tried to relate the speculation to the IPO under-pricing. As will be defined formally in chapter 6, the turnover rate measures the intensity of the short-term (or more specifically in the IPO's first trading day) trading activities. The bigger the turnover rate the greater

the speculation magnitude, if we regard the short-term trading activities as speculative trading. A same term of turnover rate has emerged from US IPO literature and referred by Krigman, Shaw and Womack (1999) and Aggarwal (2001) as flipping rate. However, their turnover rate is to measure the block trades done by institutional investors while in Chinese IPO literature the turnover rate is to measure retail investors' behavior because retail rather than institutional investors are the majority in China's stock market. Being a highly speculative market, Chinese stock market has the highest turnover rate in the world by Chinese definition[33]. From 1991 to 2000, the average annual turnover ratio is 587% in China, far exceeding its counterparts observed in other markets, and it is reported that at least 90% of turnover is from trades by retail investors with limited funds[34]. Eun and Huang (2002) suggest that this high turnover ratio is likely to reflect the speculative trading behavior.

On the other hand, indirect literature can be found in line with the investment opportunity assumptions. In fact, Su and Fleisher (1999) suggest that the under-pricing of A-share IPO's is partly due to relative small aggregate supply of shares. And Tian (2003) has demonstrated that the listing quota has restricted the amount of issuing shares, so the supply is less than sufficient. Chau et al (1996) and Gu (2000) suggested that "the lack of investment opportunities causes…the high initial returns of IPO's" without testing the hypothesis. More explicitly, Zhang (2006) points out that because there are large amount of idle capital in the market investors try to "hit the new share and make speculation". The incentive for this speculative behavior is the inappropriately matched risk and return of IPOs. All these arguments indicate that the

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[33] Detailed comparison results of turnover rates between the Chinese stock markets and the world's other stock markets between year 1992 to 2000 can be found in Shirai's (2002) paper. In general, the numbers show that the turnover rate in the two Chinese stock markets are 4 to 20 times higher than in other stock markets in countries and regions such as US, Japan, Hong Kong and South Korea.
[34] The details of this percentage and statement can be found in Eun and Huang's (2002) paper.

imbalance between the new share supply and demand may be a testable implication of the speculation effect hypothesis. In existing Chinese IPO literatures, researchers such as Chi and Padgett (2005) have used the lottery winning ratio to measure the over-subscription degree. Since the imbalance between the new share supply and demand is largely reflected in the over-subscription level, it is appropriate to employ the lottery winning ratio as a testable proxy variable for the test of the speculation effect as well.

4.3.2 Western Region Development Policy Effect

The "Western Region Development" policy started from year 2000[35]. According to the policy the government's emphasis of economic development is moved from eastern regions to western regions, where most China's poor and less developed provinces are located[36]. Through this policy the government plans to reduce the development imbalance between eastern region and western region as well as to decrease the gap between the rich and the poor, because the western region has much greater portion of poor population than the eastern region. It is believed that the western regions gained less boosting power for economic development due to the lack of capital. Some academics and government officials have ascribed the lack of financial facilities[37] and financial services to the cause of the lack of capital in western regions and they suggest to build up new 'capital pools' for western regions and to encourage western region companies to go public. Statistic report shows that in SSE 50% of the publicly listed companies are local companies and in SZSE this rate is

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[35] According to the then Chinese president Jiang Zemin's instruction, China's State Council Western Region Development Leading Group Office was set up in January 2000, which can be seen as the official start of the policy.

[36] The official definition of "Western Region" includes 12 provinces and cities, they are: Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi and Nei Menggu.

[37] China's both stock exchanges are located in the so-called eastern sea-shore region.

36%, but in western regions there is no such kind of financial facilities. In the year 2003, the eastern region companies accounted for 59.29% of the total amount of all the publicly listed companies nationwide but the western region companies only accounted for 17.48% (the rest are middle region companies [38]), said *Shanghai Security* (May 26th, 2003). To solve the problem, the government has determined to encourage western region companies to go public at the existing two stock exchanges. In its official document of "*State Council's several suggestions on further promoting the development of the western regions*" (March 11th, 2004), the Chinese government has clearly stated that it would "actively support the eligible western region companies to issue shares (go public)" to "widen the investment channel in order to provide the capital guarantee for the western region development", quoted by *People's Daily* (March 23rd, 2004), the country's most significant newspaper.

Although the government has decided to encourage western region companies to go public, the reality is different. Because the western region areas started the economic reform later than the eastern region areas and because the inland western region areas have far less convenient transportation channels, western region companies are normally perceived as less efficient and less profitable compared to their eastern counterparts. To deal with this lack of confidence in western region companies, the investors are supposed to get more incentives and motives to invest in the western region companies under this policy. In practice, investors have realized the existence

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[38] Even though the *Shanghai Security* separately listed the proportion of middle region companies, the middle region company is not used as a geographic discrimination criterion in this thesis for two reasons. According to the Chinese custom people usually differentiate between eastern and western regions in a very general sense, although sometimes narrower regional definition may come out of different context. Depending on the context, sometimes western region may stand for the poorer area rather than always necessarily the geographic definition. Secondly, the Chinese government's "Western Region Development" policy only give rise to the term western region, therefore, in this thesis all the regions belong to eastern region if they are not from the 12 provinces and cities included in the government policy.

of such incentives and tried to profit on them implicitly. For example, there are many so called 'concept shares' in China's stock market. These concept shares' IPOs are popular because the hot concepts make the investors believe the shares are going to be attractive to more investors than the normal shares and hence have bigger growth potential in the secondary market. "Western Region Development" is one of such hot "concepts" that make the regions' shares more popular. A more vivid example is that when people are analyzing the IPO price of Sichuan Road and Bridge Company (Sichuan is a western inland province), they believe that the price should be adjusted in line with its "Western Region Development" concept (www.nugoo.com, March 24th, 2003). The analysts expect that the policy must have positive impact on the future development of this company and thus on the IPO price, because the government policy is supposed to encourage the investment into the western region communication and transportation facilities. The example shows that practitioners believe that the western region concept could provide a more prosperous profile for the IPO share.

Since the economic reform, China has seen its economy in the process of being transformed from tightly government planned and controlled into a more market-oriented one. However, the government maintains powerful influence in the economy. As the "Western Region Development" policy brought about a vital policy change, some researchers claim that the Chinese government may adjust its IPO policy, using under-pricing to support the implementation of this policy because the under-priced western region IPOs are supposed to provide less confident investors more incentives to invest into western region companies. "Between reducing the risks and increasing capital-raising efficiency…the CSRC has chosen to sacrifice the efficiency by under-

pricing the IPO's……" said *Financial and Economic Times* (V572, July 2004).

Although it is claimed that the government may seek implementation of the "Western Region Development" policy through IPO pricing, interestingly, there is no particular policy or regulation in the CSRC-issued documents requesting favor towards western region IPOs even if the government claims to do so. In fact, the government tends to give fiscal support such as tax reduction and remission to the western region companies. Additionally, cheap business loan and government appropriation are often used too[39]. The reason why the concept of "Western Region share" makes the IPO more attractive is only because investors believe the government policy may help improve the company's performance in above ways. In result the Western Region IPOs are relatively under-priced due to its short-term price increase in the secondary market. If the result is positive, it is promising to think the IPO under-pricing also as a government signal for commitment in the "Western Region Development" policy as what Perotti (1995) and Tian (2003) have pointed out - the motivation of this forced under-pricing is in the political interests of the reformist government in developing a capitalist stock market and transforming the society.

The literature on the Western Region Development policy effect on Chinese IPO under-pricing is even less than the speculation effect. But there is one particularly interesting research paper trying to explain the Chinese IPO under-pricing from more or less the geographic point of views. This is the only paper found so far dealing with the regional factors from the government influence perspective, and more

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[39] Supportive fiscal policies can be found in government archives such as *State Council's Notice on Several Policy Measures Regarding to the Implementation of Western Region Development Policy [State- promulgated (2000) No. 33]* and *Notice on Favourable Tax Policy Measures Towards Western Region Development Policy [Finance & Taxation- promulgated (2001) No. 202].*

interestingly the purpose of the regional differentiation in this paper is to indirectly find out the impact of the government listing quota system. Chan et al (2004) find that the Chinese IPO under-pricing is positively related to the number of investors in the province or municipality where the IPO firm comes from. They argue that since the listing criteria is not solely based on the quality of the companies, but is also determined by the central government that tries to balance the development of different provinces, not all IPOs are of similar quality. They conjecture that the IPOs from the more developed provinces are of higher quality than those from the less developed ones. The number of stock investors in the province is used as a proxy for the stage of development (wealth) of the area. Because the eastern regions in general are much more developed in economic sense than the western regions and because the Western Region Development policy indicates government's intention of keeping balance between the developed and undeveloped regions, their research could imply that the government may have managed to use the under-pricing to implement its balancing strategy. But all in all, the test of Western Region Development Policy statement is a direct and explicit test to see whether or nor the government has been involved in Chinese IPO under-pricing.

4.3.3 Government Protection Effect

Perotti's (1995) paper shows that a partial sale and (possibly) its under-pricing are signals of commitment of the government due to investors' concern about future interference from the government. Perotti's (1995) theory may have realistic implications to Chinese IPO under-pricing. Although the privatization wave has stormed China for decades, there are still many huge monopoly companies tightly controlled by the government. In contrast to other SOEs, these industry giants usually

are of strategic importance to the nation, such as energy and petrochemical companies. It is generally believed that the government carefully protects these companies. Also as described previously, one major purpose of Chinese stock market is "to reform the unprofitable, inefficient state-owned enterprises." When these government-protected firms go public investors often have more concern about the government interference in the future. Thus, according to Perotti's (1995) theory it is likely to presume that the under-pricing is a signal of credible privatization in the sense that the government needs to under-price those protected firms more than it does with the non-protected firms to ease investors' concerns.

The government protection possibly has been reflected in the under-pricing of the IPO share, but few researches have explicitly tested the statement. An (2003) comments on the statement by saying that, because "the Chinese government traditionally always takes the stock market as a tool to help those state-owned firms with bad performance", "some industries like energy will benefit from the policy." The most direct remark on this issue is from Sayuri (2002) that in China "stock prices of protected firms were lower than the prices of unprotected even though the former performed better than the latter."

Although research on the government protection effect on IPO under-pricing still needs further development, a few studies do have noticed the government protection and its possible impacts in the IPO area even if they not directly relate the protection to the under-pricing. For example, when studying the relationship between the pre-IPO financial packaging process (essentially the carving out process as we discussed) and the long-term performance of Chinese IPO firms, Aharony et al (2000) observe

that the government protection seems to have played active role in causing discriminative difference of long-term performances among the IPO firms. They identify that firms within petrochemical, energy and raw material industries have enjoyed government protection and firms within all other sectors have not. Their classification of government-protected and non-protected IPO firms is enlightening to the test of the government protection effect on IPO under-pricing too. A possible testable implication of government protection effect is to look at the discriminative difference in IPO initial returns between the government protected firms and the non-protected firms according to Aharony et al (2000)'s classification. The test will directly show whether or not there is a government involved in the under-pricing of IPOs of government protected firms.

Chapter 5 Hypothesis

Last chapter has exhibited the IPO under-pricing theories. Especially, several statements about Chinese IPO under-pricing have been discussed. This chapter will follow the discussion of these theories and statements by looking at the corresponding testable implications. Eventually, testing hypotheses will be formulated based on these testable implications.

But before going through all the hypotheses, one thing ought to be mentioned beforehand although detailed discussion is left to chapter 6. In the hypothesis setting, IPO under-pricing magnitude is measured in the form of average IPO initial return. Accordingly, hypotheses are set up to test the relationship between individual factors and the IPO initial return rather than the term IPO under-pricing.

5.1 Speculation Effect

By two means, it is possible to demonstrate the speculation effect on the IPO under-pricing. The first approach is to take a look at an allegedly powerful policy weapon in the government's ammunition depot to fight the speculation – the transaction stamp duty tax. It is mentioned earlier that the Chinese government increased the transaction stamp duty tax rate on May 12th 1997 to curb market speculation. The tax rate was almost doubled and it was the first time and the only time (before May 2007) in Chinese stock market history that the government raised the transaction tax rate. It is a very strong and serious signal of the government intention to tackle the speculation problem. If the government's intention has been fully realized and its goal achieved, the speculation effect would have been subdued by this policy change. Furthermore, if the assumption that the speculation is a driving force of Chinese IPO under-pricing is

correct, the under-pricing magnitude would have become smaller in the post-event period than in the pre-event period. The hypothesis is thus set as:

Hypothesis 1: *The average IPO initial return is higher before the transaction stamp duty tax ratio is increased on May 12th 1997 than after.*

Since the tax raise is a government policy change, the test of hypothesis 1 may help indirectly test the government influences on IPO pricing.

The above hypothesis is focused on the effect of the tax rate change event, while a second view of the transaction stamp duty tax rate is based more universally on the whole time series of the transaction tax rate development. As said, the Chinese government only increased the transaction stamp duty tax rate once and for all the rest of times it always tried to reduce the tax rate (before May 2007). If the logic and reasoning about transaction tax rate, transaction cost and speculation magnitude in chapter 4 are reasonable, and more importantly if our assumption about the relationship between the speculation effect and the IPO under-pricing is robust, it is natural to imagine that the transaction tax rate fluctuation has a direct impact on the IPO under-pricing.

The Chinese government believes, and so does this research, that the stamp duty tax is a manageable force to control the speculation magnitude. If it makes sense that a higher transaction stamp duty tax rate could reduce the speculation because of the increased transaction cost, then a reasonable inference is that a lower transaction stamp duty tax rate could lead to a higher speculation due to the decreased transaction

cost. Given the assumption that that speculation magnitude has positive contribution to the IPO under-pricing, a higher transaction stamp duty tax rate in turn would lead to a lower IPO initial return and vice versa.

Thus, it is possible to set up a hypothesis with both directions of IPO initial return movement associated with the transaction stamp duty tax rate movement. The purpose of running this hypothesis test is still to find out the real impact of the speculation effect because the transaction tax only kicks in at the time when a stock transaction happens in the secondary market. In the primary market, neither the new issuer's offering price is possibly affected by any transaction tax taking place later nor is the under-pricing magnitude. Therefore, by looking at the relationship between the IPO initial return and the transaction stamp duty tax rate that is exogenous to the IPO pricing and only directly affects the speculative trading, a bridge connecting the IPO under-pricing and the speculation effect can be built up.

Hypothesis 2: *The IPO initial return is negatively related with the stamp duty tax rate on the transaction value.*

The second approach to find out the speculation effect is to look at the direct link between the magnitudes of speculation and IPO initial return. If the assumption that the IPO under-pricing is caused by speculation is correct, then a positive relationship would be found between the two magnitudes. A good proxy to measure the speculation magnitude is the turnover rate in the first trading day, as suggested in last chapter. As a result, the positive relationship between the magnitudes of speculation and under-pricing would translate into the positive relationship between the turnover

rate and the IPO initial return.

Hypothesis 3: *The IPO initial return is positively related with the first trading day turnover rate.*

Chapter 4 has suggested that the supply and demand of IPO shares somehow play roles in introducing the speculation effect which agrees with the introduction of China's highly speculative stock market and sparse investment opportunities. As a result of the serious imbalance between supply and demand, the A-shares are distributed through a lottery system, in which there is a fixed price offer with investors bidding for quantities[40]. The odds of winning the lottery depend on how much money has been put into the lottery. Winners are selected via a random number generating scheme and are entitled to purchase shares (usually one thousand shares) at the issue price (Gu, 2000). Since the demand for the new shares far exceeds the supply, only a small percentage of the subscriptions win the lottery. As a result, a proxy usually used by previous researchers such as Liu and Li (2000) and Chi and Padgett's (2005) to measure the oversubscription of IPO shares is the lottery winning ratio. As they suggest, the odds of winning the lottery can be used to quantify the demand for IPOs since it shows how much money has been invested to buy the newly issued shares and what the chance is to stand out from loads of other applications. Lower odds signify a higher imbalance between supply and demand of new shares. According to the assumption that the speculation is caused by the lack of supply, a higher imbalance between supply and demand of new shares means a higher

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[40] Details about the online fixed pricing can be found in chapter 2, the introduction of China's stock mark background.

speculation and hence a higher IPO under-pricing. Obviously, a testable hypothesis would be:

Hypothesis 4: *The IPO initial return is negatively related to the IPO share's lottery winning ratio.*

In early studies, the lottery winning ratio is usually put to test of information asymmetry and information cascade hypotheses. But since all these hypotheses assume the same relationship between the lottery winning ratio and IPO initial return, the test result of hypothesis 4 can be used for the other two hypotheses that will be shown later in this chapter.

5.2 Western Region Development Policy

Previous chapters have discussed that under the Western Region Development Policy, the government could seek to under-price the IPO shares of western regions in order to encourage investments into the area. To test whether the new "Western Region Development" policy has really affected the IPO pricing, a comparison between ex ante and ex post event is necessary. As mentioned in literature review, Chan et al (2004)'s study indicates that eastern region IPOs are possibly under-priced more than western region IPOs. This study will compare the difference of IPO mean initial returns between western region and eastern region companies before and after year 2000 when the policy started. The geographic definition of western region will follow the official definition by the government. The classification of western and eastern companies is according to where the company has registered. This company classification criterion is adopted by all the financial databases used in this study and

also by most of the financial databases in China. As the Western Region Development policy is supposed to cause more under-pricing to the western region IPO's after the policy came into effect. The hypothesis is set as:

Hypothesis 5: *The Western Region IPOs will be under-priced more after year 2000 when the Western Region Development policy has come into effect.*

5.3 Government Protection Effect

The last chapter of literature review has discussed that the government could under-price government-protected IPOs in order to compensate for investors' concern of future government interference. But before setting up testable hypothesis, it is necessary to notice another side of the government protection assumption. As mentioned before, the government-protected firms are usually at the same time huge monopoly companies. These companies often have gigantic market capitalization and large market shares. Meanwhile, some of the government protected firms may have comparatively good performance among the listed firms, of which the majority shares are held by the state, due to their dominant market position and possibly government support. A good example is China's petrochemical companies. Later sections of this chapter will show that such firm characteristics as size and profitability are usually believed to be factors that could affect the IPO under-pricing. It is presumed that larger and more profitable issuing firms will suffer less under-pricing in the IPO due to reduced information asymmetry between the issuer and investors.

Tangled with impacts of other factors, the real effect of government protection on the IPO under-pricing is hard to predict. It is possible that the attractive profile of those

government protected firms overweighs investors concern of government future intervention, thus making the government protection effect more difficult to distinguish. In reality whether the investors' concern of government protection or the firm's specific attractive characteristics will prevail, only the empirical data can prove. But from the angle of government interference, the hypothesis is set as follows:

Hypothesis 6: *The IPO mean initial return in government-protected firms is higher than in non-protected firms.*

5.4 Information Asymmetry Hypotheses

As discussed in literature review, some classical theories have been put forward to explain the IPO under-pricing and these theories could also be adopted into the context of China's IPOs. Information asymmetry hypotheses are the most frequently tested hypotheses in Chinese IPO literature.

Rock's (1986) "Winner's Curse" argument implies that the degree of information asymmetry is a decreasing function of profitability and firm age. The information asymmetry between informed investors and uninformed investors causes the "Winner's Curse" problem as the uninformed investors are more likely to receive the allocation of shares of bad quality firms. The under-pricing is a compensation to lure the uninformed investors to play along. In other words, better quality firms measured by higher profitability need less incentive to lure uninformed investors as opposed to the "lemon" firms in the market. Also, the longer the issuing firm has stayed in the market, the more information about the firm is available to the outside investors. In this sense, a higher profitability and a longer firm's history would lead to less IPO

initial return. Because if the information asymmetry really is the cause of IPO under-pricing, then the less information asymmetry would mean a less IPO under-pricing reflected in a less IPO initial return.

Hypothesis 7: *The IPO initial return is negatively related with the issuing firm's profitability.*

Hypothesis 8: *The IPO initial return is negatively related with the issuing firm's age.*

Generally speaking, Chinese IPOs are oversubscribed. A lottery offering mechanism is hence used in the process, as introduced previously. China's IPO market setting indicates that Koh and Walter's (1989) ballot allocation test for Winner's Curse hypothesis may be applicable in Chinese IPO context too. Indeed, Chi and Padgett (2005) use the lottery winning ratio as an explanatory variable in test for information asymmetry, which coincides with our early discussion of Hypothesis 4.

Hypothesis 9 (also Hypothesis 4): *The IPO initial return is negatively related to the IPO share's lottery winning ratio.*

Based on the information revelation theory, Benveniste and Wilhelm (1990), Spatt and Srivastava (1991) and Benvensite and Busaba (1997) address that the under-pricing is a reward to those investors who reveal their demand and true valuation for the new shares. They argue that the fixed pricing should cause more under-pricing to the IPO than the bookbuilding offering method.

Hypothesis 10: *The IPO initial return is higher under the fixed pricing method than the bookbuilding method.*

Within the information asymmetry theory category, signaling hypotheses are the mostly tested. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989) have pointed out that the under-pricing is used as a costly signaling tool by the high quality firm to reveal its value to the investors so that it will be rewarded in the seasoned offering later on.

Hypothesis 11: *The IPO initial return is higher for the firms that have seasoned offerings than the firms that have no seasoned offerings.*

Another very often-used variable to explain the cross-sectional differences in IPO initial return is the IPO price itself. Su and Fleisher (1999) have suggested that the under-pricing of A-share IPO's is partly due to relative small aggregate supply of shares and they found that the smaller the IPO price, the higher the IPO initial return. They believe a higher offer price means a lower profit to the informed investors. Shleifer (1986) once argued that the supply of shares is negatively related to share prices, reflecting the downward-sloping demand curve. If Su and Fleisher's (1999) argument is right, then a small aggregate supply of shares means higher price and in turn a smaller IPO initial return should be expected. However, their result is opposite. In this sense, to look at the relationship between the IPO price and its initial return is necessary.

Hypothesis 12: *The IPO initial return is positively related to the offer price.*

5.5 Ex ante Uncertainty Hypotheses

If Beatty and Ritter (1986)'s ex ante uncertainty theory is correct then the smaller the issuing firm is the bigger ex ante uncertainty about its IPO's intrinsic value and therefore the greater under-pricing of its IPO, i.e. the greater the IPO initial return. In line with this logic, the equity size, an often employed proxy for firm size by previous researchers such as Su and Fleisher (1999), should be negatively related with the initial return. Thus, the hypothesis is:

Hypothesis 13: *The IPO initial return is negatively related with the firm's market capitalization.*

In Chi and Padgett's (2005) study, the market capitalization is regarded the same as the offer size, which equals the shares issued and fully paid multiplied by the offering prices. In China, the vast majority of IPOs are partial sale, which means the issuing firm still holds some non-tradable shares post listing. Chi and Padgett's (2005) calculation of offer size does not include the non-tradable shares. However, when calculate the market capitalization that equals to all outstanding shares multiplied by the market price (in this case the offer price as the new shares' market price), the non-tradable shares do need to be taken into account because someday if the issuing firm wants it could still in theory sell the non-tradable shares at the prevailing market price. This paper therefore regards market capitalization as a different variable from offer size and employs both.

The offer size essentially in its own meaning i.e. the total shares offered to public

multiplied by the offer price is often used by researchers such as Beatty and Ritter (1986) and McGuinness (1992) as a proxy for measuring the ex ante uncertainty of the IPO's. In this sense a smaller offer size amounts to higher ex ante uncertainty and will lead to a higher under-pricing of the IPO.

Hypothesis 14: *The IPO initial return is negatively related with the IPO offer size.*

Other proxies reflecting the ex ante uncertainty have appeared in the IPO literature. According to Davis and Yeomans (1976) et al's theory that the under-pricing is higher in buoyant markets, hypotheses are set as follow together with a standard deviation of daily market return as the proxy of market turbulence to test for the assumption that the ex ante uncertainty is higher in more volatile market.

Hypothesis 15: *The IPO initial return is positively related with the average market return during the time interval from the offer price is fixed to the IPO share really goes to floatation.*

Hypothesis 16: *The IPO initial return is positively related with the coefficient of variation of daily return of the market index levels during the time interval from the offer price is fixed to the IPO share really goes to floatation.*

In Chinese IPO context, Yu and Tse (2003) use percentage change of the market index three months prior to the issuing as an explanatory variable to control for the ex ante uncertainty. Their measurement somehow is problematic according to the findings of this thesis which will be demonstrated in more details in the later chapter. This study

finds that the time interval from the offer price is fixed to the IPO share goes to floatation varies severely ranging from 12 days to 380 days (see table 2), and the mean of the time interval is about one month (33 days) with a median of 25 days. Therefore, the fixed three months interval chosen by Yu and Tse (2003) is inappropriate for measuring the market fluctuation. This thesis will measure market returns within the time interval consistent with the listing time lag of every individual IPOs rather than within the fixed three months for all IPOs.

5.6 Behaviour Theories

According to information cascade or bandwagon hypothesis, a positive bandwagon or cascade means that the IPO is under-priced, and vice versa. Based on the hypothesis, Amihud, Hauser, and Kirsh (2001) find that IPOs tend to be either undersubscribed or hugely oversubscribed, with very few moderately oversubscribed. In Chinese IPO literature, Liu (2003) suggests that investors' demand for new shares can be used for testing the bandwagon effect. He further suggests that the odds of winning the lottery could reflect investors' demand for the new share and the odds should be negatively related to the degree of IPO under-pricing. This hypothesis again is set the same as hypothesis 4 and 9.

Hypothesis 17 (also Hypothesis 4 and 9): *The IPO initial return is negatively related to the IPO share's lottery winning ratio.*

5.7 Privatization IPO and Political Motives/Existing China-specific Hypotheses

According to Perotti's (1995) partial sale and government signaling model, a bigger government shareholding would indicate a higher IPO under-pricing because the less

percent of shares the government sells to the public the higher under-pricing is needed for signaling. In Chinese literature Mok and Hui (1998) demonstrate that the 'Chinese characteristic' of high equity retention by the state is one of the key determinants of market-adjusted IPO under-pricing. However, Mok and Hui's (1998) result is not consistent with a later finding of Chi and Padgett (2005). In this sense, a re-test of the hypothesis is required. The hypothesis is set as:

Hypothesis 18: *The IPO initial return is positively related with the government retention rate.*

Tian (2003) has advanced that the listing time lag between the IPO announcement date and the IPO listing date causes the Chinese IPO under-pricing. In the literature review, a debate among Tian (2003), Chi and Padgett (2005) and Yu and Tse (2003) has been discussed as well. If the government really uses the listing time lag to adjust the IPO under-pricing as Tian (2003) suggests, then a positive relationship between the IPO initial return and the length of the listing time lag would be found.

Hypothesis 19: *The IPO initial return is positively related with the time lag between the IPO announcement day and the first trading day.*

The test of hypothesis 19 would not only help clarify above debate, but more importantly would prove whether or not the government has really played such floatation time game because testing for government involvement in IPO under-pricing is one of the major tasks of this thesis.

If Dewenter and Malatesta (1997)'s theory that government may use under-pricing to reduce the employees' misgivings about privatisation is right, then the more employee shares the government has offered the more under-priced the IPO is. Consequently, the employee shareholding would be expected to be positively related with the IPO initial return.

Hypothesis 20: *The IPO initial return is positively related with the size of employee shareholding.*

Chapter 6 Data Analysis – General Description

6.1 Data Collection

In China, the financial information distribution industry is pretty much segmented and the competing firms in the area are much smaller compared to Bloomberg, Reuters and Thomson Financial in the western countries. Even though several information firms do have nationwide operations, there are few dominant information vendors. Many of the financial news agencies in China are effectively state-owned or controlled by the government. Although some database such as DataStream provides information of Chinese stock market, their data is neither complete nor comprehensive. Some other internationally known news and information agencies only start financial information operation recently.

Therefore, this research mainly relies on private information vendors for the data. The main sample set is obtained from Shanghai Wind Information Co. Ltd., a commercial database company serving institutional investors. The raw dataset of the original sample given by the company includes 1,464 IPO shares from October 12th 1990 to September 9th 2004, which covers the whole Chinese stock market history till the time when the sample was obtained. The original sample includes almost all the IPO shares at both SSE and SZSE. Every entry in the sample includes 38 items such as offering price, first-trading-day closing price, listing date, company status and IPO P/E ratio, etc. To compare and to eliminate possible human errors, another sample of 1,320 IPO shares at both SSE and SZSE during approximately the same time period was collected one by one from Asia Securities Co. Ltd., an investment company in China. Whenever disparity occurs between the two raw samples and whenever item is missing, other commercial databases such as Stock Star (www.stockstar.com),

Panorama (www.p5w.net) and Financial Analyst (www.fxj.com.cn) are resorted for complementary information and adjustment is made in accordance with the data that is quoted by the most resources. Any market index to be used in this study is SSE A-Share Index and SZSE A-Share Composite Index, the two major weighted-average indexes at the Shanghai Security Exchange (SSE) and the Shenzhen Stock Exchange (SZSE).

Due to data analysis requirement, some data items that are missing from the main dataset such as first-day trading volume and value, companies' founding date and companies' industrial classification are collected company by company from public information sources such as Internet, IPO prospectus, newspapers and government archives. For example, the companies' founding dates are collected from Stock Star (www.stockstar.com) and yahoo finance China website (cn.fiance.yahoo.com), and the companies' industrial classifications are according to the CSRC Listing Companies' Industrial Classification Guidebook (2001). As for documentary data such as government policy and regulation, newspaper, government archive and the official issuing handbooks are main sources. For example, the geographical classification of provinces and regions of the "Western Region Development" policy is found within a government's official document shown later in the analysis section.

After the original sample is collected, sub-sample datasets are re-collected out of the raw sample dataset for the following reasons. Firstly, for every individual testing hypotheses and models the sub-sample sizes may be different due to missing data items. For example, when the industry dummy variables are formulated some companies may be left out of the sub-sample dataset because they lack industry

classifications. Also "died" companies are not included in some sub-sample datasets[41].

The concern of survival bias is not significant for this research for the reasons given

in the footnote. In the meantime, even if there is no missing item and the issuing firm

is still alive at the time when the data is collected, there is still another consideration

of choosing an appropriate window period for testing.

Basically, the window period of testing is chosen as from January 1996 to December

2003. This window period can be different for different hypotheses. For example, the

information asymmetry hypotheses tests are based on the whole window period, while

the test for the effect of transaction stamp duty rate tax increase is based on the

window period of one year around the event date when the tax rate was increased. As

a matter of fact, there are far less IPOs in the time period before year 1996 than in the

period after 1996. Among the IPOs before 1996 many are not even market tradable

when they were issued. In the original sample, there are 364 firms that were listed

prior to 1996 and almost half of them went public even before the Chinese stock

exchanges are established. It is therefore difficult to measure their under-pricing

magnitude and compare them with other market tradable IPOs. During the early

1990's, there were many changes in the regulations and laws in the primary market.

Only until the middle 1990s, the market was relatively established and the

infrastructure became reasonably stable. When the market is experiencing frequent

regime changes it is difficult to distinguish one particular effect from others. Another

reason to choose such testing window period is that there are less studies focusing on

the more recent time period. Eventually, 880 IPO shares are included in the new sub-

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[41] Because the commercial database company pays less attention to the non-existing companies, the information for "died" companies is likely to be incorrect or incomplete. In the given period in the example, these companies are in very small numbers (<10), and thus the survival bias will not be a problem.

sample dataset. Among the 880 shares, 83 IPOs are previously private-owned before going public. The private-IPOs account for 9.4% of total IPOs in the sub-sample.

Even after the sample set is selected, some raw data still need to be transformed for data analysis purpose. These data transformations will be illustrated when descriptive statistics of data are under discussion. The data is analyzed mainly in statistic software EViews, and SPSS is also used.

6.2 Basic Benchmark Measurement

A first step to build up a testable model is to choose a proper measurement benchmark. To measure the IPO under-pricing level, two approaches are adopted in previous literatures. Therefore, it is necessary to make a comparison between the two. The most widely accepted and used approach is to use the IPO raw initial return that is defined by the formula:

$$r_{i1} = \frac{P_{i1} - P_{i0} + D_{i1}}{P_{i0}} \qquad (1)$$

where r_{i1} is the ith IPO share's daily return on the first trading day;

P_{i1} is the closing price of the ith IPO share on the first trading day;

P_{i0} is the offer price of the ith IPO share;

D_{i1} is the dividend issued on the first trading day for the ith IPO share.

As a matter of fact, dividend in the first trading day is equal to zero. Therefore, the raw initial return (IPORETN) is defined by:

$$IPORETN = \frac{P_1 - P_0}{P_0} \qquad (2)$$

This raw initial percentage return is also adopted by many previous researchers such

as Ritter (1984).

On the other hand, some researchers such as Chi and Padgett (2005) also used market-adjusted abnormal initial return (MAAR) to measure the IPO under-pricing degree. The MAAR definition is:

$$MAAR_{i1} = 100 \times (\frac{1 + r_{i1}}{1 + r_{m1}} - 1) \qquad (3)$$

where r_{i1} is the raw initial return; and r_{m1} is the same time market index return with the definition:

$$r_{m1} = \frac{P_{m1} - P_{m0}}{P_{m0}} \qquad (4)$$

In the formula P_{m1} is the closing market index on the first trading day and P_{m0} is the closing market index on the offer day.

Chi and Padgett (2005) claimed that the market-adjusted initial return will give a more accurate picture. When $MAAR_{i1}$ is interpreted as an abnormal return, the assumption is that the systematic risk of the IPO's under consideration is the same as that of the index, i.e. the betas of the IPO's average to unity. Ibbotson (1975) and some other researchers have demonstrated that the average beta of newly listed firms is higher than one. Thus, the abnormal return $MAAR_{i1}$ calculated in above equation provides a somewhat upwardly-biased estimate of the initial performance of the IPO relative to the market. On the other hand, the market-adjusted initial return provides a good measure of relative return. Since the under-pricing is measured against the average returns in the market, the market-adjusted return is more sensible measure according to the under-pricing definition. As a matter of fact, this thesis finds no

statistically significant difference between the two under-pricing measures of IPO raw initial return and the market-adjusted initial return. But for logic consistency, the thesis will present the statistics and regression results in terms of market-adjusted initial return.

A third measure of IPO under-pricing is the so-called odds (new share lottery winning ratio)-adjusted IPO initial return. As mentioned earlier, the IPO's in China are all oversubscribed and the oversubscription rates are normally very high which is reflected by a very low lottery winning ratio of new shares. It is suggested by some researchers to make adjustment of the possibility of being allocated the new shares to the IPO initial return. The logic is that if a high degree of under-pricing is achieved through a high degree of oversubscription which means a much higher demand than the supply then the initial return should be reduced accordingly to reflect the low probability of winning the new share. Such lottery winning odds-adjusted and market-adjusted IPO initial return has been used by researchers such as Liu (2003) in empirical studies. It is defined as follows:

$$OAMAR_{i1} = MAAR_{i1} \times WINNINGRATE_{i1} \qquad (5)$$

where $MAAR_{i1}$ is the IPO market-adjusted initial return and WINNINGRATE is the IPO new share lottery winning ratio. WINNIGRATE is defined by the following formula:

$$WINNINGRATE = \frac{\text{Total shares offered by the issuing firm}}{\text{Total shares applied for by the investors}} \qquad (6)$$

All quantities in formula 5 and 6 are calculated based on the data on the IPO listing date.

After appropriate proxy measure of the under-pricing magnitude has been chosen, the next step is to find the proper statistic model and identify other independent variables. As Stigler (1981) points out, the method of least square is the automobile of modern statistical analysis. This study is going to carry out the hypothesis test based on the so-called ordinary least square (OLS) regression model, particularly because the OLS regression is asymptotically efficient and is a best linear unbiased estimation (BLUE) model. The principle is to choose the estimated regression coefficients to fit in the regression model so that the sum of squares of prediction errors is minimized, given certain independent variables. In this sense, those independent variables that give the best fitting result will be the factors that have the biggest power in explaining the dependent variable. As decided, the IPO initial return will enter the left-hand side of the regression equation as the dependent variable while all other factors that may explain this initial return will enter the right-hand side of the regression equation as independent variables. The question then boils down to which factors ought to be included as the independent variables, because these independent variables are exactly the factors we are looking for. The hypothesis test will replace the independent variables in the regression with the proxy variables set up according to the hypotheses listed in the last chapter. If the proxy variable stands the statistical test, so does the hypothesis.

As a matter of fact, the original benchmark OLS regression model is usually adopted by previous researchers such as Dewenter and Malatesta (1997) and Su and Fleisher (1999). An illustrative example is given as follows:

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$$MAAR_i = \alpha_0 + \alpha_1 \times PRICE_i + \alpha_2 \times IPOSZ_i + \alpha_3 \times AGE_i + \alpha_4 \times MKECAP_i +$$

$$\alpha_5 \times PROFSHA_i + \alpha_6 \times GOVNT_i + \alpha_7 \times TIMEIPO_i + \varepsilon_i \qquad (7)$$

The meanings of every variable in above equation will be explained in more details later in the following sections, but the regression formulas for every individual sub-samples will be in a similar format as above. The $MAAR_i$ on the left-hand side of the regression equation stands for the dependent variable which in this instance is the ith IPO's market-adjusted initial return, and all other independent variables are listed on the right-hand side of the equation with α's standing for the regression coefficients of these independent variables. The above independent variables are just for demonstration purpose because they may not all be included in the same model for a specific hypothesis test. On the other hand, some other factors may be missing from above model, depending on which hypothesis is to be tested. For example, the turnover rate for speculation effect hypothesis test is not included in the model. The independent variables serving particular hypothesis will be set up according to the hypothesis later on. The definition of additional independent variables will be explained accordingly in the following sections.

After the model is chosen, the next issue under concern is the scaling of the measurement. There is a particular reason to scale the independent variables' values so that the resulting numbers are not too large or too small and are similar in magnitudes to other variables. This is because large numbers cause overflow errors and small numbers cause round-off errors, especially when sums of squares are computed, which adversely affect the accuracy of results. If the scale of measurement of an independent variable is changed in a linear regression model, its regression

coefficient and the corresponding standard errors are affected by the same scale, but all other statistics are unchanged. Therefore the impact of changing the scale of measurement on the regression results is well justified. As can be seen later the units of measurement of the independent variables in this study range widely from tens to billions, it is necessary to scale the measurement units of these variables to a similar level. Scaling of every individual variable will be discussed in details in the following section when these independent variables are defined.

6.3 General Description of the Raw Data

Now that the benchmark model has been chosen and the measurement has been selected, it is very helpful to take a close look at the general descriptive characteristics of the sample so that we could get an overview of the whole dataset and we could find and deal with any problem in the data at an early stage before we really embark on the analysis. The meanings of the variables in this section are listed in the following table.

Table 1: Meanings of Individual Variables in the Raw Dataset

Variables Names	Meanings of Variables
AGE	Issuing firm's age.
GOVNT	Government shareholding (retention rate) in the post-IPO firm (%).
IPORETN	IPO initial return.
MAAR	Market-adjusted IPO initial return.
OAMAR	Lottery winning odds-adjusted and market-adjusted IPO initial return.
IPOSZ	IPO offer size.
MKECAP	Issuing firm's market capitalisation.
PRICE	IPO offer price (RMB ¥).
PROFSHA	Issuing firm's profitability.
TIMEIPO	Listing time lag between IPO announcement and listing dates.
EMPLYEERATE	Employee shareholding in the post-IPO firm (%).
WINNGINGRATE	IPO lottery winning ratio (%).

Some of above variables are directly read off the dataset and the above table is self-explanatory for the meanings of these variables. Other variables are calculated based on the readings from the dataset. Although more detailed discussions about the

variables will be left to every individual chapters that deal with particular hypotheses, brief explanations and calculation formulas of these variables are listed below so that readers can better understand how the variables are calculated.

AGE   The issuing firm's age at the time of IPO. It is the total calendar days from the firm's founding date to the first trading date divided by 100.[42]

GOVNT   The size of government shareholding in percentage of the total share volume in the post-issuing IPO firm. It is defined by the following formula:

$$GOVNT = \frac{\text{Government shareholding in volume in the issuing firm after the IPO}}{\text{Total shareholding in volume of the issuing firm after the IPO}} \quad (8)$$

IPORETN, MAAR and OAMAR are calculated by formula 2, 3 and 5 respectively as discussed.

IPOSZ   The IPO offer size measured in billion Chinese RMB Yuan. It is calculated by the following formula:

$$IPOSZ = \text{Total shares issued to public} \times \text{Offer price} \quad (9)$$

MKECAP   The issuing firm's market capitalization measured in 100 million Chinese RMB Yuan on the first trading day:

$$MKECAP = \text{Total outstanding shares incl. tradable and non-tradable} \times \text{fully paid market price of the shares} \quad (10)$$

As said earlier, the IPO size and issuing firm's market capitalization are regarded different variables, which is easy to tell from their formula definitions. In fact, researchers such as Su and Fleisher (1999) and Liu (2003) have used both measures in their regressions.

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[42] Days instead of years are used is because 1, the Chinese companies are usually very young and 2, it is to make the scale match with other variables' measurements. It is also for the purpose of scaling discussed in chapter 5 that the days are divided by 100.

PROFSHA   The issuing firm's profitability at the time of IPO. It is the ratio of the issuing firm's net profit in the former year before the issuing divided by the volume of the firm's outstanding shares at the time of IPO. It is also called earnings per share (EPS) and it is calculated by the following formula:

$$PROFSHA = \frac{\text{Issuing firm's net profit in Yuan one year before the IPO}}{\text{Total outstanding shares in volume at the time of IPO}} \quad (11)$$

Researchers such and Chi and Padgett (2005) have used the EPS as a measure of the issuing firm's profitability.

TIMEIPO   The listing time lag. It denotes the number of days between the announcement date of an IPO and the first market trading date divided by 100:

$$TIMEIPO = \frac{\text{The IPO's first trading date - The IPO's announcement date}}{100} \quad (12)$$

EMPLYEERATE   The employee shareholding ratio. It is the total employee share volume divided by the total outstanding share volume:

$$EMPLYEERATE = \frac{\text{Employee shareholding in volume in the issuing firm after the IPO}}{\text{Total shareholding in volume of the issuing firm after the IPO}}$$

$$(13)$$

WINNINGRATE is calculated by formula 6 as discussed earlier.

The abbreviations of the variables will be used throughout this thesis with the same meanings.

Table 2: Descriptive Statistics of Individual Variables

(Note: The lottery winning ratio is measured in percentage.)

Variables/Statistics	Observations	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
AGE	880	9.9046	8.5200	62.5800	0.0100	9.2383	1.2118	5.1150
GOVNT	880	0.4684	0.5455	0.8500	0.0000	0.2507	-0.7281	2.2860
IPORETN	880	1.2950	1.1529	8.3021	-0.0617	0.8370	1.6594	9.6322
MAAR	880	1.2945	1.1565	8.2543	-0.0424	0.8335	1.6530	9.6034
OAMAR	879	1.2397	0.5203	27.4605	-1.0466	2.5848	5.0528	34.0529
WINNINGRATE	879	1.4079	0.4545	90.5777	0.0107	5.0543	12.1107	179.0010
IPOSZ	880	0.4745	0.3030	11.8160	0.0431	0.8808	9.2410	105.5860
MKECAP	880	22.8308	9.5950	3658.8400	1.9400	128.8883	25.7841	722.1003
PRICE	880	6.8885	6.2250	36.6800	2.2000	3.0736	3.0724	20.9251
PROFSHA	880	0.1766	0.1496	1.9029	-0.3768	0.1338	4.1146	41.8046
EMPLYEERATE	880	0.0411	0.0183	0.4847	0.0000	0.0646	2.4692	10.8365
TIMEIPO	880	0.3324	0.2500	3.8000	0.1200	0.2703	4.9231	46.6143

The descriptive statistics of individual variables are given in table 2 above. A very prominent finding in the table is that the average IPO raw initial return across the sample is approximately 129% with a maximum level of more than 830%, which is almost the same magnitude as Chi and Padgett's (2005) presented in their paper even the sample of this research includes data from a later period of time. The supposedly more sensible measure of average market-adjusted IPO initial return MAAR is only marginally lower than the average raw initial return with very similar descriptive statistics.

Meanwhile, the lottery winning ratio seems to be very low with a mean of 1.4079%, which is already higher than the normally perceived 0.3% winning rate[43] in China. The lowest rate is 0.0107%, which means every IPO new share is demanded by almost 10,000 investors or accounts[44]. The finding is consistent with previous descriptions of the high oversubscription rate of Chinese IPOs. Based on this very low lottery winning ratio, people could argue that the very high IPO initial return is inflated by the low probability of winning the new shares. Therefore, the lottery winning odds-adjusted and market-adjusted IPO initial return OAMAR will provide the most accurate description of the under-pricing magnitude. OAMAR does show a 6% lower IPO initial return than the other two under-pricing measures. However, this minor change will not dampen the huge 123% initial return. The IPO high initial return again proves that a severe under-pricing does exist in the Chinese IPO market and this pattern of high magnitude of IPO under-pricing has not been changed so far as of the time when data was collected for this study.

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[43] 0.3% is an unofficial estimate of average IPO lottery winning ratio among investors which is not proved or tested by any official publications.
[44] The subscription is through investors' accounts opened with security companies and one investor may have multiple accounts.

A distinct common feature of all the variables in table 2 is that they all have large magnitude of skewness and kurtosis. Only the government retention rate has relatively small skewness (-0.7281). According to statistic theory, when a distribution is normal the variable's skewness and kurtosis values are zero. Non-normal kurtosis produces an underestimate of the variance of a variable. Apparently, most variables in table 1 are far from normally distributed. Many variables are highly skewed in terms of their skewness and have too peaky spikes in terms of their kurtosis. Such non-normality can also be clearly seen from figure 1, which is the normal P-P plot of the standardized residual of OLS regression with original variables listed above.

Figure 1: Normal P-P Plot of the OLS Regression with Non-transformed Variables from SPSS

(The P-P plot demonstrates whether the residual from the regression of IPORETN are normally distributed. Under perfect normality, the plot will be a 45-degree line.)

Normal P-P Plot of Regression Standardized Residual
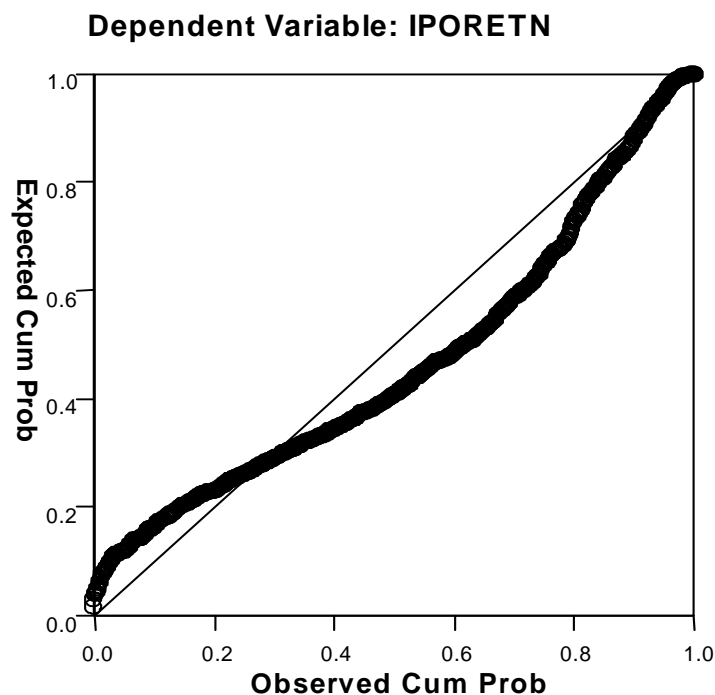
The x-axis of the plot is the observed cumulative probability of the sample and y-axis is the expected cumulative probability if the sample is normally distributed. If the normality assumption is strictly followed the bold curve should coincide with the diagonal straight line. But in figure 1, it is clear that the original data set is far from normal so that the bold cure does not coincide with the straight line.

The non-normal dataset is a common problem seen in many empirical studies and it could lead to some concerns of the regression. One of the underlying assumptions of OLS regression analysis is that the regression variables ought to be normally distributed. The violation of this assumption may undermine the regression quality for instance by the decentralized mean (skewness) or underestimated variance (kurtosis). In literature, there are normally two different points of views to cope with the non-normal dataset.

The first approach is based on large sample statistics. Some researchers believe that in a large sample, a variable with statistically significant skewness often does not deviate enough from normality to make a substantive difference in the analysis. In other words, with large samples the significance level of skewness is not as important as its actual size (worse the farther from zero) and the visual appearance of the distribution. In a large sample, the impact of departure from zero kurtosis also diminishes. For example, the underestimates of variance associated with negative kurtosis (flat distributions) disappear with samples of 100 or more cases; with positive kurtosis the underestimation of variance disappear with samples of 200 or more (Waternaux, 1976). In other words, as long as the sample is big enough it is possible to ignore the non-normality problem and the raw data analysis may still produce sufficiently

precise estimations. Since this study uses a dataset of more than 800 observations, this approach is promising because it provides a quicker but relatively accurate analysis procedure.

Another more aggressive approach is to use the data transformation. Its basic idea is to adopt some traceable mathematical transformations on the raw dataset to make the variables' distribution more like normal. As soon will be seen, the regression variables can be transformed by taking their square root, cubic root, logarithm or inverse. Accordingly, transformed variables are denoted in prefixed forms. For example, **LNPRICE** stands for logarithm of **PRICE** and **CUBEPROFSHA** for cubic root of **PROFSHA** etc. The selection criterion for which transformation should be used or whether the variable should be transformed is based on the variable's deviation from the normal distribution in terms of Skewness and Kurtosis. Less deviation is preferred. In fact, as all the transformations are the monotone one-to-one mapping functions of the original variables, the real effects of the original variables can be easily traced back by taking inverse image of the transformed function.

Although all the sub-sample sets have large number of observations, by taking the one-to-one mapping transformation it is easy to trace back the original variable. In this sense, the transformation may further help to prevent the occurrence of the regression problem caused by the non-normally distributed data. Therefore, it may be better to transform the raw data into the data that is closer to the normally distributed one. The effect of taking the transformations of the raw data will be illustrated through the distribution histogram of the variables. Details of the data transformations and the distribution histograms will be discussed in the analysis chapters.

However, there is a drawback in the data transformation method. Because the regression analysis is concerned about the relationship between different set of regression variables, the regression variables are supposed to capture certain model characters and they should have meaningful economic or financial presentations. The data transformation may cause difficulty in understanding these economic explanations. To avoid too much complexity, the study will only adopt simple one-step data transformations such as natural logarithm, square root, cubic root and inverse etc. Transformations that involve two or more steps such as reflect and square root method will not be used.

As a matter of fact, this study finds that transformed dataset and non-transformed dataset actually produce quite similar statistic results and no big difference in terms of significance level or regression coefficient sign has been found. For this reason, only results based on transformed dataset will be demonstrated. Besides the two approaches of dealing with the dataset, it is also possible to make further improvement on the regression method itself. One such improvement is through the use of the White Heteroskedasticity-consistent OLS regression.

Table 3: Correlation Matrix for the Variables

(The numbers stand for the correlation coefficients between the two variables on top of the same column and on the left of the same row. E.g. the correlation coefficient between AGE and itself is 1.00000 and the correlation coefficient between EMPLYEERATE and AGE is 0.3046. All significant at 90% significance level or above.)

	MAAR	AGE	EMPLYEERATE	GOVNT	IPOSZ	MKECAP	PRICE	PROFSHA	TIMEIPO	WINNINGRATE
MAAR	1.000000									
AGE	0.051599	1.000000								
EMPLYEERATE	0.022871	0.304614	1.000000							
GOVNT	-0.056460	-0.389223	-0.254813	1.000000						
IPOSZ	-0.227984	0.033273	-0.137449	0.143458	1.000000					
MKECAP	-0.112753	0.006510	-0.060247	0.087132	0.657024	1.000000				
PRICE	-0.152296	0.073027	-0.076625	-0.177558	0.093742	-0.004341	1.000000			
PROFSHA	-0.438565	-0.065671	0.103795	-0.052880	0.080928	0.019815	0.497537	1.000000		
TIMEIPO	0.128729	-0.063853	0.001351	0.066559	-0.025597	-0.020113	-0.093074	-0.058612	1.000000	
WINNINGRATE	-0.138586	-0.052694	0.079918	0.028788	-0.006822	-0.000874	-0.043020	0.213653	-0.002364	1.000000

Before starting the analysis of every each and single factors it is interesting to see roughly the relationship between these variables and especially their relationship with the IPO initial return. Therefore, table 3 above demonstrates the correlation matrix of all the variables. It can be seen from the table that the issuing firms' market capitalisation may have a slightly high correlation with the firms' offer size, which indicates that a further parsimonious test of the regression model may be needed in the later regression analysis if one of the variables are not significant in the regression. In fact, in the later part of this study the statistic test shows that the issuing firm's IPO offer size may be a more powerful explanatory variable in the regression.

Also a quick look at the table will lead to the impression that the IPO initial return may be closely related to the issuing firm's profitability, because the correlation between these two variables are relatively high (-0.4386). And the negative correlation seems to support the information asymmetry hypothesis that the information asymmetry is a decreasing function of the issuing firm's profitability. In the meantime, several variables including issuing firm's age, government retention rate and offer price seem to be correlated with the IPO initial return in an opposite direction as opposed to what have been expected according to the hypotheses. Attention should be brought to these variables in the later analysis.

Chapter 7 Data Analysis - Speculation Effect

Chapter 4 has thrashed out the logic behind the statement that China's highly speculative market may have contributed to the Chinese IPO under-pricing. On this ground the speculation effect hypothesis has been derived. It has also been discussed that the government's control of new share supply and problematic IPO process are behind the speculation. Therefore, the test of speculation effect hypothesis overall may help to indirectly find out whether the government has been involved in the IPO under-pricing.

In particular, the hypothesis test engages in an investigation of a government policy change of transaction stamp duty tax rate. No matter what purpose the government policy change is for, the test will reveal whether the impact of the policy change has been reflected in the IPO pricing. To this end, the government's involvement in IPO pricing will be indirectly revealed through its direct tackle of speculation.

7.1 Model and Variables

Chapter 4 has introduced the background of the raise of transaction stamp duty tax rate on May 12th 1997. Through the tax raise Chinese government seeks to curb speculation, as claimed by *China Security*, a newspaper with government background. On the other hand, speculation is blamed for causing Chinese IPO under-pricing by people in the area. If the tax raise has achieved the government's objective of suppressing speculation, the event of the tax rate change would have negatively affected the under-pricing. Hence, an event study on the impact of the tax rate change on IPO initial return will deliver the answer whether the speculation hypothesis is robust since speculation is the sole target of this policy change.

Hypothesis 1 in chapter 5 suggests that the under-pricing magnitude measured in IPO initial return is smaller after May 12th 1997 than before because the speculation is supposed to be subdued by the tax raise and so is the IPO under-pricing. As mentioned before, the window period of testing is chosen from six months before May 12th 1997 to six months after May 12th 1997.

Six months is a common length of window period for event study. In this case, the six months window period would provide enough observations in a sufficiently long period for the event impact to appear statistically. Meanwhile, it would avoid including possible overlapping impacts from other events, for instance, the transaction stamp duty tax rate was cut one year later in June 1998. If a longer test period is used, the pre-event effect in many financial studies, such as leveraged stock returns before merger and acquisition, would possibly pollute the sample due to the later event of the tax cut. In other words, unknown pre-event effect from the later tax cut could make it more difficult to differentiate the real impact of the tax raise on IPO initial return if the test window period gets closer to the later event of tax cut. On the other hand, if the test period is shorter there may not be enough IPOs in the period.

To measure the change in IPO initial return from the pre-event to the post-event period, a dummy variable is defined as follows:

POST970512   The period dummy variable, which has value 1 if the IPO is issued after the May 12th 1997 and 0 if otherwise.

Since no other factors are considered except for the event itself within the window period, the testing model for hypothesis 1 simply will be:

Model 1:

$$MAAR_i = \alpha_0 + \alpha_1 \times POST970512_i + \alpha_2 \times MKTCAP_i + \alpha_3 \times PROFSHA_i + \varepsilon_i \qquad (14)$$

where ε_i is the error term. As MAAR is already market return adjusted, the issuing

firms' market capitalisation and profitability are used as control variables.

According to hypothesis 1 that the average IPO initial return is higher before the

transaction stamp duty tax ratio is increased than after, the regression coefficient α_1

of the dummy variable in above model should have a negative sign to make the

hypothesis stand.

Setting up proxy variables to measure or reflect the speculation magnitude is a more

direct way for testing the hypothesis, which compares to the indirect event study

above. If the change of transaction stamp duty tax rate has impact on the IPO pricing,

then it is possible to use the tax rate itself as a proxy to gauge the impact of the change,

i.e. the magnitude of the tax rate could be related to the IPO initial return too.

According to this assumption, the transaction stamp duty tax rate can be used as an

explanatory variable in the regression. It is shown in chapter 5 that the turnover rate

can be used as a proxy to directly measure the speculation magnitude, and the IPO

lottery winning ratio can be used to measure the imbalance between supply and

demand of new shares which according to chapter 2 and 3 is essentially a driving

force of China's speculation. Based on hypothesis 2, 3 and 4, the three independent

variables are defined as follows:

TRNSCTNTAX   The transaction stamp duty tax rate.

TRNOVER   The turnover rate of the IPO share in the first trading day measured in percentage. It is defined by the following formula:

$$TRNOVER = \frac{\text{Total IPO shares traded on the first trading day}}{\text{Total outstanding tradable IPO shares}} \qquad (15)$$

In simple words, the turnover rate measures how actively the new share is traded on its first trading day. The speculative trading of new shares in China, as said, is conducted mainly by retail investors. If the IPO initial return is targeted by speculative trading, then the short-term intensity of the speculation will be reflected in a high turnover rate. In fact, the term 'turnover rate' has been referred by Krigman, Shaw and Womack (1999) as flipping rate of sell-motivated block trades as a percent of total dollar volume on the first-day, to predict future returns. But in this study the turnover rate mainly measures the trading behaviour of retail investors because the majority of investors in the Chinese stock market are retail investors. Share volume rather than dollar volume is used in this study. In previous Chinese IPO literatures, the turnover rate is usually measured as the rate of the new shares traded on the first trading day against the total outstanding shares. However, since vast majority of Chinese IPOs are partial sales and the proportion of non-tradable shares in the post-IPO firms varies significantly, the traditional measurement of turnover rate may lack accuracy. In order to more accurately measure the speculation magnitude, the turnover rate is measured against only to total tradable shares in this thesis because there is no way for investors to speculate on short-term return of non-tradable shares.

WINNINGRATE   The IPO lottery winning ratio. It is calculated according to formula 6.

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The lottery winning ratio is defined in the way such that the more shares are in demand by investors or the fewer shares are in supply by the issuing firm the lower the winning ratio. By this means, the lottery winning ratio gauges the oversubscription level of the new shares, or equivalently how eagerly investors are demanding the new shares. Intuitively speaking, an IPO that has potentially higher initial return would trigger a higher demand from retail investors who would like to realize the quick profit through instant selling.

The second model for testing hypothesis 2, 3 and 4 will be:

Model 2:

$$MAAR_i = \alpha_0 + \alpha_1 \times TRNSCTNTAX_i + \alpha_2 \times TRNOVER_i + \alpha_3 \times WINNINGRATE_i$$

$$+\alpha_4 \times MKTCAP_i + \varepsilon_i \qquad (16)$$

where the issuing firm's market capitalisation is used as a control variable.

Recalling the underlying assumption of hypothesis 2 would lead to the expectation of a negative regression coefficient α_1, because a higher transaction stamp duty tax is supposed to curb the speculation and in turn cut the IPO under-pricing. Similarly, if speculation directly causes IPO under-pricing, then the turnover rate that measures the speculation magnitudes would have a positive regression coefficient α_2. Finally, if the short-term speculation is driven by the imbalance of the demand and supply of new shares, the lottery winning ratio should have a negative regression coefficient α_3, because a higher likelihood of winning the lottery means less imbalance between the demand and supply of new shares and vice versa.

7.2 Analysis and Results

To test the event impact of transaction stamp duty tax raise is an implicit and indirect approach to find out the speculation effect. Let us firstly take a look at the sub-sample of IPOs in the 12 months window period in which the event study of the stamp duty tax raise will be carried out.

Table 4: Comparison of Market-adjusted IPO Initial Return in the 6 Months

pre- and post-Stamp Duty Tax Raise

	MAAR pre 12/05/97	MAAR post 12/05/97
Mean	1.8270	1.3693
Median	1.5943	1.1989
Maximum	4.6849	3.8872
Minimum	0.6321	0.0420
Std. Dev.	0.7982	0.7106
Observations	94	114

The above table shows that there are 208 IPOs in the window period. Among them 94 IPOs went public before the tax raise and 114 afterwards. The partition looks pretty even between and pre and post event periods in terms of IPO observations. The comparison shows that the average market-adjusted IPO initial return experienced a significant drop from 183% to 137% and this pattern is consistent across all other statistics such as median, maximum and minimum. Given that the standard deviation is pretty close, the numbers give a quite good indication that the event of tax raise has caused the market-adjusted IPO initial return to drop.

But we jump to any conclusion, let us further look at how the regression model shows. The regression results of model 1 (formula 14) are presented in the following table 5. As discussed in chapter 6, the White heteroskedasticity-consistent OLS regression is used.

Table 5: White Heteroskedasticity-Consistent OLS Regression with the Post Event Period Dummy Variable

(Note: In parentheses are the student t-statistics; *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 208.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	1.8270 (22.4337***)
POST970512	-0.4577 (-4.3237***)
MKTCAP	-0.3267 (-2.8737***)
PROFSHA	-4.1139 (-7.8737***)
R-squared	0.3849
Adjusted R-squared	0.3805

Hypothesis 1: Table 5 demonstrates the ordinary least square (OLS) regression results of model 1. The period dummy variable **POST970512** has a negative regression coefficient (-0.4577), which is in line with our expectation under hypothesis 1, and the regression coefficient is statistically significant at a 99% confidence level (or equivalently 1% significance level). The test results support our assumption that the event of the transaction stamp duty tax rate increase on May 12th 1997 has a negative impact on the IPO initial return.

That is to say, the government action of increasing the transaction stamp duty tax rate has eased the IPO under-pricing at least within the window period of testing. Since one underlying assumption for hypothesis 1 is that the IPO under-pricing is caused by retail investors' speculation and the government claims that the increase of the

transaction stamp duty tax rate is to curb the speculation, the satisfactory test results have indirectly proved the underlying assumption.

In addition to proving that the speculation effect is a source for Chinese IPO under-pricing, above test also displays that the change of government's transaction tax policy has clear impact on IPO under-pricing despite the government intention of fighting speculation through the policy.

Let us look at the second, more explicit and direct approach to explore the speculation effect. But at first, let us examine some fundamental statistic characteristics of the raw data in model 2. The transaction stamp duty tax rate is the same for all the IPOs in the same period, so there is no point to show the descriptive statistics of it across different IPOs. The following table 6 demonstrates how the transaction stamp duty tax rate has evolved with the development of China's stock market.

Table 6: History of China's Transaction Stamp Duty Tax Rate Changes

(Note: The table only shows the transaction stamp duty tax rate changes before December 2004 when the data for this research was collected. Also the table only shows the transaction stamp duty tax rate changes for A-shares.)

Time of Changes	Changes
June 12th, 1992	Transaction stamp duty tax starts (for both buy and sell sides). The rate is originally set at 0.3%.
May 12th, 1997	Transaction stamp duty tax rate is increased from 0.3% to 0.5%.
June 12th, 1998	Transaction stamp duty tax rate is decreased from 0.5% to 0.4%.
November 11th, 2001	Transaction stamp duty tax rate is decreased from 0.4% to 0.2%.

The first change in table 6 took place at the beginning of China's stock market. The second change on May 12th 1997 has been repeatedly mentioned in previous parts of

the thesis and it forms the foundation of hypothesis 1. Table 6 shows that except for the second change, the Chinese government has been trying to cut the transaction stamp duty tax rate consistently. According to table 6, the whole window period of testing for model 2 will be divided into four periods and the independent variable of **TRNSCTNTAX** will take constant value within each period. For instance, **TRNSCTNTAX** is 0.5% from May 12th 1997 to June 12th 1998.

As said earlier, the lottery winning ratio showed in table 2 is very low with a mean of 1.4079% with the lowest lottery winning rate of 0.0107%, which means every IPO new share is demanded by almost 10,000 investors or accounts paying application deposit upfront. Table 2 shows that the highest lottery winning ratio in the sample is 90.58%, which means not a single IPO in the sample is undersubscribed. As there is no undersubscribed IPO, it may be difficult to see how the IPO behaviours when there is not enough demand. But anyway, the following table shows how the market-adjusted IPO initial return behaviours under different categories according to whether the IPO is slightly oversubscribed, moderately oversubscribed or heavily oversubscribed.

Table 7: Distribution of IPO Initial Return by Oversubscription Level

(Note: N stands for the number of observations in the category.)

Category	Slightly Oversubscribed		Moderately Oversubscribed		Heavily Oversubscribed	
Lottery Winning Ratio	30% to 100% (N=5)		1% to 30% (N=237)		0.01% to 1% (N=637)	
Statistics	Mean	Median	Mean	Median	Mean	Median
MAAR	0.0899	0.0418	1.0749	0.9890	1.3862	1.2308

A distinct feature of the sample is that the vast majority of the IPOs are heavily oversubscribed (N=637) and only 5 IPOs have lottery winning ratio bigger than 30%.

Another apparent pattern is that the average market-adjusted IPO initial return is the highest when the probability of winning the new share is the lowest. The moderately oversubscribed IPOs seem to have moderate market-adjusted IPO initial return too. The group of IPOs that have relatively higher lottery winning ratio tend to have the lowest average market-adjusted IPO initial return of 9%, which is dramatically lower than the average market-adjusted IPO initial return for the whole sample (129%). A distribution histogram may help us better understand the statistics of the winning ratio.

Figure 2: Distribution Histogram of the Lottery Winning Ratio - WINNINGRATE

Series: WINNINGRATE	
Sample 2 881	
Observations 879	
Mean	1.407895
Median	0.454486
Maximum	90.57766
Minimum	0.010700
Std. Dev.	5.054307
Skewness	12.11066
Kurtosis	179.0010
Jarque-Bera	1155996.
Probability	0.000000
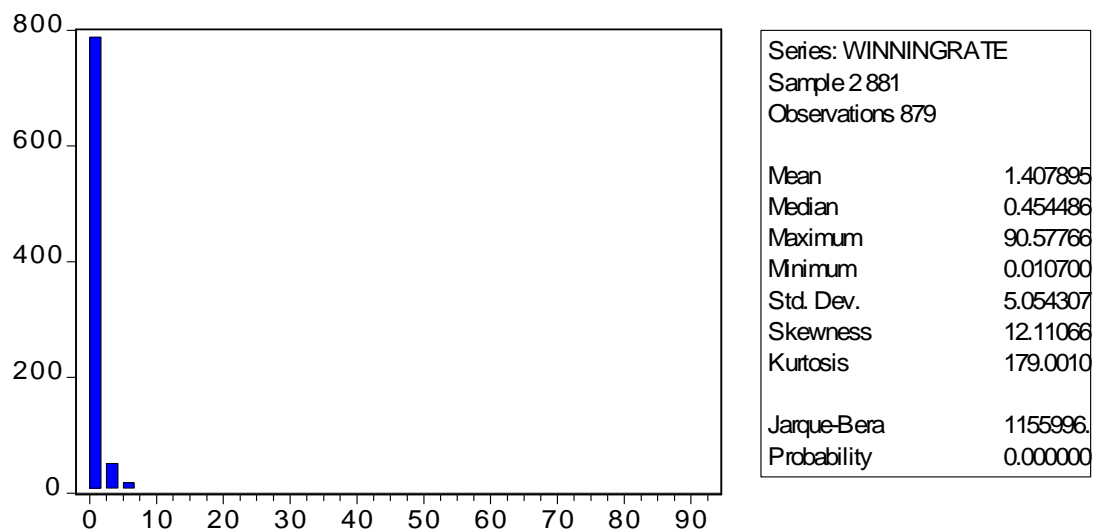
In figure 2, the lottery winning ratio of vast majority IPOs is less than 2.5%. The data shows that even judged by average lottery winning ratio, Chinese IPOs are hugely short of supply. The data again confirms the earlier statement that Chinese IPOs are mostly oversubscribed. Meanwhile, the data is far from normally distributed with extremely high kurtosis (179.0010) and skewness (12.1107). The existence of non-normality in the distribution of independent variables could lead to some problems and it could be dealt with in two ways, as discussed in chapter 6. The natural

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logarithm-transformed lottery winning ratio has a better-shaped distribution that is illustrated in figure 3.

Figure 3: Distribution Histogram of the Natural Logarithm of the Lottery Winning Ratio - LNWINNINGRATE
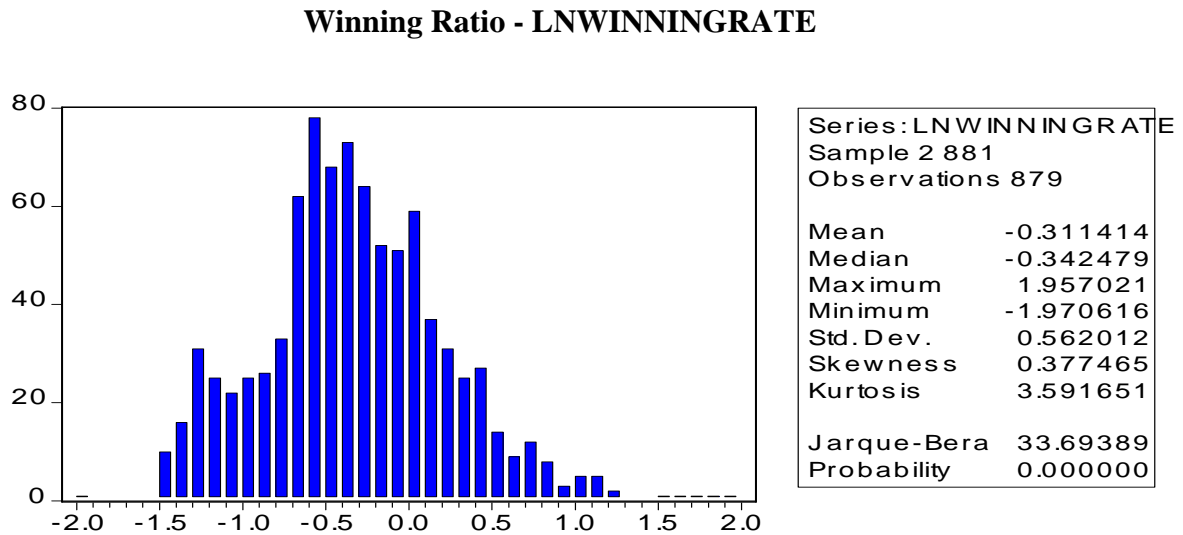
A new variable **LNWINNINGRATE** is used to represent the natural logarithm of the lottery winning ratio. Now the chart looks more like a normal distribution with a bell-shape curve. The excess skewness is now only 0.3775 and the kurtosis is significantly reduced. Taking natural logarithm is not the only data transformation method. As a matter of fact, taking the inverse, square root and cubic root of the original variable are all practical transformation methods, depending on the fundamental characteristics of the data. Chapter 6 has stressed that only the best transformation will be used for a specific independent variable. Examples of different types of data transformations will be demonstrated in later chapters when transformations are adopted.

Let us now take a look at another independent variable – the turnover rate - in model 2. The descriptive statistics of the turnover rate is listed in the following table.

Table 8: Descriptive Statistics of Turnover Rate

	TRNOVER
Mean	0.586034
Median	0.600000
Maximum	0.940000
Minimum	0.030000
Std. Dev.	0.161715
Skewness	-0.999921
Kurtosis	4.506118
Jarque-Bera	228.5121
Observations	875

As discussed before, the turnover rate is an approximate measure of the intensity of short-term trading activities. Table 8 shows average 58.6% turnover rate in the first trading day, which means on average an IPO has more than half of the total outstanding tradable shares changed hands in the first trading day alone. The highest turnover rate is even 94% for the IPO in a single day. Chapter 4 has mentioned an annual IPO turnover rate of 587% in China. Consistent with that number, the high level of first trading day turnover rate again confirms that the Chinese primary market is "driven by fast money flow in and out of the market".

Table 8 also shows that the distribution of the turnover rate is not normal either. But after comparing different transformation methods, the thesis finds that data transformation in this instance will not help improve the distribution too much. Therefore, the original variable **TRNOVER** will be used in the regression. The correlations between the turnover rate, lottery winning ratio and market-adjusted IPO initial return are presented as below.

Table 9: Correlation Matrix for Lottery Winning Ratio, Turnover Rate and IPO

Initial Return

(The numbers stand for the correlation coefficients between the two variables on top of the same column and on the left of the same row. E.g. the correlation coefficient between TRNOVER and MAAR is 0.3541.)

	WINNINGRATE	TRNOVER	MAAR
WINNINGRATE	1.0000		
TRNOVER	-0.0436	1.0000	
MAAR	-0.1386	0.3541	1.0000

Both the turnover rate and the lottery winning ratio have the right correlation sign as expected, i.e. the lottery winning ratio is negatively correlated with the IPO initial return and the turnover rate is positively correlated with IPO initial return. Furthermore, the turnover rate seems to have a relatively high correlation coefficient with the market-adjusted IPO initial return (0.3541).

A further investigation of turnover rate statistics shows more compromising results. Aggarwal's (2001) study uses an IPO-flipping ranking classification method to analyze the relationship between the IPO initial return and the flipping rate. Following his method, this study uses the turnover ranking classification method to identify the connection between the IPO initial return and the speculation.

Table 10: Turnover Rate Distribution by Initial Returns

(Note: The table follows Reena Aggarwal's (2003) classification of IPO shares. The definitions of very cold, cold, hot and very hot IPO shares follow his definitions too. N is the number of observations of IPO shares in that category.)

	Very cold Day 1 return <= 0% (N = 2)		Cold 0 < Day 1 return <= 10% (N=15)		Hot 10 < Day 1 return <= 60% (N=146)		Very hot Day 1 return > 60% (N=717)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Initial Return	-0.030833	-0.030833	0.046795	0.053009	0.383186	0.400495	1.510444	1.312187
Turnover Rate	0.427300	0.427300	0.336577	0.362706	0.486854	0.486432	0.611752	0.630039

First thing to be noticed in table 10 is the big proportion of "very hot" IPOs (first trading day return greater than 60%) in China's stock market. There are about 81.5% (717/880) IPOs falling into this category, while in Aggarwal's (2001) paper this rate is about 7.3% for the US IPOs. Although this may look trivial because the Chinese IPOs are obviously under-priced much more than the US IPOs in a bigger proportion, a more interesting finding in table 8 is the apparent simultaneous increases of the turnover rate and the IPO mean initial return. For the first three categories, the mean of the turnover rate does not change much, i.e. 0.4273 for the very cold IPOs, 0.3366 for the cold IPOs and 0.4869 for the hot IPOs. But for the 81.5% majority block – the very hot IPOs – the turnover rate mean jumps to 0.6118. Accompanying this, the group mean of the IPO first day return has a significant jump to the highest 1.5104. The difference between the hot and very hot IPO initial returns is statistically significant at 5% confidence level. But for the first two groups, as the sample sizes are too small it is not sensible to talk about statistic significance. The finding demonstrates that the turnover rate and IPO initial return are closely connected. Given that the turnover rate measures the speculation effect, the table also reveals that the short-term speculative trading is really targeting at the IPO initial return.

Finally, let us examine the regression results. As said earlier, **WINNINGRATE** is replaced by the transformed new variable **LNWINNINGRATE** in the regression to sooth the non-normal distribution problem.

Table 11: White Heteroskedasticity-Consistent OLS Regression with Turnover Rate, Lottery Winning Ratio and Transaction Stamp Duty Tax Rate

(Note: In parentheses are the student t-statistics; * stands for 10% significance level and *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 874.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	-0.2918 (-1.8931*)
TRNSCTNTAX	1.3851 (4.9372***)
TRNOVER	1.6884 (9.1741***)
LNWINNINGRATE	-0.3031 (-5.6541***)
MKTCAP	-1.9872 (-2.0531*)
R-squared	0.2673
Adjusted R-squared	0.2644

Hypothesis 2: The t-statistic of the independent variable **TRNSCTNTAX**, the transaction stamp duty tax rate, is significant at 99% confidence level. But the regression coefficient has a positive sign (1.3851), which is opposite to what the hypothesis assumed. The result is surprising but it may be interpreted possibly in two ways.

Firstly, because the transaction stamp duty tax rate is relatively stable and it remains constant within every time period as shown in table 6, the tax rate may be too stubborn to capture the characteristics of the fluctuation in the speculation magnitude and hence the lump-sum IPO initial return. In a specific period, in which the transaction stamp duty tax rate remains constant, the investors' decision to pursue the lump-sum IPO initial return is less likely to be affected by the constant transaction tax

rate. Because the investors cannot foresee any transaction tax rate change in a very short-term, they will buy and sell news shares to realize the short-term initial return anyway. By contrast, the change of the transaction stamp duty tax rate will have an instant impact on the IPO initial return but only in a short-term. The test of hypothesis 1 shows that the initial return right after the tax rate raise is decreased significantly compared to that before the policy change. It is possible that the long-term effect of the tax rate change is rather than straightforwardly seen as suggested by hypothesis 2. In other words, only in short-term and only the change of transaction stamp duty tax rate instead of the rate itself affects the speculation while in long-term China's investors' speculative trading behaviour is not affected.

Certainly, the underlying assumption of above interpretation is still that the speculation effect positively causes the IPO under-pricing. If above interpretation is reasonable, the relationship between the speculation proxy – turnover rate – and the transaction stamp duty tax rate should be either insignificant or positive. A regression of turnover rate against transaction stamp duty tax rate may support above conclusion. Indeed, an OLS regression shows that the hypothesis that the turnover rate is negatively related with the transaction stamp duty tax rate cannot be accepted, instead the regression coefficient is positive at a confidence level of about 95% (see table 12).

Table 12: White Heteroskedasticity-Consistent OLS Regression of Turnover

Rate against Transaction Stamp Duty Tax Rate

(Note: In parentheses are the student t-statistics; ** stands for 5% significance level and *** stands for

1% significance level.)

Dependent Variable: TRNOVER; Method: Least Squares; Included observations: 875.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	0.5384 (25.4338***)
TRNSCTNTAX	0.1313 (2.3934**)
MKTCAP	-0.9381 (-1.3805**)
R-squared	0.1563
Adjusted R-squared	0.1551

The second possible explanation is that the varying transaction cost introduced by the transaction stamp duty tax has been reflected in the IPO under-pricing. That is to say, if the issuing company needs to under-price its IPO for whatever purposes it may have to under-price the IPO more to compensate for investors' transaction costs due to increased transaction stamp duty tax. While less under-pricing is needed when the transaction stamp duty tax rate is low. In this instance, the hypothesis should be modified to assume that the IPO initial return is positively related with the transaction stamp duty tax, which is exactly what the regression result tells.

The transaction tax rate is a brand new testing proxy proposed by this study. It is very interesting to find the positive relationship between the transaction tax rate and the IPO initial return. Although this thesis has put forward above two explanations for the result, the real reason may be still waiting to be discovered. On the other hand, a

significant regression coefficient at least shows that the government tax policy plays important role in IPO pricing no matter what the real government motivation of the policy is.

Hypothesis 3: The test of hypothesis 3 proves to be successful. In table 11, the explanatory variable **TRNOVER** has a positive regression coefficient (1.6884) as the hypothesis expected. T-statistic shows a 99% confidence level. We cannot reject the null hypothesis of hypothesis 3 at 1% significance level. The first impression from the test is that the speculation effect may have introduced the IPO under-pricing as the thesis has pointed out earlier.

A potential argument that could possibly undermine the validity of above test results is that the normal OLS regression model does not rule out the possibility of the existence of the so-called simultaneous equation problem. In contrast to hypothesis 3, people could argue that it is the high IPO initial return that drives investors to pursue speculative profits in short-term rather than the other way around. Although previous researchers such as Chi and Padgett (2005) and Tian (2003) ignore this problem and only use the normal OLS, it is worthwhile to handle this problem explicitly. The heteroskedasticity-consistency adjusted two-stage least square (TSLS) regression result is shown in the following table 13.

Table 13: White Heteroskedasticity-Consistent Two-stage OLS Regression of

IPO Initial Return against Turnover Rate

(Note: In parentheses are the student t-statistics; *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 874.

Instrument list: C TRNSCTNTAX LNWINNINGRATE

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	-4.0601 (-2.6534***)
TRNOVER	9.1820 (3.4977***)
R-squared	-1.8680
Adjusted R-squared	-1.8714

As the transaction stamp duty tax rate and the lottery winning ratio are all decided exogenously, they are used in the two-stage least square regression as instrument variables. The regression coefficient of the turnover rate is still positive (9.1820) as expected. The hypothesis that the IPO initial return is positively related to the IPO initial return cannot be rejected at a 99% confidence level. It is not uncommon to see negative R-squared and adjusted R-squared in a TSLS regression. But they really have no statistical meanings in the context of TSLS because the model's residuals are computed over a set of independent variables different from those used to fit the model. However, to show how well the model fits the data, it is helpful to gauge the correlation between the fitted model and real data.

Table 14: Correlation Matrix of Fitted Model and Real Data for TSLS

Regression in Table 13

	FITTEDMAAR	MAAR
FITTEDMAAR	1.0000	
MAAR	0.3647	1.0000

The table 14 illustrates that the regression model in table 11 is fitted relatively well to the real data with a correlation coefficient of 0.3647, which is high enough in the normal sense of regression quality. Given the results in table 11, 13 and 14, it is safe to say that the hypothesis 3 stands the statistical tests successfully.

Now that both the normal OLS and TSLS generate the same regression result when the turnover rate is used as an explanatory variable, no doubt should be cast about the quality of the regression especially with respect to the simultaneous equation problem. The message is clear from the test, Chinese IPO under-pricing is driven by the short-term speculation, which in the test is measured by the turnover rate on the first trading day.

Hypothesis 4: In table 11, the explanatory variable **LNWINNINGRATE** does have a negative regression coefficient (-0.3031) as expected by the hypothesis, and it is significant at 99% confidence level (-5.6541). The result contradicts Chi and Padgett's (2005) research, in which they claim that the IPO lottery winning rate does not have sufficient power in explaining the IPO initial return. Nevertheless, Chi and Padgett's (2005) hypothesis is set the same as hypothesis 4 in this thesis. In this sense, table 11

shows that their hypothesis as well as hypothesis 4 in this study has passed the statistical test.

Earlier chapters have depicted that China's speculative market is partly due to the imbalance between the new share supply and demand. The test simply proves that this imbalance has found its way into the IPO under-pricing through speculation.

7.3 Summary

In summary, the thesis finds that the claim that Chinese IPO under-pricing is driven by retail investors' short-term speculation in the primary market is largely supported by the empirical data. More specifically, the thesis finds that hypothesis 1, 3 and 4 stand statistical tests.

As the underlying assumption of the speculation effect hypothesis is that the under-pricing is positively related to speculation level, a significantly positive relationship between the speculation measure – turnover rate – and the under-pricing measure - IPO initial return – would prove the assumption to be sound. In this sense, the thesis has directly tested the speculation effect statement for the first time in Chinese IPO literature through testing of hypothesis 3.

In addition to the direct test of the statement, the successful testing of hypothesis 1 on the other hand shows the mitigating impact of an event which is supposed to reduce the speculation magnitude is significant to the under-pricing. Well following what the Chinese government has planned, the increase of transaction stamp duty tax has increased the speculation costs and hence compromised investors' speculative

opportunities in the IPOs. The testing of this tax rate raise event not only proves that the speculation is behind China's high IPO initial return but also it demonstrates vividly how regulatory influences have found way into IPO under-pricing mechanism.

As repeatedly discussed earlier, the imbalance between supply and demand of new shares has played important role in introducing the speculation to China's primary market as the higher speculative margin would trigger higher demand and supply imbalance and vice versa the more likely the demand is bigger than the supply the more possible the retail investors would target the short-term speculation. The successful testing of hypothesis 4 again indirectly proves that the speculation is driving the IPO under-pricing.

Although the test of hypothesis 2 produces opposite sign of regression coefficient to the hypothesis, it is possible that the proxy of long-term transaction stamp duty tax rate is not suitable for reflecting the short-term speculation fluctuations. Alternative explanations may come along based on this surprising result, but they demand future study. A particularly interesting assumption among them is that the compensation for the transaction cost caused by the transaction stamp duty tax is required from the investors' point of view, reflecting a leveraged IPO initial return.

All in all, the statement that the short-term speculation in China's stock market has driven up the IPO under-pricing is supported by the empirical data used in this study. In the test process, traces of government influence have been found in the example of transaction stamp duty tax rate change. In terms of contributions to existing literatures, this chapter has several highlights. Firstly, the thesis has for the first time tested a

statement about IPO under-pricing in China. It does inspire a new angle to look at China's high level of under-pricing i.e. from irrational investors' behaviours such as speculation. Secondly, the thesis again proves that the imbalance between supply and demand of new shares in China has played roles in the under-pricing, no matter this imbalance is intentionally imposed by the government or not. The result is consistent with findings from earlier studies such as Chi and Padgett (2005) and Su and Fleisher (1999)'s papers. Thirdly, the test of the hypothesis raises interesting question about the impact of the transaction costs to the IPO under-pricing.

Chapter 8 Data Analysis – Western Region Development Policy

Implications of government policy influence somehow have emerged in last chapter during the test of speculation effect. This chapter, by contrast, will directly reveal the impact of a major government policy – the Western Region Development Policy – on the IPO under-pricing. The successful hypothesis test in this chapter will not only prove the statement regarding to the Western Region Development Policy discussed earlier but also discover the government involvement in IPO under-pricing directly from policy perspective. The underlying assumption throughout this chapter is that the government uses under-pricing as a policy tool to lure investors to invest in western region IPOs.

8.1 Model and Variables

Hypothesis 5 has implicitly assumed that there is a difference of the mean initial returns between the western region and eastern region IPOs. According to the hypothesis, this difference is affected by the Western Region Development policy on the back of the assumption that the policy introduces higher under-pricing to the western region IPOs. In order to measure the mean initial return difference between the two regions' IPOs and measure the change of the difference before and after year 2000 when the policy started, it is necessary to formulate at least two sets of dummy variables for the regression as follows:

WEST   The region dummy variable, which takes value 1 if the IPO comes from the western region area and 0 if otherwise.

AFTER2000   The period dummy variable, which takes value 1 if the IPO is issued after January 2000 and 0 if otherwise.

In addition, another interactive dummy variable is used to measure the event impact as a whole.

INTERDUMMY The interactive dummy variable that measures the event effect

as a whole. It is defined as the cross-product of the above two

dummy variables **WEST** and **AFTER2000**.

The following table shows how the value of the interactive dummy variable

INTERDUMMY is determined.

Table 15: Definition Matrix of Interactive Dummy Variable INTERDUMMY

	Western Region IPO	Eastern Region IPO
IPO Before Year 2000	0	0
IPO After Year 2000	1	0

The regression model is modified accordingly as follows:

Model 3:

$$MAAR_i = \alpha_0 + \alpha_1 \times WEST_i + \alpha_2 \times AFTER2000_i + \alpha_3 \times INTERDUMMY_i$$

$$+\alpha_4 \times MKTCAP_i + \alpha_5 \times PROFSHA_i + \varepsilon_i \qquad (17)$$

The regression means that an IPO's initial return is affected by the issuing firm's

region and when it went public (before or after the WRD policy came into effect). If

the IPO is a western region IPO that went to public after the WRD policy started, then

supposedly the **INTERDUMMY** which represents such IPO's group will have a

positive relationship with the IPO's initial return.

If the mean initial return of western region IPOs is bigger than that of eastern region

IPOs, a positive regression coefficient α_1 will be found in the regression. Otherwise, if

the mean initial return of western region IPOs is smaller than that of eastern region

IPOs, a negative regression coefficient α_1 will be found. If there is no significant difference between the mean initial returns of the two regions' IPOs, α_1 should have a small absolute value with insignificant t-statistic. Meanwhile, as hypothesis 5 has laid out, the Western Region Development policy presumably causes the western region IPOs to be under-priced more. As a result, a positive regression coefficient of α_3 should be expected. It is not obvious to tell the sign of α_2 because no assumption has been made about the policy's impact on the eastern region IPOs.

8.2 Analysis and Results

Let us firstly take a look at the general descriptive statistics of the dataset with respect to the Western Region Development Policy.

Table 16: Distributions of IPO Initial Returns with respect to Western Region

Development Policy

(Note: Total Observations 880.)

	IPO NO.	Mean MAAR	Median MAAR	Max MAAR	Min MAAR	Std. Deviation
Western Region IPOs	183	1.3883	1.1893	4.6849	-0.0113	0.8558
Eastern Region IPOs	697	1.2699	1.1307	8.2543	-0.0424	0.8264
IPOs before January 2000	530	1.2952	1.1517	8.2543	-0.0264	0.8300
IPOs after January 2000	350	1.2935	1.1589	4.7639	-0.0424	0.8400

Table 16 divides the IPOs into several categories. There are much more IPOs from the eastern region area than from the western region area in the sample. Only approximately 20.8% (183/880) IPOs are from western region area, which agrees with the early introduction of China's stock market that the majority of listed companies in China are from more developed eastern area. It appears that the western region IPOs have a larger average initial return than their eastern counterparts (1.3939 against 1.2688). The statistics do not fully agree with Chan et al (2004)'s findings. Meanwhile, the IPO mean initial return of the whole sample seems to have experienced a drop of 0.17% (from 1.2952 to 1.2935) after the policy came into place. Since it is assumed that the policy introduces more under-pricing to the western region IPOs, the drop of the IPO mean initial return of the whole sample must be primarily due to the drop of IPO mean initial return of eastern regions. Let us take a closer look at the sub-group of the western region IPOs only.

Table 17: General Descriptive Statistics of Western Region IPOs

(Note: Total Observations 183.)

	IPO NO.	Mean MAAR	Median MAAR	Max MAAR	Min MAAR	Std. Deviation
IPOs before January 2000	112	1.3766	1.1903	4.6849	-0.0113	0.8504
IPOs after January 2000	71	1.4069	1.1647	4.1329	0.1734	0.8700

Table 17 evidently confirms above judgment. The sub-group of western region IPOs has a relatively even distribution between the groups of IPOs that went public before and after January 2000 (112 observations before versus 71 observations after). It is

crystal clear that there is a hike in the mean initial return after the policy came into place. The jump of 3% is fairly significant, compared to the change of mean initial returns of 0.17% of the whole sample in table 16. Obviously, the drop of IPO mean initial return of the whole sample is due to the mean initial return drop from eastern region IPO because the policy, as expected, has incurred an increase in the mean initial return of western region IPOs. At the first sight, table 17 illustrates that the policy indeed has caused more under-pricing to western region IPOs, which could indicate that the government has tried to use the under-pricing to attract investment into western region companies. But will the regression tell the same story as the descriptive statistics? Let us look at the regression result.

Table 18: White Heteroskedasticity-Consistent OLS Regression with Dummy Variables of WEST, AFTER2000 and INTERDUMMY

(Note: In parentheses are the student t-statistics; *** stands for 1% significance level, ** 10% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 874.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	1.8292 (16.9256***)
WEST	0.1423 (1.2133)
AFTER2000	-0.1023 (-1.5706)
INTERDUMMY	0.03912 (0.2694)
MKECAP	-0.0006 (-2.3168**)
PROFSHA	-2.7567 (-5.5894***)
R-squared	0.2064
Adjusted R-squared	0.2018

Hypothesis 5: In general the statistic results tell a similar story, but the test fails to show sufficient significance. First thing to notice in table 16 is that the regional dummy variable **WEST** has a positive regression coefficient sign, which means that the western region IPOs are on average under-priced more compared to eastern region IPOs. But the difference is only marginal (0.1423) and it is only at weak confidence level. The period dummy **AFTER2000** shows a negative regression coefficient (-0.1023), which is consistent with the early judgment that around the event date there is a drop in the IPO mean initial return. But again, this drop is only significant. Finally, the interactive dummy variable **INTERDUMMY** has a positive sign as expected, which agrees with the underlying assumption of hypothesis 5 that the Western Region Development policy contributes positively to the IPO under-pricing. However, the test does not show enough statistic explanatory power in terms of significance level.

8.3 Summary

Although both the descriptive statistics and regression results indicate that the government's Western Region Development Policy has impact on the IPO under-pricing in the exact direction as the statement indicated, the data does not lend sufficient explanatory power to the independent variables in the statistic sense. It is possible that the government may have relied more on fiscal measures such as favourable tax and government capital allocation that are suggested in earlier chapters, instead of direct economic incentive of IPO under-pricing to encourage investment into western region companies. Even if the practitioners have claimed that the policy will introduce more under-pricing to western region IPOs, the data shows that the government may have not heavily relied on under-pricing to fulfil its objective. Alternatively, the government might have planned to use the under-pricing as

suggested, but in reality it found that the investors are already encouraged by the high expectation of thriving western firms under the western policy and there is no further need to under-price the new shares. Or, the government simply fails to fulfil its intention. If any of these scenarios is the case, the insignificant regression coefficients are no longer surprising.

In summary, the statement that the Western Region Development policy has caused western region IPOs to be under-priced is only weakly supported by the empirical data. The regression shows satisfactory regression coefficient signs but the t-statistics are not significant enough. Based on the test of Western Region Development Policy hypothesis, there is not enough evidence to support the statement that the government has been involved in the western region IPO pricing process.

Chapter 9 Data Analysis – Government Protection Effect

While last chapter is focusing on specific government policy influences on IPO under-pricing, this chapter examines the influences of general government protection of the IPO firms on the under-pricing. The government protection is regarded a source of IPO under-pricing because it is assumed that the government could under-price government-protected IPOs in order to compensate for investors' concern of future government interference. Chapter 4 has listed several related statements from the area regarding the Chinese government's protection. This chapter will test the statement and check whether the Chinese IPO under-pricing can be explained by government involvement in terms of discriminative protection.

9.1 Model and Variables

The government protection effect hypothesis is based on the assumption that the IPO under-pricing is a cost for the state-owned company going public to compensate investors for their concern of government future intervention in the company's business. This is a brand new hypothesis although the idea about government protection effect on IPO under-pricing is not fresh. However, the government protection has rarely entered the Chinese IPO under-pricing literature. One reason may be because it is not easy to tell which firms are more blessed by the government than others because the vast majority IPO firms in China are state-owned. The difficulty is like to statistically prove that the parents like some of their children more than the others.

As mentioned in literature review, Aharony et al (2000) have found discriminative difference in the long-term IPO share performances between government protected

and non-protected government firms. To do that, they have managed to identify groups of companies under the category of government protection. Their paper may not deal with the IPO under-pricing but their grouping method is enlightening to this thesis. Their grouping method does not tell how much government protection has been given to the issuing firms but at least it provides a feasible way to test the protection effect from statistic perspective.

In their paper, Aharony et al (2000) identify the petrochemical, energy and raw material firms as government-protected and all other firms as non-protected firms. According to their method, the sample of this thesis is divided as follows:

Table 19: Issuing Firm Classification According to Government Protection

	Numbers of the companies
Protected Sectors	**161**
Petrochemicals	110
Energy	36
Raw Materials	15
Non-protected Sectors	**719**
Agriculture	26
Consumer Products	74
Commerce and Retail	39
Conglomerate	34
Construction, Properties and Real Estate	37
Electronics	29
Finance	5
Information Technology and Telecommunication	56
Machinery, Equipment and Instruments	137
Manufacturing	107
Media and Culture	4
Medicine	56
Public Service	12
Textiles, Clothes	41
Tourism and Hotel	16
Transportation	45
Warehouse	1

The industrial classification of every IPO firm follows the official guidance from

CSRC, which has been mentioned in chapter 6. In the table, there are far less government-protected firms (161) than non-protected firms (719). At the first glance, the categorization criterion given by Aharony et al (2000) appears to be a good way to group the sample. Because almost all these companies are previously state-owned enterprises (SOE's), it is difficult to distinguish the government-protected firms from the rest. The industries they select include those of national strategic importance and coincide with industries described by An (2003) as have benefited from the government protection.

To discern the government protection effect from the regression, a dummy variable is set up to label the government-protected firms.

PROTED The dummy variable to indicate whether the issuing firm has the government protection property or not. It is given value 1 if the firms is government-protected and value 0 if otherwise.

The regression model is as follows:

Model 4:

$$MAAR_i = \alpha_0 + \alpha_1 \times PROTED_i + + \alpha_2 \times MKTCAP_i + \alpha_3 \times PROFSHA_i + \varepsilon_i \qquad (18)$$

where the issuing firm's market capitalisation and profitability are controlled variables.

Hypothesis 6 suggests that the government protection ought to bring more under-pricing to the IPO. Accordingly, the dummy variable of **PROTED** is expected to have

a positive regression coefficient α_1.

9.2 Analysis and Results

The general descriptive statistics of the sample with respect to the government protection is firstly put into table 20.

Table 20: General Descriptive Statistics of IPOs with respect to Government

Protection

(Note: Observations 880.)

	IPO NO.	Mean MAAR	Median MAAR	Max MAAR	Min MAAR	Std. Deviation
Government-protected Firms	161	1.0921	1.0878	3.2414	-0.0424	0.5672
Non-protected Firms	719	1.3398	1.1853	8.2543	-0.02639	0.8761

Table 20 shows that the market-adjusted IPO mean initial return of government-protected firms is significantly lower than that of non-protected firms by 24% (1.0921 vs. 1.3398). But under hypothesis 6, the assumption is the government protection would lead to more under-pricing due to investors' concern of government interference. The data seems to contradict this assumption. Let us look at the regression results in the following table 21 for a clearer answer.

Table 21: White Heteroskedasticity-Consistent OLS Regression with the

Government Protection Dummy Variable

(Note: In parentheses are the student t-statistics; *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 880.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	1.3398 (40.9884***)
PROTED	-0.2477 (-4.4791 ***)
MKTCAP	-0.0006 (-3.1927 ***)
PROFSHA	-2.7293 (-14.5879 ***)
R-squared	0.2185
Adjusted R-squared	0.2122

Hypothesis 6: Once again, table 21 shows that the regression coefficient of the dummy variable **PROTED** is negative (-0.2477) as opposed to a positive sign expected by the hypothesis with a high significance level. It simply means that the government protection contributes negatively to the IPO initial return, i.e. IPO under-pricing is reduced by the government protection.

However, the result is not a total surprise. Chapter 4 has argued that since the government-protected firms are usually large monopoly firms that have huge market share and large market capitalization and possibly some of them have comparatively better performance, information asymmetry and ex ante uncertainty effects may overweigh the concern of government protection and cause the IPO initial return to move in opposite direction. A separate inspection of the relationship between the government protection group and other proxies will help to draw a more

comprehensive picture.

Table 22: OLS Regression Results of Various Proxies against Government

Protection Dummy Variable

(Note: In parentheses are the student t-statistics; ***stands for 5% significance level.)

Other Proxies as Dependent Variable	Regression Coefficient against PROTED
Market Capitalisation	24.9702 (2.2270***)
Cubic Root of Profitability	0.0056 (0.5383)

In table 22, regressions show that the government-protected IPO firms statistically have larger market capitalization at a 95% confidence level and better profitability but at a relatively low confidence level. The reason to transform the profitability variable is described in chapter 6. Although thorough investigation of information asymmetry and ex ante uncertainty hypotheses is left to the next chapter, at least table 22 shows that there exists possibility that other factors have overweighed the government protection effect proposed by hypothesis 6 and these factors have not been reflected in model 4. Indeed, the next chapter will explore in depth the relationship between these proxies such as market capitalization and profitability with the IPO initial return.

9.3 Summary

The opposite sign of regression coefficient in the test of hypothesis 6 does not support the original hypothesis of government protection effect. Although further investigation is still needed to find out the real causes of such phenomenon, the test does show that the statement that the government protection may lead to Chinese IPO under-pricing has not been supported by empirical data. Under the circumstance that the empirical evidence for Western Region Development Policy effect is not significant, the failure of test of hypothesis 6 may further render the impression that the government influences is not the real reason of Chinese IPO under-pricing as

some academics and practitioners have suggested.

In summary, the statement that the government protection may cause IPO under-pricing is not supported by the empirical data. Instead, this thesis finds that the government-protected firms tend to have lower IPO under-pricing as table 20 and 21 suggest. However, the real reason why the government-protected firms have a lower IPO initial return on average is worth future study.

So far, all three brand new hypotheses have been tested and the results are basically mixed. With respect to the speculation effect, empirical data strongly supports the statement that the speculative trading is behind Chinese IPO under-pricing. Especially during the test, government influences have been found through the change of transaction stamp duty tax rate. The second hypothesis test regarding to the Western Region Development Policy only shows weak support to the statement that the government uses IPO under-pricing to encourage investments into western region companies. The direct test of government protection effect on IPO under-pricing proves to be not satisfactory but it does raise an interesting question why the government protection instead appears to have reduced the IPO under-pricing.

From next chapter, hypotheses test will focus on classical factors and some China-specific factors that have been used already in testing by previous researchers. Hopefully, more explanations of Chinese IPO under-pricing will appear in the test. In the meantime, some factors with government political implications will come out of the test and then the overall conclusion about government influences on Chinese IPO under-pricing can be drawn from the results.

Chapter 10 Data Analysis – Existing Classical Hypotheses

This chapter will test the existing classical IPO under-pricing hypotheses. Although in previous studies many of the hypotheses have been put to test with China's data of different periods, chapter 4 has pointed out that inconsistent test results have appeared in the literature. To clarify the inconsistency is therefore a key objective of this chapter. In addition, tests of classical hypotheses are indispensable parts of any research seeking to comprehensively reveal IPO under-pricing rationale.

10.1 Information Asymmetry Hypotheses

10.1.1 Model and Variables

Information asymmetry hypotheses include hypothesis 7, 8, 9, 10, 11 and 12. Especially, hypothesis 9 is the same as hypothesis 4. Since the test of hypothesis 4 is successful, the result will be reserved and no further test regarding to hypothesis 9 is conducted in this chapter. Explanatory variables with respect to hypothesis 7, 8, 10, 11 and 12 are set below.

PROFSHA	The issuing firm's profitability at the time of IPO. It is calculated by formula 11.
AGE	The issuing firm's age at the time of IPO, as discussed in chapter 6.
PRICE	The IPO share offer price measured in Chinese RMB Yuan.
SEO	The dummy variable for seasoned offering. If the IPO has issued seasoned offering later on, SEO is set equal to 1; otherwise SEO equals 0.
FIX	The dummy variable for fixed pricing method. If the IPO is

offered through fixed pricing, FIX is set equal to 1; otherwise FIX equals 0.

The regression model is thus:

Model 5:

$$MAAR_i = \alpha_0 + \alpha_1 \times PROFSHA_i + \alpha_2 \times AGE_i + \alpha_3 \times PRICE_i + \alpha_4 \times SEO_i +$$

$$\alpha_5 \times FIX_i + \varepsilon_i \qquad\qquad (19)$$

Rock's (1986) "Winner's Curse" argument implies that the IPO initial return is a decreasing function of profitability and firm age. In result, the regression coefficient α_1 of the issuing firm's profitability, according to hypothesis 7, should have a negative sign. Likewise, the regression coefficient α_2 of the issuing firm's age should also have a negative sign according to hypothesis 8. As fixed pricing requires the investors to reveal their demand, in return IPO under-pricing should be higher to compensate for the investors' willingness of doing so. Therefore, fixed pricing should have higher under-pricing then bookbuilding method according to Benveniste and Wilhelm (1990), Spatt and Srivastava (1991) and Benvensite and Busaba (1997)'s theory. Hypothesis 10 implies a positive regression coefficient α_5. Hypothesis 11 assumes that under-pricing is a costly signal tool in order for high quality issuing firm to achieve better seasoned offering later on. Hence, under-pricing is supposed to be higher for the issuing firms that have seasoned offering. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989)'s theory indicates a positive regression coefficient α_4. Su and Fleisher (1999) have argued that a higher offer price means a lower profit to the informed investors. Consequently, an increased offer price has the

similar impact as a decreased profitability on IPO. Hypothesis 12, therefore, suggests

that the regression coefficient α_3 of offer price should have a positive sign.

10.1.2 Analysis and Results

Table 2 in chapter 6 has demonstrated some descriptive statistics of above variables.

The following table shows how the IPO initial return differs in different offering

methods' groups and seasoned offering group.

Table 23: Descriptive Statistics of IPO Initial Return in Fixed Pricing vs.

Bookbuilding and Seasoned Offering vs. Non-seasoned Offering

(Note: The number of IPOs in the sample is 656.)

	IPO NO.	Mean MAAR	Median MAAR	Max MAAR	Min MAAR	Std. Deviation
Fixed Pricing	617	1.3225	1.2037	8.2543	-0.0264	1.1819
Bookbuilding	39	1.1805	0.8786	3.1235	0.0184	0.8538
SEO	89	1.2911	1.1784	4.3196	0.0145	0.8134
Non-SEO	567	1.3176	1.1875	8.2543	-0.0264	0.8507

The sample size has been reduced because the sample has only included IPO's that are

either offered through bookbuilding or fixed pricing. There are some ad hoc offering

methods in the Chinese IPO history as mentioned in early chapters. Since these

offering methods are not in the main-stream offering process, these IPO's are excluded

from the sample so that the thesis can focus on the information asymmetry hypothesis

tests.

The above table shows that under fixed pricing method, the average IPO under-

pricing seems to be higher than under bookbuilding by about 14% in market-adjusted return terms. This finding is consistent with the assumption of hypothesis 10. However, the IPO's that have seasoned offerings later under-perform the IPO's that do not issue seasoned offering. Although the difference is marginal, this could still put a question mark on the assumption of hypothesis 11. Let us see what happens to the regression.

Notably, table 2 shows that the above first three variables are not normally distributed. Chapter 6 has stressed how data transformation can help soothe the non-normality problem and an example of natural logarithm transformation is given in chapter 6. Likewise, **PROFSHA** and **PRICE** are transformed by taking cubic root and natural logarithm of the original variables respectively. According to the transformation criterion proposed in chapter 6, because the original variable of **AGE** has a distribution closer to normal than its transformed counterparts, the original variable **AGE** is used for the regression. The distribution histograms of the original and transformed variable of **PROFSHA** are shown in the following two figures.

Figure 4: Distribution Histogram of the Issuing Firm's Profitability – PROFSHA

Series: PROFSHA	
Sample 2 881	
Observations 880	
Mean	0.176621
Median	0.149622
Maximum	1.902906
Minimum	-0.376804
Std. Dev.	0.133843
Skewness	4.114553
Kurtosis	41.80457
Jarque-Bera	57695.48
Probability	0.000000
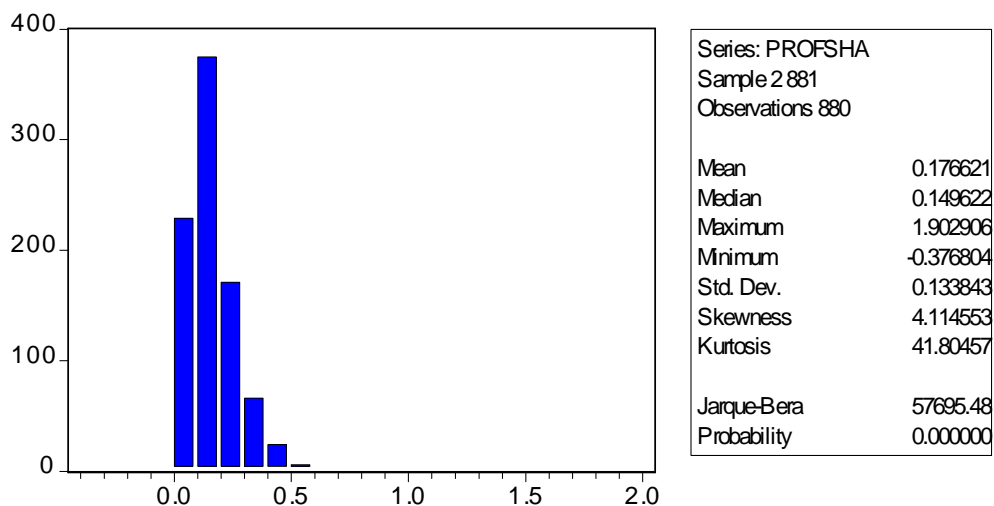
Figure 5: Distribution Histogram of the Cubic Root of the Issuing Firm's

Profitability - CUBEPROFSHA
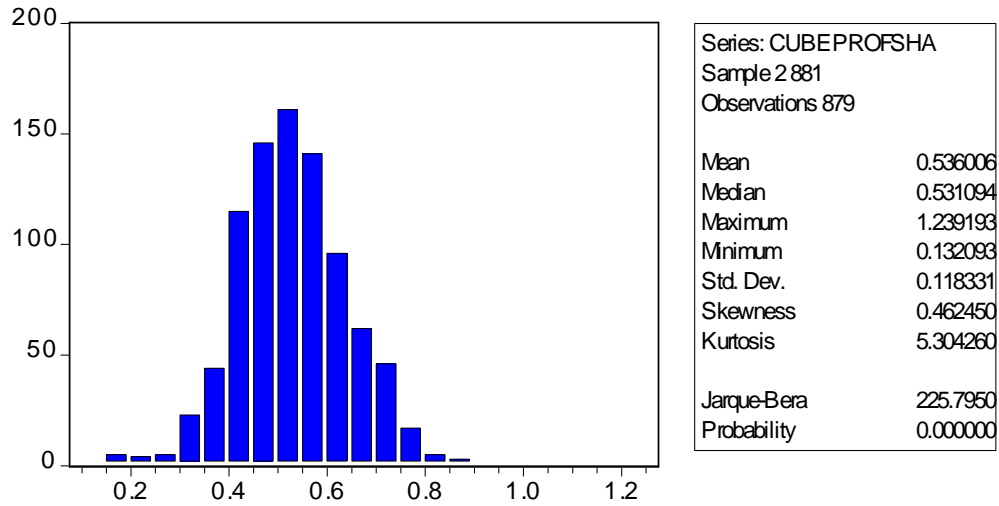
Figure 4 and 5 illustrate that the cubic root transformation has apparently improved the normality of the data's distribution in terms of both skewness and kurtosis. Now, the transformed variables can be used in the regression.

Table 24: White Heteroskedasticity-Consistent OLS Regression with Issuing Firm's Profitability, Age, Price, Offering Methods and Seasoned Offering

(Note: In parentheses are the student t-statistics; *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 655.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	2.7514 (12.7007***)
CUBEPROFSHA	-4.8508 (-14.3678***)
AGE	-0.0005 (-0.1684)
LNPRICE	0.4565 (5.4245***)
FIX	0.3194 (2.9474***)
SEO	-0.0562 (-0.7894)
R-squared	0.3500
Adjusted R-squared	0.3449

Hypothesis 7: Table 24 shows that the regression coefficient of the profitability **CUBEPROFSHA** is negative (-4.8508) exactly as we expected. Chapter 6 has addressed that, since the cubic root is the increasing function of the original variable it will have the same sign as the original variable in a linear regression. That is to say, the issuing firm's profitability is negatively related to the IPO initial return. Furthermore, we cannot reject the null hypothesis at 99% confidence level according to the t-statistics (-14.3678). The result agrees with Su and Fleisher's (1999) finding.

Hypothesis 8: The age of the issuing firm at the time of IPO, **AGE**, is again negatively (-.0.0005) related to the IPO initial return. However, the factor seems to have only marginal impact on the IPO initial return. Meanwhile, the t-statistic (-0.1684) is not high. Similar result about the firm age is commonly found by almost all

Chinese IPO researchers.

Hypothesis 9: The test of hypothesis 4 already shows that the lottery winning ratio is negatively related to IPO initial return at a 99% confidence level (see table 11). Koh and Walter's (1989) method of ballot allocation test for Winner's Curse hypothesis is fully applicable to Chinese IPOs in this case. The result agrees with Chi and Padgett's (2005) finding about information asymmetry hypothesis.

Hypothesis 10: The regression again shows a positive coefficient (0.3194) for the fixed pricing method, which is consistent with the findings in table 23. With the high significance level of 95%, our hypothesis is fully supported by empirical data. To this extent, Chinese IPO under-pricing can be partly explained by the information revelation theory.

Hypothesis 11: Like the findings in table 23, not only the regression coefficient of seasoned offering dummy variable does not show a positive sign but also its significance level is very low. Hypothesis 11 is not supported by the empirical data, which means the issuing firms that make seasoned offering later seem to be less motivated to use under-pricing to signal their quality to investors.

Hypothesis 12: Table 24 shows that the IPO offer price is positively (0.4565) related to the IPO initial return. We cannot reject the null hypothesis at a 99% confidence level with a high t-statistic (5.4245). For the same reason explained in hypothesis 7, the logarithm transformation should generate the same regression coefficient sign as the original variable. The result agrees with Su and Fleisher's (1999) finding.

10.1.3 Summary

Putting the regression results of hypothesis 7, 8, 9, 10, 11 and 12 together, we can draw conclusion that some hypotheses based on Rock's (1989) "Winner's Curse" model are basically supported by China's data. Test of hypothesis 7 proves that in China, the better performance of the issuing firm can help reduce the information asymmetry between the issuer and investors and hence reduce the cost of issuing in form of IPO under-pricing. Compared to hypothesis 7, hypothesis 8 is relatively weakly supported by the empirical data. But as said earlier, most of Chinese IPO firms are very young with the oldest firm having been founded for less than 3 years (see table 2). All 880 IPO firms are populated within a three-year band. Given such narrow range of firm age, it is not totally surprising to see a relatively weak t-statistic of firm. The test to some degree shows that older firms have better chance to reduce the information asymmetry and hence the IPO under-pricing than younger ones. The test of hypothesis 9 shows that in China, the likelihood of winning a random lottery is negatively related to the IPO under-pricing degree which is consistent with Koh and Walter's (1989) finding in Singapore. The Winner's Curse problem is reduced by the random lottery. Successful test of hypothesis 10 shows that the information revelation hypothesis is strongly supported by the data. It shows that the information asymmetry between underwriter and the investors may have caused the IPO under-pricing. On the other hand, the signaling theory regarding seasoned offering expectation is not supported by the empirical data as hypothesis 11 fails the test. The test of hypothesis 12 is based on Su and Fleisher's (1999) assumption that a higher offer price means a lower profit to the informed investors. From the informed investors' perspective, a high price IPO is equivalently a bad performance IPO. Thus, a higher under-pricing will be needed for uninformed investors. In this sense, the test shows that in China a

higher offer price exacerbates the Winner's Curse problem and hence the IPO under-pricing. In summary, this study finds that the information asymmetry theories especially Winner's Curse hypotheses and information revelation hypotheses are suitable for explaining Chinese IPO under-pricing.

10.2 Ex ante Uncertainty Hypotheses

10.2.1 Model and Variables

Beatty and Ritter (1986)'s ex ante uncertainty theory suggests that the ex ante uncertainty of the IPO firm's intrinsic value is a decreasing function of the firm size. Early chapters have discussed that it is necessary to regard issuing firm's market capitalization and IPO offer size as two different variables in Chinese IPO context. According to hypothesis 13 and 14, the two proxies to measure the ex ante uncertainty are defined as follows:

MKECAP The issuing firm's market capitalization measured in 100 million Chinese RMB Yuan on the first trading day. It is calculated by formula 10.

IPOSZ The IPO offer size measured in billion Chinese RMB Yuan. It is calculated by formula 9.

Chapter 5 has discussed that market condition can also cause ex ante uncertainty at the time of IPO. Davis and Yeomans (1976) et al's theory suggests that the under-pricing is higher in buoyant markets. Proxies of market condition include the average market return and the variation coefficient of market index daily return. According to hypothesis 15 and 16, the two proxies are defined as follows:

MKTRTN The average market return during the time interval from the offer price is fixed to the IPO share really goes to floatation. It is defined by the following formula:

$$MKTRTN = \frac{1}{n}\sum_{n} r_i' = \frac{1}{n}\sum_{i=1}^{n} \frac{P_i' - P_{i-1}'}{P_{i-1}'}$$ (20)

where P_i' is the closing market index on the ith day after the offer price is fixed, and P_{i-1}' is the closing market index on the $(i-1)^{th}$ day after the offer price is fixed. P_0' is market closing index on the day when offer price is fixed. n is the number of days elapsed between the offer price is fixed and the first trading day.

MKTSTDEV The standard deviation of the market daily returns during the period between the day when offer price is fixed and the first trading day. It is used as the proxy of market status and is given by the formula:

$$MKTSTDEV = \sqrt{\frac{\sum_{i=1}^{n} (R_i' - METRTN)^2}{n-1}}$$ (21)

where R_i' is i^{th} day market return and n is the number of days elapsed between the offer price is fixed and the first trading day.

Both the average market return and the coefficient of variation of market index daily return are measured in the same time interval for the same IPO, i.e. from the specific IPO's offer price is fixed to the first trading day. From the definitions of the two market status proxies, it is clear that **MKTRTN** and **MKTSTDEV** together measure

how the market behaves when the IPO goes public in terms of the average market

return and market volatility during the specific IPO period.

The regression model is modified as follows:

Model 6:

$$MAAR_i = \alpha_0 + \alpha_1 \times MKECAP_i + \alpha_2 \times IPOSZ_i + \alpha_3 \times MKTRTN_i$$

$$+ \alpha_4 \times MKTSTDEV_i + \varepsilon_i \qquad (22)$$

The ex ante uncertainty hypothesis indicates that the two proxies of the issuing firm's

market capitalisation and offer size, contribute negatively to the ex ante uncertainty

about the intrinsic value of the new share. Consequently the under-pricing, the

premium to compensate for the ex ante uncertainty, ought to be negatively related to

the issuing firm's market capitalisation and offer size. In turn, both regression

coefficients α_1 and α_2 should be negative. Under the assumption that the under-

pricing is higher in buoyant market due to investors' expectation of higher return and

ex ante uncertainty is higher in more volatile market, the two market condition

proxies should be positively related to the IPO initial return, which is reflected by

positive α_3 and α_4.

10.2.2 Analysis and Results

The descriptive statistics of issuing firm's market capitalisation **MKECAP** and offer

size **IPOSZ** have been demonstrated in table 2 in chapter 6. The two variables again

are not normally distributed. Natural logarithm transformation is applied to both

variables. The table also shows that the two variables apparently have different

distributions, which justifies the earlier statements that the issuing firm's market

capitalisation and offer size should be treated as two separate proxies as opposed to Chi and Padgett's (2005) method. The descriptive statistics of the average market daily return and variation coefficient of market return are displayed in the following table.

Table 25: Descriptive Statistics of Average Market Return and Market Variation

Stats/Variables	MKTRTN	MKTSTDEV
Mean	0.086659	1.798341
Median	0.015000	1.495000
Maximum	2.390000	5.710000
Minimum	-2.810000	0.330000
Std. Dev.	0.515775	1.022527
Skewness	0.400988	0.941378
Kurtosis	5.794757	3.361389
Observations	880	880

Table 25 shows that in general, Chinese IPOs normally go public in a relatively buoyant market with an average market daily return (8.6%) during the IPO periods, and in a relatively volatile market with the mean variation of the market daily return is also high (179.8%). But compared to other explanatory variables in table 2, the two market condition proxies have much less severe non-normality problem in terms of much smaller skewness and excess kurtosis. In fact, the original variables of the two proxies are used in the regression. The results of the regression are presented in the following table.

Table 26: White Heteroskedasticity-Consistent OLS Regression with Ex Ante Uncertainty Proxy Variables

(Note: In parentheses are the student t-statistics; * stands for 10% significance level and *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 880.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	1.3828 (5.5491***)
LNMKECAP	-0.2863 (-1.8608*)
LNIPOSZ	-0.6661 (-3.3837***)
MKTRTN	0.0804 (1.6378*)
MKTSTDEV	-0.0764 (-2.9398***)
R-squared	0.1616
Adjusted R-squared	0.1578

Hypothesis 13: When the issuing firm's market capitalisation is used as a proxy of firm size, the regression in table 26 shows that it is negatively (-0.2863) related to the IPO initial return. The t-statistic is significant at 90% confidence level. The null hypothesis of hypothesis 13 cannot be rejected at 10% significance level based on the data.

Hypothesis 14: At the same time, the table shows that when IPO offer size is used it is negatively (-0.6661) related to the IPO initial return. The null hypothesis of hypothesis 14 cannot be rejected at 99% confidence level. The result agrees with Yu and Tse's (2003) finding.

The satisfactory test results of hypothesis 13 and 14 firmly prove that the IPO initial return is reduced with larger firm size. Because the firm size is a proxy of ex ante uncertainty, China's data reveals that larger issuing firms are likely to suffer less from the IPO under-pricing due to reduced ex ante uncertainty about the issuing firm's quality.

Hypothesis 15: The regression result shows that the average market return since the offer price is fixed is positively related (0.0804) to the IPO initial return. The null hypothesis of hypothesis 15 cannot be rejected at 90% confidence level. Generally speaking, Davis and Yeomans (1976) et al's theory claims that the under-pricing is higher in buoyant markets. Successful test of hypothesis 15 gives empirical support to theory, because it shows that when average market return is higher the IPO initial return tends to be higher as well. The result also agrees with Yu and Tse's (2003) finding in the Chinese IPO context.

Hypothesis 16: The test result of hypothesis 16 is surprising. According to the hypothesis, a positive regression coefficient is expected because in a more volatile market there ought to be more ex ante uncertainty about the intrinsic value of the new share. A higher IPO under-pricing is hence demanded by investors to compensate for such ex ante uncertainty. But China's empirical data seems to tell a different story by showing a negative although small regression coefficient (-0.0764) of the market standard deviation. And this negative regression coefficient is significant at a 99% confidence level.

10.2.3 Summary

Ex ante uncertainty hypothesis is essentially a variation of information asymmetry hypothesis. The ex ante uncertainty is caused by the asymmetric information between the issuing firm and the investors. When investors do not have access to sufficient information, they will make their decision relying on certain publicly known information such as firm size. Their decision is also frequently affected by the market conditions before the IPO. When market is bullish, the investors will require higher return to compensate for potentially higher opportunity cost of giving up cash to the IPO investment. If the market is volatile, the investors will also expect a higher return from the IPO to compensate for a higher risk. Both requirements are reflected in a higher IPO initial return.

Hypothesis 13 and 14 are based on the assumption that larger firm size or market capitalisation will help reduce the ex ante uncertainty. The test shows that the two hypotheses stand in Chinese IPO context. But when coming to market condition hypotheses, empirical tests give mixed signals. The average market return seems to be a good explanatory variable in the regression according to the test result of hypothesis 15. But on the other hand, China's data surprisingly shows that in more volatile market investors seem to require less from the IPO initial return. Although emerging Chinese stock market is generally more volatile than most developed markets, the result that contradict common sense needs more investigation especially when the result has very high statistic significance.

In summary, ex ante uncertainty hypothesis is generally supported by empirical data. The exception is that the variation coefficient of market return appears to move in the opposite direction to the IPO initial return which contradicts assumption laid out

according to the ex ante uncertainty hypothesis. As pointed out earlier, ex ante uncertainty hypothesis is derived from information asymmetry theories. Last section has illustrated that information asymmetry is suitable for explaining Chinese IPO under-pricing. Taking into account the test results of this section, the conclusion can be drawn that information asymmetry hypotheses in broad sense provide useful insight into Chinese IPO under-pricing.

10.3 Behaviour Hypotheses

One testable behaviour hypothesis in Chinese IPO context is the information cascade or bandwagon hypothesis. It is assumed that the information about the quality of the new share is passed on from investors who have bought the IPO share to later investors. When more and more investors demand for an IPO share, it is going to form a so-called positive bandwagon effect. It possibly indicates that the IPO is under-priced. The negative bandwagon effect, on the other hand, indicates the IPO is possibly over-priced.

Empirical study from Amihud, Hauser, and Kirsh (2001) reveals that IPOs tend to be either undersubscribed or hugely oversubscribed with very few moderately oversubscribed. For this reason, it is possible to use subscription proxies to measure the bandwagon effect and in turn capture the characteristics of IPO under-pricing. As said earlier, because the lottery winning ratio is a good proxy of subscription rate it is possible to use the lottery winning ratio to measure the bandwagon effect. A lower lottery winning ratio means a higher oversubscription rate. A higher oversubscription rate indicates a higher positive bandwagon effect. In turn, a higher under-pricing is

expected. Hypothesis 17 is thus set up, predicting a negative relationship between the lottery winning ratio and the IPO initial return.

Hypothesis 17 is exactly the same as hypothesis 4 and 9, because the lottery winning ratio has already been used as proxy to measure imbalance between supply and demand of new shares in speculation effect hypothesis and to measure the ballot allocation ratio in information asymmetry hypothesis. Since the test result of the hypothesis is already shown in chapter 7, only the implication of the test result will be discussed here. Table 11 in chapter 7 shows that the lottery winning ratio is negatively (-0.3031) related to the IPO initial return. Moreover, the null hypothesis cannot be rejected at a 99% confidence level. The result agrees with Liu's (2003) finding about bandwagon.

In other words, the empirical test shows that the more severely the IPO is oversubscribed, the more possibly that the IPO is under-priced. If the oversubscription indicates a positive information cascade or bandwagon effect, then it is equally to say that Chinese IPO under-pricing is positively related to the bandwagon effect. In summary, Chinese IPO under-pricing can be partly explained by the behaviour hypothesis, more specifically, the information cascade or bandwagon hypothesis.

This chapter has so far tested some existing classical hypotheses. The empirical data generally supports the classical hypotheses. However, the variation coefficient of market index return has an opposite regression coefficient sign to the hypothesis. The result poses a good question for future research.

Chapter 11 Data Analysis – China-specific Hypothesis, Privatization and Political Motives

This chapter is going to test some existing China-specific hypotheses. In general, these hypotheses are based on unique characteristics of China's stock market, most of which have been introduced in chapter 2 and 4. As discussed in literature review and hypothesis setting chapters, the word "China-specific" may not properly reflect the nature of some of these hypotheses. For example, Mok and Hui (1998) have described the high government retention rate as the reason of Chinese IPO under-pricing. As a matter of fact, state-owned IPO is not rare case in many markets and therefore government retention is not a unique feature of Chinese IPO's. The reason why Mok and Hui (1998) have put the term "Chinese characteristic" on it is only because China's government retention rate is relatively high. The thesis will follow their convention using the same term "China-specific".

On the other hand, some earlier studies argue that certain factors are really "China-specific". For example, Tian (2003) suspects that the Chinese government uses the different time lengths of IPO listing lag to adjust market cycle and supposedly the long time lag has caused IPO under-pricing. Whereas Chi and Padgett's (2005) predicts that government has tried to capitalize on the market cycle to achieve better IPO issuance. In their argument, the listing time lag is also a concern. Since the IPO procedure is generally standard in many markets, the listing time lag is not seen as an explanatory variable in literatures of other countries' IPO's. Only in China, it is described as a China-specific factor of causing the IPO under-pricing.

As said before, China's IPO process helps the government to disperse the stake shares

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of state-owned enterprises to private sectors, so the process itself is tangled with government's privatization and political considerations. People believe that Chinese IPO pricing is inevitably affected by these factors too. Tests of hypotheses based on these factors will help not only search for all possible explanations of Chinese IPO under-pricing, but also identify whether there is a relationship between government influences and the under-pricing. For example, the employee shareholding appears in many IPO literatures as an explanatory variable for that the employee's possible misgivings about IPO privatization might force the government to compensate them with under-priced IPO's.

11.1 Model and Variables

The general statistics of all the explanatory variables are shown in chapter 7. Therefore, this chapter will discuss directly the implications of the statistics based on tables and results in chapter 7.

Table 2 shows that the average government shareholding rate in the post-issuing IPO firms in China is 46.8%. It is this high government retention rate that some researchers such as Mok and Hui (1998) have ascribed as one of the key determinants of Chinese IPO under-pricing. According to Perotti's (1995) partial sale and government signalling model hypothesis 18 is set to assume a positive relationship between the government retention rate and the IPO initial return.

Another thing that should be noticed in table 2 is that the average time lag for Chinese IPOs between the IPO announcement and the first trading day is about 33 days (0.3324 x 100 days). Although this is not much longer than the normal one or two weeks list waiting time in other markets, the time lag varies significantly in the

sample with the longest observation of more than one year (3.8 x 100 days) and the shortest of only 12 days (0.12 x 100 days). This wide range of listing time lags may hint the possibility of the statement that the time lag is used by the Chinese government as a policy tool to adjust the market cycle as some researchers such as Tian (2003) suggested. In fact some researchers believe that the long listing time lag causes the IPO under-pricing. To examine whether the time lag effect is realistic and whether the government has played the so-called floatation time game, hypothesis 19 assuming that the IPO initial return is positively related to the listing time lag will be tested.

In table 2, the average employee shareholding ratio in the post-issuing IPO firms in China is about 4.11%. The rate is relatively low, but Dewenter and Malatesta (1997)'s theory may be still enlightening in understanding Chinese IPO under-pricing. They advance that the under-priced IPO is used by government as a policy tool to compensate for employees' misgivings about the privatisation. Accordingly, hypothesis 20 assumes that a higher employee shareholding (and potentially higher unhappy employee shareholding) in the IPO firm will lead to a higher IPO initial return and vice versa.

Definitions of above independent variables are as follows:

GOVNT   The size of government shareholding in percentage of the total share volume in the post-issuing IPO firm. It is defined by formula 8.

TIMEIPO   The listing time lag. It is calculated by formula 12.

EMPLYEERATE   The employee shareholding ratio. It is calculated by formula 13.

The regression model is modified as follows:

Model 7:

$$MAAR_i = \alpha_0 + \alpha_1 \times GOVNT_i + \alpha_2 \times TIMEIPO_i +$$

$$\alpha_3 \times EMPLYEERATE_i + \alpha_4 \times MKTCAP_i + \varepsilon_i \qquad (23)$$

According to hypothesis 18, a positive relationship between the IPO initial return and the government retention rate indicates a positive α_1 in the regression. The logic is that the more shareholding the government has in the list firm, the higher possibility the government will intervene with the firm's future operation. Investors would in turn require higher compensation from the IPO reflected by a higher under-pricing. Likewise, a positive α_2 is expected according to hypothesis 19 because the underlying assumption is the longer the IPO is locked after announcement, the higher ex ante uncertainty about the market condition when the IPO really goes to the market. The risk premium of a longer lock-up period between the IPO announcement date and IPO listing date is reflected by a higher IPO under-pricing. Again, hypothesis 20 requires a positive α_3 to stand. The rationale could be explained by Dewenter and Malatesta (1997)'s employee misgiving theory. The more employee holding in the issuing firm, the more likely the government has to compensate for a bigger proportion of employees who have misgivings about the privatisation. Thus, a higher IPO under-pricing is expected.

11.2 Analysis and Results

Table 2 shows that the distributions of above variables are not normal. According to the data transformation criterion discussed in chapter 6, data transformation methods are adopted. Since the original government retention rate has a distribution closer to normal than its transformed variables, the original variable **GOVNT** is used in the regression and so is the listing time lag **TIMEIPO**. While natural logarithm is applied to the employee shareholding rate **EMPLYEERATE** and the original variable is replaced by its transformed counterpart **LNEMPLYEERATE**. The white heteroskedasticity-consistent OLS will be used to further deal with the non-normality problem and results are presented in the following table:

Table 27: White Heteroskedasticity-Consistent OLS Regression with China-specific Variables

(Note: In parentheses are the student t-statistics; ** stands for 10% significance level and *** stands for 1% significance level.)

Dependent Variable: MAAR; Method: Least Squares; Included observations: 495.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	1.1884 (7.1920***)
GOVNT	-0.2891 (-1.9511**)
TIMEIPO	0.5931 (1.4136)
LNEMPLYEERATE	-0.0536 (-0.6375)
MKECAP	-0.0007 (-2.1425**)
R-squared	0.0489
Adjusted R-squared	0.0431

The note in table 27 says that there are only 495 observations included in the sample. The main reason for the low volume of observations is that many IPO firms do not

have employee shares at all. As said, the average employee shareholding in Chinese IPO firms is only 4.11%. Therefore, the employee shareholding only occupies a very small proportion of the total share volume in the post-issuing IPO firms in China.

Hypothesis 18: The government retention rate **GOVNT** is negatively (-0.2891) related to the IPO initial return, opposite to what has been expected based on the hypothesis. The t-statistic is significant at 90% confidence level. The test confirms Chi and Padgett's (2005) finding but contradicts Mok and Hui's (1998) result.

Hypothesis 19: The listing time lag **TIMEIPO** has a satisfactory positive regression coefficient (0.5931) as the hypothesis has assumed. But the t-statistic is comparatively low, indicating that the null hypothesis may not be supported by empirical data. The weak test result does not give much support to Tian's (2003) finding.

Hypothesis 20: The natural logarithm of employee shareholding ratio **LNEMPLYEERATE** is negatively (-0.0536) related to the IPO initial return, which is opposite to the hypothesis assumption. But the t-statistic is not significant enough. The result supports Su and Fleisher's (1999) finding.

Generally speaking, the test results of above three hypotheses signal that the China-specific factors, which have been put forward by previous studies as causes of Chinese IPO under-pricing, are not satisfactory in explaining the phenomenon. Especially, the regression shows that the high government retention rate is unlikely to introduce high IPO under-pricing but instead it seems that the IPO initial return on average is reduced by the high proportion of government shareholding. In the

meantime, the employee privatisation misgiving is trivial in the Chinese IPO context according to the test.

11.3 Summary

The characteristics of China's stock market such as high government retention rate and long listing waiting time have been proposed by earlier researchers as causes of the severe under-pricing of Chinese IPOs. Chapter 4 has pointed out that in the Chinese literatures the empirical tests of hypotheses based on these China-specific factors have produced inconsistent results. Consequently, the debate of the real impacts of these factors on the Chinese IPO under-pricing is still going on. Meanwhile, as many Chinese stock market characteristics are believed to be brought about by the government, people claim that the government's influences have entered the IPO pricing process through these China-specific factors. This chapter therefore goes through the existing hypotheses, trying to clarify the debates and find out the real influences of these factors. After the empirical test, the thesis finds that the existing China-specific hypotheses are not fully supported or even opposed by the market data.

Specifically, the thesis finds that the high government retention rate does not contribute positively to the IPO initial return but instead the bigger government shareholding seems to make the issuing firm better off by reducing the under-pricing cost. Recalling that in chapter 8 the government protection appears to reduce the IPO under-pricing too, it is interesting to continue search for the real impacts of government participation in the issuing firm's capital structure and government intervention in the issuing firm's business. Although Chi and Padgett (2005) claim that negative link between government retention and IPO initial return means the

privatization is welcomed by the investors, the contradiction to the classical government hypotheses may deserve future research.

Secondly, the listing time lag again only has relatively weak link to the IPO initial return although it does show a positive contribution to the IPO initial return. In this sense, claims about the listing time lag effect from earlier studies have is not fully supported by current empirical dataset. Chapter 4 has pointed out that some researchers believe the Chinese government plays a so-called floatation time game to adjust market cycle by letting long listing time lag IPOs go floatation in bearish market and short listing time lag IPOs go floatation in bullish market. This hypothesis is based fundamentally on the assumption that the listing time lag has a significant positive impact on the IPO initial return, which according to above test cannot be convincingly accepted. In result, this thesis finds that the floatation time game hypothesis is not supported by the empirical data. The government has not manipulated the IPO process in such way according to statistic result.

It is not surprising to see an insignificant link between the employee shareholding and the IPO initial return. Empirical data shows that the employee shareholding in Chinese issuing firms is on average very small. As said before, the management shareholding is not that common either in Chinese issuing firms as in the western countries. Nearly half of the issuing firms in the sample of this study do not have employee shares at all. Even if the firm does allocate employee shares the post-issuing firm is still largely controlled by the state through high percentage of government retention. For this reason, the IPO process may not affect the employees too much and employee misgiving about the change of the firm's capital structure is

not that significant as in full scale privatisation. Or even if there are some misgiving feelings, the data shows that the government has not used or does not want to use the under-priced IPOs to compensate for the employees' bad feelings. After all, the Chinese government has little concern about being voted out as the country is ruled by the sole party, even if the government may have to worry a little bit about the impact of the employees' misgiving feelings to the social stability.

In fact, the last point may raise a very interesting question in the IPO literature in general. Political motivated IPO under-pricing is already predicted by many earlier researchers as a classical factor. However, in a country ruled by dictatorship some normal assumptions of political motives may collapse. Based on the data, this thesis would claim that employee misgiving or election related political motives are not sensible in Chinese IPO literature. The claim would be the first in the Chinese literature.

Chapter 12 Data Analysis – An Overview of Model and Other Issues

Now that the hypotheses set in chapter 5 have all been tested, it is time to take an overview out of the box. How will the alternative angles emerging from the testing of the three nascent statements help increase the explanatory power of IPO under-pricing model? Is there any other issue that can be looked at after the whole bunch of testing? After answering these questions, the data analysis will have completed its task set out at the beginning of the thesis.

Firstly, let us check how much extra explanatory power the new hypotheses emerged from the testing of nascent China-specific statements has added to the existing models. The following table compares the R-squared and adjusted R-squared parameters of regression equations which employs different set of independent variables. All three regressions are based on the same dataset and are White heteroskedasticity-consistent.

Table 28: Explanatory Power Comparison among Different Models

Models	Nascent China-specific Model	Classical Model	Existing China-specific Model
Observations	873	878	493
Explanatory Variables Used	CUBEPROFSHA	CUBEPROFSHA	CUBEPROFSHA
	AGE	AGE	AGE
	LNWINNINGRATE	LNWINNINGRATE	LNWINNINGRATE
	LNPRICE	LNPRICE	LNPRICE
	LNMKECAP	LNMKECAP	LNMKECAP
	LNIPOSZ	LNIPOSZ	LNIPOSZ
	MKTRTN	MKTRTN	MKTRTN
	MKTSTDEV	MKTSTDEV	MKTSTDEV
	TRNOVER	-	-
	TRNSCTNTAX	-	-
	PROTED	-	-
	-	-	GOVNT
	-	-	TIMEIPO
	-	-	LNEMPLYEERATE
R-squared	0.4934	0.4359	0.4484
Adjusted R-squared	0.4863	0.4308	0.4358

The above table compares the explanatory power of three different sets of independent variables. The first set includes all classical hypotheses factors that proved to be statistically significant in our test and factors that are significant in testing the three nascent China-specific statements. The second set includes only all the classical hypotheses factors. The third model includes all classical hypotheses factors and the three existing China-specific hypotheses factors. The comparatively small observation volume (493) of the third model is still because many IPO firms do not have employee shareholding.

The result is exciting. The third model which adds existing China-specific hypotheses factors to classical model has higher R-squared and adjusted R-squared than the classical hypotheses model, but the difference is small (about 43.5% - 43.0 = 0.5%). By contrast, our final model which adds three new factors from the new hypotheses proposed by this thesis has the highest R-squared and adjusted R-squared, and hence the highest explanatory power. The improvement is significant (about 48.6% - 43.0% = 5.6%). Since the adjusted R-squared has excluded impact from changes of degree of freedom and it better represents the model fitness, the result is very robust. In conclusion, the thesis has found a better model than the existing ones which includes some alternative factors proposed by this thesis.

Last chapter has pointed out that Tian's (2003) floatation game hypothesis is not supported by the empirical data. However, every coin has two sides. Tian's (2003) suggestion might be enlightening in terms of thinking about the relationship between market cycle and the IPO under-pricing. Let us firstly take a look at the distributions of IPO initial return, market cycle and IPO numbers during the sample period.

Table 29: Distribution of IPO Initial Return, Market Average Daily Return and

IPO NO. During the Sample Period

Year	IPO NO.	Mean MAAR	SSE Average Daily Market Return	SZSE Average Daily Market Return	SSE-SZSE Average Daily Market Return
1996	149	1.1252	0.0024	0.0054	0.0039
1997	189	1.4981	0.0014	0.0015	0.0015
1998	95	1.3285	-0.000038	-0.0013	-0.000658
1999	97	1.1287	0.00088	0.00076	0.00082
2000	137	1.5069	0.0018	0.0015	0.0017
2001	77	1.3851	-0.00093	-0.0016	-0.0013
2002	69	1.3257	-0.00067	-0.00058	-0.00063
2003	67	0.7185	0.00048	0.00078	0.00063

The table shows that the average market daily return across the two exchanges is very small compared to the average IPO initial return. This explains why the market-adjusted IPO initial return is not much different from the IPO raw initial return since the market adjustment factor is quite marginal. Let us take a look at a regression based on the table from above table. The dependent variable is the average market daily return that is the proxy of market cycle, and the independent variables are the average market-adjusted IPO initial return and IPO numbers during the year.

Table 30: White Heteroskedasticity-Consistent OLS Regression of Market Cycle against IPO Initial Return and IPO No.

(Note: In parentheses are the student t-statistics; *** stands for 5% significance level.)

Dependent Variable: Average Market Daily Return; Method: Least Squares; Included observations: 8.

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient
C	0.0014 (0.8427)
Mean MAAR	-0.0038 (-2.5893***)
IPO No.	0.000037 (3.1075***)
R-squared	0.7543
Adjusted R-squared	0.6561

The regression shows that the average market daily return is positively (0.000037) affected by the IPO numbers during the year at a 95% confidence level. This could be easily explained by the fact that almost all Chinese IPOs are under-priced, therefore the more IPOs are offered during the year, the more possible that the average market daily return will get higher. However, the average market-adjusted IPO initial return seem to have a negative impact on the market cycle by showing a small negative regression coefficient (-0.0038) at a 95% confidence level.

The result could indicate that the government may have controlled for the number of IPOs instead of IPO listing time lags to adjust market cycle. Chi and Padgett (2003) have suggested that the Chinese government may have tried to capitalise on the market cycle to achieve maximum IPO proceeds and the test of hypothesis 15 has proved this. Either way, the positive relationship between market cycle and IPO under-pricing could give more economic implications to the regulators.

Chapter 13 Findings and Conclusions

Using a Chinese IPO dataset covering the period from January 1996 to December 2003, the thesis has now already tested classical hypotheses, existing China-specific hypotheses and more importantly three brand new hypotheses based on statements about Chinese IPO under-pricing rationale.

Generally speaking, the thesis finds that the existing theories can only partly explain the high degree of China's IPO under-pricing. On the one hand, the information asymmetry, ex ante uncertainty and information cascade hypotheses are largely supported by empirical data. On the other hand, existing China-specific hypotheses pertaining to Chinese IPO characteristics of government retention rate, listing time lag and employee shareholding all fail to stand the empirical test statistically.

A major contribution of this thesis to the empirical study is that three statements about the reason of the China's IPO under-pricing have been hypothesized and tested. With respect to alternative explanations, the thesis finds that the three statements have gained mixed support from the real market data. Especially, the speculation effect is strongly supported by the hypothesis test while the other two are not.

The thesis has not found enough evidence to suggest government involvement in causing the IPO under-pricing despite various statements claim so. In particular, the thesis clears an existing debate by showing that the government does not play a so-called floatation time game. Apart from the empirical test of various hypotheses, this thesis has made some interesting discovery during the hypothesis test. These findings emphasize the need of future study on Chinese IPO under-pricing and may help to

better understand the phenomenon because they apparently contradict existing hypotheses. Reflecting on the proposed contributions to the literature set out at the start, this chapter will summarise all the findings and conclude the thesis.

13.1 Findings

This study has made good progress at some points towards both finding the real causes and clarifying existing debate.

13.1.1 Findings about Nascent China-specific Hypotheses

One main goal of this study is to evaluate some unproved statements. According to these statements, this thesis has tested several brand new hypotheses using brand new proxy variables.

A main factor put forward by this study to explain the Chinese IPO under-pricing is the speculation effect. It is claimed by practitioners that the highly speculative trading in China's stock market has contributed to the high IPO under-pricing. According to the statement, the thesis carries out both direct and indirect investigation of the speculation effect hypothesis. Through the test, the hypothesis proves promising to explain Chinese IPO under-pricing in the sense that there is clearly a strong link between high level of speculation and high level of initial return of Chinese IPOs.

The direct test of the speculation effect hypothesis involves defining proxy variables that can measure or reflect the speculation magnitude. For example, the turnover rate reflects the intensity of the short term speculative trading activities in the first trading day after IPO. The test shows that the turnover rate of the IPO share is positively

related to the IPO initial return, which confirms the effect of such speculative trading on the IPO under-pricing. The second proxy variable is the lottery winning ratio, which measures the imbalance between the new share supply and demand. A fundamental assumption of the speculation effect statement is that China's speculative market is partly due to the high imbalance between the supply and demand of new shares. Following the logic, it is assumed that a lower probability of winning the lottery would mean a higher imbalance between the new share supply and demand and in turn a higher speculation magnitude. Consequently, a higher under-pricing is expected. The test again successfully proves that the lottery winning ratio is negatively related to the IPO initial return.

Meanwhile, an indirect test of the speculation statement involves an event study of a government policy change. The Chinese government once increased the transaction stamp duty tax rate to curb speculation in the market. Under the assumption that the Chinese IPO under-pricing is driven by speculation, this tax rate change would have negatively affected the IPO initial return due to increased speculation cost. The test shows that this government tax policy change does have significantly negative impact on IPO initial return. The importance of the successful test of the tax rate change lies not only in proving the speculation effect but also in indirectly unveiling the government influence on IPO under-pricing.

The speculation effect hypothesis is supported by both direct and indirect tests. However, there is an interesting finding in data analysis. A brand new proxy variable of transaction stamp duty tax rate is introduced for testing the speculation effect based on the whole time series of IPO initial returns in the long run. It is originally assumed

that a higher transaction tax rate means a higher cost of speculative trading. A lower IPO under-pricing is thus expected due to subdued speculation. On the contrary, the test shows that the transaction stamp duty tax rate is positively related to the IPO initial return. The thesis provides two conjectures regarding to this somehow surprising phenomenon. One is that the relatively stable tax rate may not be able to capture the short-term fluctuation characteristics of IPO initial return while the sudden change of the transaction stamp duty tax rate can. The investors' decision to pursue short-term IPO initial return by speculative trading may not be affected too much by the transaction cost in the long run. The second explanation is that the variation of transaction cost due to varying transaction stamp duty tax has already been reflected in the IPO under-pricing. Extra under-pricing is needed to compensate for higher transaction cost and vice versa. However, the real reason of this result is still waiting for future research.

The second statement put to test is the Western Region Development Policy effect. Some claim that in order to encourage investment into companies in less developed western region, the Chinese government may have used the IPO under-pricing as an economic incentive to sweeten the offer and make it more attractive to investors. This study finds that a difference does exist in the IPO initial returns before and after the policy came into place, but the policy itself alone may not have sufficient explanatory power to interpret the difference. The test demonstrates that the Western Region Development Policy is not that influential as claimed by some statements in causing the IPO under-pricing or the government simply has not used the IPO under-pricing to facilitate Western Region Development Policy although it hinted to do so. The

statement about government involvement in causing the western region IPO under-pricing is not supported.

A direct test of the government protection influences on the IPO under-pricing is proposed by this study for the first time. Some have claimed that the government's discriminative attitude towards companies in different industrial sectors may have caused the IPO under-pricing. The thesis finds that the government protection over issuing firms does have a significant influence on the IPO initial return. But opposite to the original hypothesis the test shows that the government protection tends to help the issuing firm reduce the IPO under-pricing. The reason for this phenomenon is not crystal clear yet but it raises a topic for possible further researches. The significant test result at least proves that the government protection has played active role in the IPO pricing process even if it has reduced the degree of the under-pricing. But on the other hand, the test firmly rejects the statement that the government's involvement in terms of discriminative protection has caused the Chinese IPO under-pricing.

13.1.2 Findings about Existing Classical Hypotheses

Another objective of this thesis is to test hypotheses advanced in previous studies. At first, this study finds that the Chinese IPO data has shown general support to the information asymmetry theory but tests fail to prove certain hypotheses within this category. This study finds a significantly negative link between the IPO initial return and the issuing firm's profitability, which is consistent with the Winner's Curse hypothesis. The firm age, however, only has a comparatively weak relationship with the IPO initial return although a correct negative regression coefficient has been found.

Empirical test suggests that the offer price does have a significantly positive relationship with the IPO initial return.

The other two hypotheses that are often tested in the IPO literatures in the advanced markets are information revelation hypothesis and signalling hypothesis. These two hypotheses however are less often tested in Chinese literatures. The thesis explores the difference between fixed pricing and bookbuilding and finds that the information revelation hypothesis does partly explain Chinese IPO under-pricing. The seasoned offering motivated signalling hypothesis however does not stand statistical test. In summary, this study finds that the information asymmetry hypothesis is largely supported by Chinese IPO data.

Secondly, regarding to the ex ante uncertainty theory this study finds that the data is not showing full support. The thesis finds that IPO offer size has a significant negative effect on the IPO initial return, which agrees with the ex ante uncertainty hypothesis. While the investors may care less about the issuing firm's market capitalisation because the test shows it only has a relatively less significantly negative impact on the IPO initial return. The study finds that the average market return since the offer price is fixed is positively related to the IPO initial return, which confirms Davis and Yeomans (1976) et al's theory that IPO under-pricing tends to be higher in more buoyant market. But the test appears to generate a negative regression coefficient for market return standard deviation, which contradicts the ex ante uncertainty assumption that IPO initial return is higher in more volatile market. But very small regression coefficients in the regressions suggest that the market return variation may only have a very small degree of impact on IPO under-pricing. The study has

acknowledged that further study may be needed regarding to this phenomenon. In summary, this study finds that the Chinese IPO under-pricing is also partly explained by the ex ante uncertainty theory.

The lottery winning ratio is also used to test information cascade or bandwagon hypothesis. A negative relationship between the lottery winning ratio and the IPO initial return proves that the Chinese IPO under-pricing may be partly explained by the investors' information cascade too.

13.1.3 Findings about Existing China-specific Hypotheses

Chinese stock market has some unique characteristics which may have influenced the IPO under-pricing. Some previous studies have tried to investigate these characteristics and the conclusion is not decisive. Using more recent dataset, this thesis re-tests hypotheses that are set up according to the China-specific IPO characteristics and the test results are mixed.

As the Chinese stock market is tangled with government influences, some hypotheses are based on the government political motives during the privatization process. High government retention, seen as a typical sign of government partial sale of state-owned enterprises (SOEs) especially in a country in which most of the IPOs are privatisation IPOs, has drawn attentions of early studies. It is believed that higher IPO under-pricing is necessary to compensate for investors' concern of future government interference when a larger government shareholding is possible to conflict with the transfer of the control in the gradual sale. Meanwhile, if the government is seen as an owner of the state-owned enterprise who holds inside information about the issuing

firm then a higher under-pricing signals the firm's quality. In both cases, the IPO under-pricing has full government political motives embedded in the mechanism and the government retention rate should have a positive link with the under-pricing. However, the thesis finds that the impact of government shareholding on IPO under-pricing is not straightforward as the hypothesis suggests. A negative rather than positive relationship shows the real impact of the government shareholding is begging for explanations. The result may indicate what Chi and Padgett (2005) have suggested that the privatization is welcomed by the investors, but the thesis has emphasized the need for future research on the topic.

Another China-specific hypothesis in previous literature is the listing time lag hypothesis. It is assumed that the longer the time lag between the IPO announcement date and the listing date, the bigger the uncertainty about the underlying value of the new share is at the time of listing. A higher IPO under-pricing is required by investors. But this study does not find enough empirical support to this hypothesis.

Around this time lag there is also a debate in the previous literature. Some researchers suggest that the Chinese government uses the time lag as a policy tool to adjust the market cycle, playing a so-called floatation time game. They also claim that this government floatation time game has caused the Chinese IPO under-pricing. For floatation time game assumption to work, the premise is that the time lag should have a significant impact on the IPO initial return, which this study has already statistically proved to be incorrect. The test result proves that the floatation time game is fundamentally flawed in terms of basic underlying assumptions.

Every coin has two sides, this study however finds that the market cycles is affected by both the number of IPOs issued and average IPO initial returns. This may provide good economic implications to the regulator, which means the IPO issuance may be a relatively effective measure for the government to adjust the market cycle.

It has also appeared in previous literature the hypothesis that the government may use under-pricing to reduce the employees' misgivings about privatisation. As most of the Chinese IPOs are privatization IPOs, this theory sounds promising. But this study does not find sufficient evidence to support this hypothesis, suggesting that the Chinese government may not need to do so because the employee shareholdings usually are very small in the post-IPO firm and the voting issue is not a realistic concern for the government.

To summarize, the hypothesis test results and findings of this thesis are all listed in the following table:

Table 31: Summary of Findings and Conclusions

Category of Hypotheses	Underlying Hypotheses	Proxies for Hypothesis Test	Test Result
Nascent China-specific Hypotheses	Speculation Effect	Dummy for transaction stamp duty tax rate change	Significant
		Turnover rate	Significant
		Lottery winning ratio	Significant
		Transaction stamp duty tax rate	Significant but in opposite direction to hypothesis
	Western Region Development Effect	Dummies for the Western Region Development policy change	Not significant
	Government Protection Effect	Dummy for government protection	Significant but in opposite direction to hypothesis
Classical Hypotheses	Information Asymmetry	Profitability	Significant
		Firm age	Weakly significant
		Lottery winning ratio	Significant
		Offer price	Significant
		Dummy for fixed pricing vs. bookbuilding	Significant
		Dummy for seasoned offering	Not significant
	Ex Ante Uncertainty	Market capitalisation	Significant
		Offer size	Significant
		Average market return	Significant
		Variation coefficient of market return	Significant but in opposite direction to hypothesis[45]
	Behaviour Hypothesis – Information Cascade	Lottery winning ratio	Significant
Existing China-specific Hypotheses	Government Signalling	Government retention rate	Significant but in opposite direction to hypothesis
	Floatation Time Game	Listing time lag	Not significant
	Employee Misgiving	Employee shareholding rate	Not significant

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[45] The result is based on the test of ex ante uncertainty hypothesis only.

13.2 Conclusions, Economic Implications and Questions for Future Research

As particularly set out at the beginning, through empirical investigations the thesis seeks to test whether or not there is a government involvement in the Chinese IPO under-pricing.

Like the opening remark from the prestigious *Financial Times* at the beginning of this thesis, various statements in media reports, academic papers and even government archives have indicated that the Chinese government may have played active role in introducing the Chinese IPO under-pricing. In a country of which the industries are transformed from state-owned to partly private and the state-owned enterprises (SOEs) still enjoy dominant market power, it seems that the above statement has drawn broad support from all walks of the financial world. However, this thesis finds that in previous literatures there lack strong and direct evidence to prove that the government really has played such role. The claim is still a claim and few studies have explicitly pinpointed the government influences. Therefore, bearing the task to see whether or not the statement is true, the thesis starts the journey to look for evidence from empirical test. In the end, the thesis finds that the government may have not been directly involved in the IPO under-pricing while some evidence even suggests the opposite that the government influences may have helped reduce the under-pricing.

The above conclusion is firstly drawn from the tests of several brand new hypotheses based on unproved statements that put forward various reasons for Chinese IPO under-pricing. During the test of speculation effect hypotheses, the thesis finds that a direct government transaction tax policy change has notably affected the under-pricing magnitude. The test shows that if the government wants to it does have the

power to directly affect the IPO under-pricing, although the policy change has actually helped cut the IPO initial return. China's speculative stock market, as said, is largely due to lack of investment opportunities. But at the same time, some government policies such as quota system and problematic unit carving out process have contributed to forming this speculative market. In this sense, the successful test of speculation effect hypothesis at least indicates that the government influences may have indirectly entered the IPO under-pricing no matter the government intended so or not. To the same end, the test of lottery winning ratio may have signified the impact of the imbalance between new share supply and demand which is caused by suppressed supply due to government control of issuing. Previous chapters have pointed out that the China's stock market is full of retail investors who care less about fundamental analysis but instead rely heavily on speculative trading to make quick profit. This is largely due to the lack of investment opportunities, government control of new shares and problematic market practices in the country. The finding shows that the IPO under-pricing, particularly in a relatively isolated market like China, may be forced by individual investor pursuing short-term abnormal returns in the secondary market.

The tests of the other two brand new hypotheses of Western Region Development Policy effect and government protection effect explicitly and directly target at government involvement in IPO under-pricing but both failed. Quite surprisingly, the test of government protection effect hypothesis shows that the government's protection upon selected firms may even have helped curb the IPO under-pricing. In both hypothesis tests, the thesis finds that the government may have no intention to under-price its new shares in the issuing firms. These finding suggests that there is a

gap between the practitioners' appreciation and the reality of the government influences. This is not surprising in a market where the government has enormous presence. But as said, in a country in which the government has absolute ruling power, there may be many other cheaper ways than IPO under-pricing for the government to achieve its objectives.

In existing literatures, the most direct tackle of government involvement is from the so-called floatation time game hypothesis. The government is said to have capitalised on the difference of IPO listing time lags and utilize the listing time lag to adjust the market cycle. As discussed in last section, this thesis finds that the listing time lag is not even significantly related to the IPO under-pricing. In this sense, there is no way for the government to use an ineffective tool – the listing time lag – to adjust market cycle at macro level.

In theory, the government retention hypothesis is promising to reveal government's direct involvement in IPO under-pricing. In China, the finding indicates that the government does not use the IPO under-pricing to signal its commitment to the privatisation; either it does not use IPO under-pricing to compensate for investors' concern of conflict of interest due to government shareholding. Since most issuing firms are still controlled by the government after the IPO, the government may be indifferent to both motivations. Or, the result simply indicates what Chi and Padgett (2005) have claimed that the privatisation in China is welcomed by investors, so the government has no need to compensate for investors' concern.

Lastly the thesis has proved that the government does not use the under-pricing to compensate employees who might have misgivings about privatisation, and maybe the government does not even have such objective in mind. After all, the Chinese government has little concern about being voted out by the unhappy SOE employees.

The last two points may have good economic implications to a country that is ruled by dictatorship. As the Chinese communist party is the sole ruling party in China, the normal election or voters' misgiving related political motives for IPO under-pricing in other markets may not work for China's IPOs. This is a quite unique characteristic of China's IPO pricing.

In summary, the thesis finds that the Chinese government has not been directly involved in the IPO under-pricing. It can be assumed that in the privatisation process of a previously highly state-owned economy, the government is like all other issuers who prefer their new shares to be priced as high as possible to maximize the proceeds. But on the other hand, the influence of government policies may indirectly enter the IPO pricing process without the government planning so. The general implication of this thesis to privatisation IPO is that in a country where the government has absolute control of the political issues, the government does not necessarily need to use the IPO under-pricing as an economic or political tool to achieve its goal.

During the hypothesis tests the thesis finds some interesting phenomenon which pose new questions for possible future research. For example, the thesis finds that higher transaction tax rate tends to introduce higher IPO under-pricing. Higher market volatility and higher government retention rate tend to reduce the under-pricing. The

government protection seems to lead to lower under-pricing too. All theses empirical findings are inconsistent with existing hypotheses. To clarify the confusion and deepen our understanding of the puzzling IPO under-pricing phenomenon especially in China's emerging market, the thesis calls for future researches on these questions.

The thesis provides a wide range of economic implications. As said, China's stock market is less efficient than its western country counterparts. The market settings of China render great possibility of information asymmetry between the issuing statement-owned enterprises (SOEs) and investors and between the government-controlled audit agencies and investors, let alone the often distorted information flow in the system. Essentially, that is the reason why the information asymmetry hypotheses are good at explaining China's IPO under-pricing. In the long run, a large magnitude of under-pricing would undermine the market efficiency and adds unnecessary extra costs to the issuing firms trying to raise capital from the primary market. Especially in China where there is literally no corporate debt market and IPO is the only possible channel for firms to raise cheap public funds, the long lasting high IPO under-pricing would in effect drag the economy growth.

From the investors' perspective, the high IPO initial return should not become the major motive for strategic investors. As the thesis has shown, even with the extremely high IPO initial return, there is still huge uncertainty about the issuing firm's long term performance which is exactly the reason why many retail investors have chosen to pursue the short term speculative returns. However, that does not necessarily mean having a high initial return is a bad thing. But instead, what the thesis indicates is that

the long-term investors should be more focused on the fundamentals of the issuing firm and be less worried about the IPO's short term returns.

In order to improve market efficiency, the government needs to improve the oversight of corporate' accounting, auditing and disclosing processes. Given this, the information flow in the market will become more effective and smooth, and the information asymmetry-caused IPO under-pricing will become smaller and smaller in the future. From the government perspective, it should improve the carving out process for SOEs to provide more reliable track records and hence less under-pricing and less cost to the SOEs will occur. Unnecessary and stubborn regulatory rules such as listing quota and PE cap should not be used any more. In fact, these two systems are both abandoned or replaced by more efficient systems such as bookbuilding. This thesis also finds that IPOs are still a good way for the government to shore up the capital market although the cost might be high because statistics show that the market cycle is related to both numbers of IPOs and IPO initial return but the sensitivity is very small. With the development of China's market-oriented economy and financial system, it can be predicted that the government influences will cede to market's invisible hand and China's stock market will become more and more efficient. China's high degree of under-pricing will not be sustainable and will finally decline to the same level as in the advanced market in the future.

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