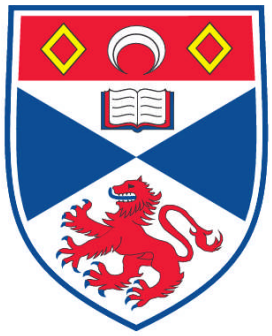
MARKET SEGMENTATION AND DUAL-LISTED STOCK PRICE PREMIUM : AN EMPIRICAL INVESTIGATION OF THE CHINESE STOCK MARKET

Jing Liang

A Thesis Submitted for the Degree of PhD
at the
University of St. Andrews



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Market Segmentation and Dual-Listed Stock Price Premium- An Empirical Investigation of the Chinese Stock Market

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A thesis presented for the degree of Doctor of Philosophy in the School of Economics and Finance, University of St. Andrews

30 September 2009

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Abstract

This thesis comprises, firstly, a careful and detailed description of the institutional workings of the Chinese stock market; secondly, a literature review of the Chinese segmented markets and dual-listed shares price premium; and thirdly, three evidence-based contributions designed to cast new light on the Chinese A-shares premium puzzle. Publicly-listed firms in China, under certain criteria, can issue two different types of shares, namely A-shares and B-shares, to local and foreign investors respectively. These shares carry the same rights and obligations, but are however priced differently due to market segmentation. After a review of the literature on determinants of the premium, the first contribution offers a complementary explanation. I propose that the premium reflects the difference in valuation preferences between the local and foreign investors, i.e., local investors pay more attention to stock liquidity, while foreign investors pay more attention to firm's intrinsic value, and so firms having more favorable fundamentals tend to have lower premia. The second contribution involves the examination of a controversial question that which investor group is better informed about local assets, by testing the direction of information flows between the A- and B-shares markets. Both time series methods, and panel data techniques which are used for the first time in this context, are employed, in order to get a distinct and more insightful picture against the current literature. The third contribution compares and contrasts institutional settings of China, Singapore and Thailand which have similar market segmentation and dual-listing systems; examines whether or not the premia in the three countries are caused by same factors; and tries to answer why foreign investors in China pay less, rather than more, as commonly observed in other segmented markets, for identical assets. It provides the first cross-country comparison evidence after 1999 with updated data.

Keywords: Stock market segmentation, dual-listed shares, Chinese A-shares premium

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CHAPTER 1

INTRODUCTION

1.1 Foreign Ownership Restrictions and Chinese Stock Market Segmentation

Although it has been asserted in the finance literature (e.g., Levy and Sarnat, 1970; Solnik, 1974; Grauer and Hakansson, 1987) that investors should diversify internationally because the risk of their portfolio can be reduced without sacrificing the expected return, the reality is more complicated. Two kinds of capital control are commonly observed in practice: restrictions on domestic investment in foreign capital markets and restrictions on foreign ownership of domestic equity. The first type of restriction refers to different degrees of limitation on capital outflows employed by domestic governments, preventing domestic investors from diversifying overseas. For instance, in South Korea, China, Taiwan and in many other developing countries, domestic citizens may have restricted access to foreign currencies and not be permitted to invest freely overseas. The latter type of restriction refers to the fact that many governments, in both developed and developing countries, often impose limitations on the maximum holding of domestic assets by foreign investors. The main reason behind this policy is that these governments hope to attract foreign investment, while at the same time ensuring the domestic control of local firms, especially those considered as 'strategically important to national interests'. Examples

of the latter type include Brazil where each foreign investor is limited to owning no more than 5% of any company's voting shares; Australia, Canada, Malaysia and Norway, where foreign investors are limited to owning a certain percentage of local firms' shares and the maximum percentage varies among industries; and China, Philippines, Singapore and Thailand, where stock markets maintain separate listings for common stocks: one for locals and one for foreigners (see, e.g., Eun and Janakiramanan, 1986 and Ma, 1996). The research scope of this thesis is the effect of market segmentation on stock prices caused by the second type of investment barrier. Table 1.1 presents selected countries where the local governments impose ownership restrictions on foreign investors.

Table 1.1: Restrictions Imposed on Foreign Equity Holdings in Various Countries

Country	Restrictions on Foreign Ownership
Australia	10% in banks, 25% in Uranium mining, 20% in broadcasting, and 50% in new mining ventures.
Burma	Investment is not allowed.
Canada	20% in broadcasting, and 25% in banks and insurance companies.
Finland	Limited to 20%.
France	Limited to 20%.
India	Maximum of 49%.
Indonesia	Maximum of 49%.
Japan	Maximum of 25-50% in a group of 11 major firms. Acquisition of over 10% of the shares of a single firm requires approval of the Ministry of Finance.
South Korea	Maximum of 15% of the major firms eligible to foreigners for investment.
Malaysia	20% in banks, 30% in natural resources, and a maximum of 70% in other firms.
Mexico	Maximum of 49%.
Netherlands	No restrictions in listed securities. Special permission needed if investment is in unlisted securities.
Norway	10% in banking industry, 20% in industrial or oil shares, 50% in shipping industry, and 0% in pulp, paper, and mining.
Spain	Maximum of 50% with no investment in defence and public information.
Sweden	20% of voting shares and 40% of total share capital.

Switzerland	A local firm can issue either bearer shares or registered shares. Foreigners can hold only bearer shares.

Source: Eun and Janakiramanan, 1986.

However, in a large number of sample countries, dramatic reductions in restrictions on foreign ownership took place during the decade of the late 1980s-90s, due to the need for financial market liberalisation. China still maintains a separate listing system for domestic and foreign class shares today. Chinese publicly-listed firms can issue multiple classes of equities to different types of investors and the Chinese stock market has thus been completely segmented into the domestic shares (which are named A-shares) market and foreign shares (which are named B-shares) market ever since its inception in the early 1990s. The dual-listing market structure meets the need of attracting foreign investment, which was in heavy demand at the beginning of China's Reforms and Opening Up[1] period, while simultaneously keeping in hand the control of domestic industries. This strict segmented structure, where foreign investors can only trade B-shares and local investors are only allowed to invest in A-shares, lasted until 19 February 2001 when the securities-governing authority China Securities Regulatory Commission (CSRC) announced that individual Chinese residents would be allowed to trade B-shares. The opening of the B-shares market marked the prelude to a series of efforts the Chinese government made to bring the Chinese capital market to the outside world; however, even after the 2001 reform, the Chinese stock market is still in a situation of mild-segmentation in terms of foreign

[1] At the Third Plenary Session of the 11th Central Committee of the Communist Party of China (CPC) in December 1978, the Chinese government decided to adopt a series of strategies designed to help China become a modern, industrial socialism nation with Chinese characteristics. It opened a new era in Chinese history and is known as the 'Reforms and Opening Up' to the outside world.

investors still being kept away from domestic investment opportunity sets and the capital control imposed on domestic investors still limits their arbitrage opportunities with the B-shares. This mild-segmentation was then further released to some extent at the end of 2002 when the authorities expressed their willingness to open the former domestic A-shares market to certain qualified foreign institutional investors (QFII) who have permission to participate in the A-shares market[2].

Interesting topics have been raised in the market segmentation context. The phenomenon of price differences between dual-listing equities is certainly one of the most challenging ones and has long been of interest to financial researchers, regulators and policy-makers (Hietala, 1989; Bergstrom *et al.*, 1993; Bailey and Jagtiani, 1994; Stulz and Wasserfallen, 1995; Domowitz *et al.*, 1997; Bailey *et al.*, 1999; Su, 1999, 2000; Bergstrom and Tang, 2001; Chan and Kwok, 2005; Lee *et al.*, 2008). The dual-listing shares are identical in every aspect apart from who can legally own and trade them. Traditional financial theory suggests the value of shares is determined by the expected future dividends flow and the cost of capital. Shares with the same dividends-claim-rights (and so the same future cash flows) would accordingly be priced equally. But when market segmentation exists, a substantial difference is observed empirically in the price of different categories of shares with identical underlying assets. This research is motivated by the challenging puzzle of the price differences of Chinese dual-listed stocks caused by the segmented market structure.

[2] More background information on the market reforms will be discussed in Chapter 2.

1.2 Chinese A-Shares Premium Puzzle

The following Table 1.2 shows the price premium, which is the percentage of the price difference relative to the price of the domestic class shares, in selected markets which have a similar separate listing market structure to China. Among all the selected segmented markets, China is an exception: instead of paying a premium, foreign investors in Chinese shares enjoy a large number of discounts.

Table 1.2: Foreign Premia in Selected Stock Markets

The foreign premium is calculated as: (price of equity available to foreign investors – price of equity only available to domestic investors) / price of equity only available to domestic investors.

Country	Source	Period	Average 'Foreign Premium'
Finland	Hietala (1989)	1984-1985	15-40%
Sweden	Bergstrom *et al.* (1993)	1980-1987	5-68%
Thailand	Bailey and Jagtiani (1994)	1988-1992	5-20%
Switzerland	Stulz and Wasserfallen (1995)	1985-1989	10%-40%
Mexico	Domowitz *et al.* (1997)	1990-1993	4-10%
China	Chakravarty *et al.* (1998)	1994-1996	-60%
Singapore	Bailey *et al.* (1999)	1988-1996	32%

This 'strange' phenomenon has led to investigations of the potential causes of the Chinese A-shares premium (Poon *et al.*, 1998; Su, 1999; Eun *et al.*, 2001; Bergstrom and Tang, 2001; Mei *et al.*, 2005; Darrat *et al.*, 2006) from crossed disciplines, e.g., economics, financial economics, behavioural finance, corporate finance and

management. All these studies tried to look into the premium from their own perspectives and provided their own explanations. A review of the related literature will be provided in detail in Chapter 3.

The Chinese domestic shares premium from March 1992 to February 2007 is calculated and provided in the following Figure 1.1. It can be seen that the premium phenomenon has been present through the entire sample period in both the Shanghai and Shenzhen markets. In the Shanghai market, A-shares were priced two-and-a-half times higher on average than the corresponding B-shares during the entire sample period. The premium was even as high as 1400% around March 1999, suggesting Chinese investors on average paying fifteen times the price foreign investors pay for identical assets. Before the opening of the B-shares market to domestic investors the mean premium ratio was around 386%, while after the reform, from March 2001 to the end of the sample period, it dropped to around 109%, and then dropped slightly further after qualified foreign institutional investors entered the A-shares market. Although it dropped significantly after the partial removal of the ownership constraint in early 2001, the premium continuously appears, suggesting that ongoing supporting factors exist. The premium in the Shenzhen market appeared to be relatively less, but had the same trend. It averaged 148% over the whole sample period with the value of 220% before the 2001 market opening reform, 74% after the qualified foreign institutional investors entered the A-shares market, and 100% in the time period between. Overall, the gap between the price paid by domestic and foreign investors narrowed as restrictions on ownership gradually were released, suggesting 'hard'

market segmentation imposed by government policies is an important reason why such premium exists.

Figure 1.1: Average Price Premium of Chinese A-Shares Over B-Shares

Note: This figure presents the monthly average A-shares premium in Shanghai and Shenzhen stock exchanges respectively, from March 1992 to February 2007. The data is obtained from the Datastream. The average price premium *PRE* is defined as: $PRE_t = \sum_{i=1}^{N} \frac{Pa_{it} - Pb_{it}}{Pb_{it}}$. Pb_{it} has been converted to Chinese currency based on the same-day spot exchange rate at time *t*. Observations contain all the Chinese publicly listed firms which have dual-class shares listed. The number of observations changes through time because of companies listing and delisting.

Besides the variation through time, the premium also varies greatly across firms. The summary statistics of the averaged Chinese A-shares monthly premium over the period of March 1992 to February 2007 is calculated and presented in Table 1.3. SHH stands for stocks listed on the Shanghai Stock Exchange and SHZH stands for those listed on the Shenzhen Stock Exchange. It can be seen that the average premium varies from the minimum 0.21 to maximum 4.70 in the Shanghai market, and that the

standard deviation is as high as 1.26. In the Shenzhen market, the difference across firms is more modest, although still distinct: the minimum is 0.45, the maximum is 3.68 and the standard deviation is about 0.67.

Table 1.3: Summary Statistics of the Chinese A-Shares Premium

	SHH	SHZH
Mean	2.501197	1.675722
Median	2.222562	1.599409
Maximum	4.702727	3.680613
Minimum	0.210292	0.450557
Std.Dev.	1.263658	0.666318

The following Table 1.4 provides information of how the monthly premium is distributed among firms. The sample period is split into three sub-periods based on the two open market reforms. It can be seen in all the three sample periods that large variation has persisted in both exchanges. The distribution also shows that the premium of firms listed on the SHSE is more spread out through the time period, against the premium of the Shenzhen-listed firms which is more clustered.

Table 1.4: Distribution of the Chinese A-Shares Premium among Individual Stocks

a. February 1992 to January 2001

	SHH		SHZH	
Premium	# Firms	Percentage	# Firms	Percentage
100%-200%	2	5%	8	19%
200%-300%	9	22%	15	36%
300%-400%	12	29%	15	36%

400%-500%	7	17%	2	5%
500%-600%	4	10%	1	2%
600%-700%	7	17%	1	2%
Total	41	100%	42	100%

b. February 2001 to June 2003

	SHH		SHZH	
Premium	# Firms	Percentage	# Firms	Percentage
0%-50%	6	14%	0	0%
50%-100%	15	34%	21	50%
100%-150%	18	41%	17	40%
150%-200%	3	7%	4	10%
above 200%	2	5%	0	0%
Total	44	100%	42	100%

c. July 2003[3] to February 2007

	SHH		SHZH	
Premium	# Firms	Percentage	# Firms	Percentage
0%-50%	8	18%	15	36%
50%-100%	14	32%	14	33%
100%-150%	7	16%	11	26%
150%-200%	13	30%	2	5%
above 200%	2	5%	0	0%
Total	44	100%	42	100%

1.3 Research Questions

The thesis involves three pieces of research looking into the price disparity issue of dual-listed shares in the segmented Chinese stock market from three different but

[3] Although the government announced the launch of the QFII programme at the end of 2002, the first transaction was carried out on 9 July 2003 by UBS Warburg.

related aspects. Based on the brief introduction to the Chinese A-shares premium, it is natural to ask generally whether existing factors that explain the dual-listed shares price premium in other countries are applicable in China; why the premium not only varies substantially through time, but also across firms; whether there are any additional factors contributing to the large price disparity; what the premium itself tells us; how the two markets interact with each other; why China is unique in that foreign investors pay less, rather than more, than domestic investors for identical underlying assets; and, given the recent institutional changes initiated by the Chinese government, how the premium is affected by these open market reforms. Motivated by the above thoughts and questions, I have organised this research into three main sections:

A. A complementary explanation of the Chinese A-shares premium - from the perspective of investors' valuation preferences.

   (i) My investigation is constructed on the main hypothesis that besides the 'hard' segmentation, which is caused by the government's institutional setting, the premium is also a reflection of different investors' equity valuation preferences, which I have called 'soft' segmentation. It is documented widely in the recent literature that foreign investors, who are mainly institutional investors, are more rational than Chinese investors, who are mainly individual investors (see, e.g., Chen *et al.*, 2001; Kang *et al.*, 2003; Mei *et al.*, 2005; Chan and Kwok, 2005; Chiang *et al.*, 2008). I hypothesise that instead of being short-run liquidity-driven investors, as the majority of the local Chinese

individual investors may be considered, foreign investors care more about a firm's intrinsic value, and so they would like to pay relatively more for firms whose fundamentals, such as financial leverage, profitability, future prospects, dividend policy, corporate governance and size, are more favourable. Hence, the premium is lower when a firm is backed by better fundamentals, given that other factors are comparable.

(ii) As mentioned earlier, the A-shares premium varies substantially across firms. Prevailing factors that influence the premium which have been put forward by previous studies are mainly market-oriented, for example, the different market liquidities of domestic and foreign class shares, different attitudes held by domestic and foreign investors toward risk, and the different information held by local and foreign investors about the Chinese economy and listed firms; however, the premium has never been looked into from a more microeconomic aspect, e.g., firm-specific characteristics. This research also provides evidence of how firm-specific attributes relate to the premium for the first time.

(iii) The event study of the 2001 open market reform has been well documented in previous research; however, the recent QFII event has never been included in market segmentation studies. Although not as notably as it did around the 2001 event, the premium of the Chinese A-shares reduced after the QFII programme was launched. The belief that foreign investors are more rational was indeed one of the essential considerations when the authority decided to introduce foreign institutional investors into the domestic A-shares market.

The Chinese stock market has been criticised for not operating its capital reallocation function properly, but being flooded with speculation behaviour characterised by liquidity-driven trading. As a result, the capital raised is not allocated to firms which have best performance. Besides being a step towards a free market system where capital can flow freely, the government also hopes the QFII can bring more advanced investment perceptions to the A-shares market and improve the efficiency of the market. This chapter also provides empirical evidence of how the relaxation in market segmentation regulation affected the valuation preference of the local Chinese investors. If the QFII is indeed successful in bringing Chinese investors value investment perceptions, the premium should drop, and the relationship between firm fundamentals and the premium should disappear, or weaken, if the relationship does exist, after the programme been introduced.

B. Interactions/ information flow pattern between the Chinese A- and B-shares markets.

(i) This chapter is motivated by a well-known question in the finance literature: are foreign investors really less well informed than domestic investors about local assets? One of the prevailing explanations of the Chinese A-shares premium, which will be discussed in detail in Chapter 3, attributes the premium to the information asymmetry between local and foreign investors groups and bases the theory on the condition that Chinese investors are better informed about local assets. However, I feel the condition itself is a

controversial argument which needs further consideration. If the condition that local Chinese are better informed regarding local assets does not hold, then it will be more appropriate to understand the commonly used information asymmetry proxy, company size, as a measurement of something else, say, the firm fundamental characteristics proposed in Chapter 4.

(ii) By comparing the extent of market segmentation/ integration in different time periods, this chapter also sheds light on research area concerning the effectiveness of the institutional changes in reducing the segmentation between the Chinese A- and B-shares markets. Previous research suggests since the B-shares market opened to local Chinese individuals in 2001, the linkage between the A-shares market and B-shares market strengthened. I aim to find out how the QFII reform acted in reducing the segmentation as policy designers anticipated. The A- and B-shares markets are supposed to be driven by same forces and there supposedly has been more closely information diffusion between the two markets in the post-QFII period.

(iii) On the econometrics front, besides the popularly used methodologies in previous studies, I make use of the recently developed Toda-Yamamoto (1995) causality test, and panel unit root and panel cointegration tests allowing for heterogeneity in coefficients and dynamics across units, which enable me to discuss the long-run structure of the relationship between the share classes, and a traditional panel causality test, to provide more robust results. The use of panel data techniques in this context is the first in the research field, and provides more comprehensive insight into the topic.

C. Why is China unique in that foreign investors pay less, rather than more, as commonly observed in other segmented markets, for identical underlying assets?

(i) This question has been raised for a long time and mentioned frequently in the existing literature, but as we shall see in the literature review of Chapter 3, has never been resolved satisfactorily. It then makes one ask whether the domestic class shares premium in China and the foreign class shares premia in other countries, which are subject to similar market settings, are caused by the same set of factors; if yes, then why do the same set of factors causes foreign shares premia in other countries, but a domestic shares premium in China; otherwise, the question would relate to a consideration of what is different about the Chinese segmented market compared with other countries. Having these questions in mind, I compare and contrast the institutional setting of China with two other Asian markets, Singapore and Thailand, which are also subject to separate listing system; examine whether the prevailing explanations of the dual-listed shares price premium, namely the differential risks, liquidities, demands and information factors, can explain both the domestic class shares premium in China and the foreign class shares premia in Singapore and Thailand; and propose and test four potential reasons for the opposite Chinese premium. Although subject to many restrictions, it provides the first cross-country comparison evidence after Bailey *et al.* (1999) with updated data.

(ii) The study also enriches the literature on the Singapore and Thai segmented markets. More than 90% of empirical studies in the field of the dual-listed

stocks price premium are conducted with data from the Chinese market, while only a few works concerning other markets were written in the late 1980s and '90s when foreign ownership restrictions were put in place in most of these countries. The majority of these markets relaxed the restrictions on foreign ownership because of the need for global market liberalisation, e.g., Finland relaxed the law concerning foreign ownership in 1993 and all shares have become 'unrestricted' since then. While a couple of them, such as Thailand, Philippines and Mexico, still have kept the system until today. However, no studies of markets apart from China have ever been done with up-to-date data. This chapter provides more updated evidence of the foreign class shares premia in the Singapore and Thai markets.

1.4 Structure of the Thesis

The remainder of the thesis is structured as follows:

An introduction to the background of the Chinese stock market is provided in Chapter 2, including the development of the Chinese stock market, classification of outstanding shares, state ownership structure characteristics, and relaxations in market segmentation regulations. In Chapter 3, related literature on market segmentation and dual-class shares pricing is reviewed in detail, including both overseas and Chinese theoretical and empirical evidence. In particular, four main factors proved in previous studies attributable to the dual-listing shares price disparity are introduced, namely the differential risks, differential liquidities, differential demands and asymmetric

information. The recently raised speculative trading and corporate governance hypotheses are also reviewed.

The three main research sections are then presented in Chapters 4, 5 and 6.

Chapter 4 proposes and examines a new hypothesis via firm specific characteristics: the Chinese A-shares premium is a reflection of the 'soft' segmentation caused by different valuation preferences that local and foreign investors hold, and firms which have better fundamentals tend to have lower premia. Following an introduction in Section 4.1, Section 4.2 discusses how the premium should relate to firm fundamentals measured by financial leverage, profitability, future prospects, dividend policy, corporate governance and size. Section 4.3 describes data sources and selection criterion, and summary statistics. In order to get a more robust result, the relationship between the firm fundamentals and the premium is examined from a variety of angles: in Section 4.4, a dynamic panel data estimation is conducted over 11 years from 1994 to 2004; in Section 4.5, cross-sectional estimations are conducted in three sub-periods, i.e., pre-2001 event, post-2001 event, and post-QFII even; and in Section 4.6, event studies are conducted to find out what fundamental features firms having larger declines in the premia around the events have. Section 4.7 summarizes and discusses.

The existence and extent of the market segmentation and the direction of information flows between the foreign and local shares markets are examined in Chapter 5. Section 5.1 introduces the motivation and reviews related literature. Using time series techniques, i.e., unit root and cointegration tests, Granger causality test, Toda-Yamamoto causality test and impulse response functions, Section 5.2 examines the

long-run price movement between the Chinese A- and B-shares, the direction of information flows and short-run interactions between them. Section 5.3 revisits the long-run relationship and information flows between them using panel data techniques, i.e., panel unit-root and cointegration tests and panel causality test. A summary is provided in Section 5.4.

A cross-country comparison among China, Singapore and Thailand is presented in Chapter 6. Following an introduction in Section 6.1, Section 6.2 introduces and compares the institutional settings in China, Singapore and Thailand. Section 6.3 introduces data source and selection criterion. A preliminary description of the premia in the sample countries is provided in Section 6.4. Section 6.5 examines whether the domestic class shares premium in China and foreign class shares premia in Singapore and Thailand can be explained by same set of factor(s). Section 6.6 raises and examines four possible causes of the opposite premium in China. Section 6.7 summarizes and discusses.

Finally, a conclusion and some evaluation of the contribution in the thesis are presented in Chapter 7.

CHAPTER 2

BACKGROUND ON THE CHINESE STOCK MARKETS

2.1 Introduction

As one of the most successful emerging stock markets around the world, the Chinese stock market has some unique characteristics which are different from any other developed stock markets well documented in finance literature. To better understand the price behaviour of the segmented Chinese A- and B-shares, this chapter aims to provide relevant background information of the Chinese stock markets, based on which analyses and arguments which will be discussed in latter chapters could be made. The organization of this chapter is as follows: Firstly, the development of the Chinese stock markets from a historical perspective will be reviewed in Section 2.2. Section 2.3 introduces the classification of Chinese publicly-listed shares along with a brief comparison among the different classes. A very important characteristic of shares ownership structure in China, state owned non-tradable shares, is introduced in Section 2.4. Section 2.5 discusses recent regulation changes in removing the ownership restrictions and opening the markets.

2.2 The Development of Chinese Stock Markets

It is widely noticed that China's recent history of economic expansion is spectacular among developing countries. Following Deng Xiaoping's reopen-door speech and economic reforms launched in 1978, China's GDP has been consistently achieved double-digit growth. The 11.4% annual growth rate in economic output for the 2007 period even kept China on track to surpass Germany as the world's third-largest economy in 2008[1]. The success of the Chinese government's economic policies has brought China attention from all over the world, both academic and practical, and it has become a referential model for other emerging markets.

The development of the Chinese stock markets has been particularly remarkable. Prior to 1978, China adopted a planned economy system and the entire financial system was controlled by state owned banks. The major, if not the only, source for enterprises' finance was through state-funded direct budgetary grants or government allocated bank credits. During the rapid expansion of the Chinese economy, these traditional channels became a restriction in meeting companies' financing need for further development. The reform of China's stock market, after around one century's abandonment, can be traced back to the early 90s, when the Shanghai Stock Exchange (SHSE) established. This was quickly followed by the opening of the other stock exchange, the Shenzhen Stock Exchange (SZSE) in July 1991. Since then, China's stock market has been experiencing tremendous development. The following Table 2.1 provides a historical perspective of the development of the Chinese stock markets.

[1] Source: National Bureau of Statistics of China.

Table 2.1: Development of the Chinese Stock Markets

Year	Number of Listed Firms	Total Issued Capital (Billion of Shares)	Market Capitalization (Billion of Yuan)	Trading Volume (Million of Shares)	Yearly Transaction (Billion of Yuan)	Opened Accounts (Thousands)
1992	53	6.89	104.81	3795.39	68.13	2166.5
1993	183	38.77	353.10	23422.17	366.70	8351.7
1994	291	68.45	369.06	201333.91	812.76	11077.6
1995	323	84.84	347.43	70547.06	403.65	12941.9
1996	530	121.95	984.24	253314.06	2133.22	24220.8
1997	745	194.27	1752.92	256079.12	3072.18	34802.6
1998	851	252.68	1950.56	215411.00	2354.43	42598.8
1999	949	308.90	2647.12	293238.88	3131.96	48106.3
2000	1088	379.17	4809.09	475840.00	6082.67	61232.4
2001	1160	521.80	4352.22	315228.76	3830.52	68986.8
2002	1224	587.55	3832.91	301619.49	2799.05	68418.4
2003	1287	642.85	4245.77	416308.40	3211.53	69812.4
2004	1377	714.94	3705.56	582773.29	4233.40	72157.4
2005	1381	762.95	3243.03	662373.20	3166.48	73360.7
2006	1434	1492.64	8940.39	1614522.62	9046.89	78540.0

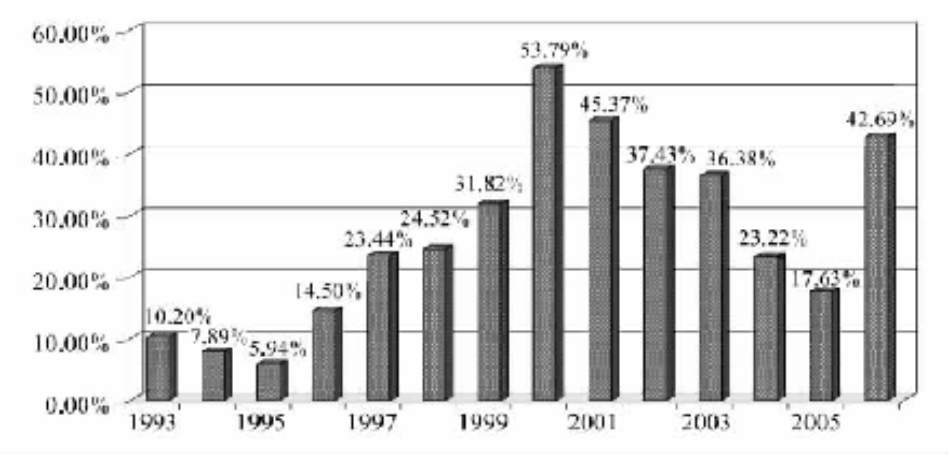
Source: China Securities and Futures Statistical Yearbook, 2007.

By the end of year 2006, the number of listed firms has increased from 53 in 1992 to 1434, and the capital issued has increased from less than 10 billion shares to more than 1400 billion shares. During the same period, the market capitalization has increased to nearly 86 times the initial amount. Market liquidity also has improved greatly: trading volume increased 400 times in 15 years. Yearly transactions expanded rapidly from about 68 to 9,000 billion Yuan from 1992 to 2006, and the number of opened accounts also experienced sustainable growth.

Until December 2006, the year-end market capitalization of both exchanges has reached RMB 8,940.39 billion, which equals 42.69% of the annual GDP. China's stock market has become the third largest in Asia and the ninth largest in the world in

term of year-end market capitalization[2]. The significant success of the Chinese stock markets has attracted the attention of both direct and portfolio investors from overseas.

Figure 2.1: Ratio of Chinese Market Capitalization to GDP



Source: China Securities and Futures Statistical Yearbook, 2007.

Most of the listed companies on SHSE are based locally in the Shanghai area, while those listed on SZSE are mostly based in industrial and commercial cities in inland China (see Su, 2003). The two exchanges are subject to similar trading process and regulations. Both exchanges operate under an auction market environment without market makers. Companies are not allowed to list across exchanges. SHSE and SZSE run their clearing and settlement and maintain their trusteeship under their own systems. They both adopt a non-profit corporate membership system and recruit members nationwide. Only members have the right to enter orders directly into the trading system.

[2] Source: Summary for Chinese Securities Market in 2006, CSRC.

2.3 Classification of Listed Shares

China's equity market began to open to the outside world when the foreign shares market was introduced. In the early stage of the development of the Chinese stock markets, the central government hoped to prevent foreign investors influencing share prices and to maintain domestic control, meanwhile to solve the demand of foreign exchange for domestic enterprises. A separate foreign shares market, B-shares market was therefore established in February 1992, when the Shanghai Vacuum Electronics began issuing B-shares on the SHSE, and this was quickly followed by the listing of the China Southern Glass B-shares on the SZSE on 28 February 1992.

The B-shares are denominated in the Chinese currency, RMB, but traded in foreign currencies: the ones traded in the SHSE are quoted in U. S. dollars, and the ones listed in the SZSE are quoted in H. K. dollars. Dividend payments of the B-shares are also carried out in foreign currencies based on the same-day official exchange rate. According to China's Corporate Law and Securities Law, the A-shares and B-shares are legally identical in terms of their voting power and dividends claim rights, at the same time, B-shares holders bear the same obligation as A-shares holders. The difference between the A-shares and B-shares only comes from who can legally own and trade them. For both types, dual-listing across exchanges is not allowed. By the end of December 2006, there were 1434 companies listed on the SHSE and SZSE, and of which 109 companies issue the B-shares and 86 companies of which have both the A- and B-shares. Companies that have issued foreign shares are usually large enterprises with heavy export orientation so that they have sufficient foreign currencies to implement dividend payments.

Table 2.2 provides a historical comparison of the Chinese A- and B-shares in respect of their number of shares issued, trading and total market capitalization, annual transaction, trading volume, turnover rate and price-to-earnings (P/E) ratio.

Table 2.2: Comparison of Chinese A- and B-Shares

Year		1993	1994	1995	1996	1997	1998	1999
Number of Stocks	SHH_A	101	169	184	287	372	425	471
	SHH_B	22	34	36	42	50	52	54
	SHZH_A	76	118	127	227	348	400	450
	SHZH_B	19	24	34	43	51	54	54
Trading Market Capitalization (Billion of Yuan)	SHH_A	29.44	47.04	49.51	124.71	232.79	284.69	410.99
	SHH_B	12.95	11.66	9.20	16.17	18.56	10.05	13.98
	SHZH_A	38.86	34.35	29.59	126.70	252.82	270.31	382.75
	SHZH_B	4.91	3.84	5.53	19.13	16.27	9.50	13.67
Total Market Capitalization (Billion of Yuan)	SHH_A	206.77	248.35	243.37	531.61	903.25	1052.54	1444.07
	SHH_B	12.80	11.66	9.20	16.19	18.56	10.05	13.98
	SHZH_A	125.10	103.25	87.69	413.24	812.17	877.39	1172.69
	SHZH_B	8.43	5.80	7.18	23.21	18.94	10.58	16.38
Annual Transaction (Billion of Yuan)	SHH_A	226.17	562.67	304.26	902.02	1355.02	1230.42	1682.62
	SHH_B	7.89	10.84	6.08	9.46	21.29	8.19	13.96
	SHZH_A	126.09	237.64	91.60	1203.21	1674.50	1111.35	1422.34
	SHZH_B	2.58	1.62	1.70	18.53	21.37	4.46	13.05
Trading Volume (Billion of Shares)	SHH_A	13.37	63.43	49.45	107.40	116.60	108.54	148.83
	SHH_B	1.37	2.24	1.93	2.79	4.97	4.25	7.21
	SHZH_A	7.55	35.37	18.66	139.09	130.53	100.71	132.15
	SHZH_B	0.37	0.29	0.50	4.03	3.91	1.91	5.05
Turnover Rate (%)	SHH_A	NA	1471.48	630.32	1035.55	758.07	475.55	483.73
	SHH_B	NA	88.04	58.34	74.57	122.62	57.23	116.19
	SHZH_A	464.41	638.39	268.10	1295.32	813.95	396.09	399.09
	SHZH_B	86.80	35.13	37.28	139.26	99.88	34.10	86.63
P/E Ratio	SHH_A	NA	NA	NA	32.65	NA	NA	38.14
	SHH_B	NA	NA	NA	14.04	NA	NA	10.05
	SHZH_A	44.21	10.67	9.8	38.88	42.66	32.31	37.56
	SHZH_B	20.11	7.02	6.01	14.07	10.67	5.71	10.38
Year		2000	2001	2002	2003	2004	2005	2006
Number of Stocks	SHH_A	559	636	705	770	827	824	832
	SHH_B	55	54	54	54	54	54	54

	SHZH_A	451	494	494	491	526	534	579
	SHZH_B	59	56	57	57	56	55	55
Trading Market Capitalization (Billion of Yuan)	SHH_A	814.68	772.61	702.50	779.69	705.06	651.46	1593.39
	SHH_B	33.45	65.61	44.23	40.43	30.03	24.01	49.44
	SHZH_A	737.74	561.88	469.38	450.91	394.79	351.39	779.74
	SHZH_B	22.88	46.22	32.35	46.83	39.00	36.20	77.80
Total Market Capitalization (Billion of Yuan)	SHH_A	2659.63	2693.45	2492.14	2940.07	2571.41	2285.61	7111.80
	SHH_B	33.45	65.61	44.23	40.43	30.03	24.01	49.44
	SHZH_A	2085.94	1531.11	1260.51	1211.98	1059.53	895.45	1699.60
	SHZH_B	30.07	62.06	36.03	53.30	44.60	37.97	79.55
Annual Transaction (Billion of Yuan)	SHH_A	3102.97	1987.68	1644.17	2054.12	2622.93	1906.15	5724.51
	SHH_B	34.42	283.25	51.74	28.29	24.13	17.87	57.15
	SHZH_A	2924.90	1336.52	1070.03	1072.87	1534.69	1203.79	3197.20
	SHZH_B	20.38	223.06	33.10	56.24	51.65	38.67	68.03
Trading Volume (Billion of Shares)	SHH_A	231.09	142.97	169.35	263.26	355.09	392.69	1012.43
	SHH_B	12.68	39.03	8.76	6.01	5.69	5.97	15.97
	SHZH_A	224.71	103.37	116.60	135.96	212.20	254.40	568.43
	SHZH_B	7.36	29.86	6.91	11.07	9.80	9.32	17.70
Turnover Rate (%)	SHH_A	506.33	216.67	208.74	268.58	288.71	290.70	564.50
	SHH_B	145.13	452.26	95.99	64.26	58.29	58.49	149.81
	SHZH_A	496.58	190.30	194.37	219.74	311.78	350.64	671.34
	SHZH_B	115.30	423.47	83.55	138.17	110.04	88.21	154.65
P/E Ratio	SHH_A	59.14	37.59	34.50	36.64	24.23	16.38	33.38
	SHH_B	25.23	43.39	30.61	30.32	20.15	12.40	23.97
	SHZH_A	58.75	40.76	38.22	37.43	25.64	16.96	33.61
	SHZH_B	13.06	25.30	17.51	20.92	12.90	9.11	21.01

Source: Summarized from the China Securities and Futures Statistical Yearbook in various years.

Observations are drawn as following:

a) In contrast to the consistent steady increase of the A-shares, IPO of the B-shares became slow down from 1998; and especially after 2001, the IPO of the B-shares stopped in both exchanges. The long standing liquidity problem of the B-shares and the therefore debate that whether it is necessary to keep the B-shares market possibly is the main reason of this.

b) The market size of the B-shares is much smaller compared with their counterpart A-shares. Through the years, the total trading market capitalization of the B-shares never exceeded 10% of the A-shares' in either exchange after 1997. As of the end of 2006, the total trading market capitalization of the B-shares only accounts for about 3% of the A-shares' in the Shanghai market and 9% in the Shenzhen market. The same observation is found with the total market capitalization. At the end of 2006, the B-shares market size is less than 1% and 5% of the A-shares' in the Shanghai and Shenzhen markets respectively.

c) The yearly transaction of the B-shares has been around 1%-3% of the A-shares' through the time, apart from one exception of year 2001 when Chinese residents rushed into the former restricted B-shares market and pushed up the B-shares transaction sharply. For the year 2001, the B-shares transaction takes up 14% and 17% of the A-shares' in the Shanghai and Shenzhen markets respectively.

d) The B-shares market has suffered from a sever liquidity problem ever since its inception. Apart from 2001, the trading volume of the B-shares only takes percentages ranging from 1% to 9% of the total market trading volume in the rest of the years.

e) At the inception of the Chinese stock market, turnover rate of the Shanghai-listed A-shares was as high as 1471.48%, suggesting a lack of alternative investment vehicles in the Chinese domestic market. Although the turnover rate of the A-shares has been dropping through

the time, the B-shares are consistently much less liquid in all years except 2001. The turnover rates of the B-shares in the post-2001 period increased significantly since more Chinese individuals took part in. The same trend is observed in the Shenzhen market apart from the peak liquidity of the A-shares occurred in 1996 when the market went through an up-trend.

f) Except for the years 1994 and 1995 when the Chinese stock market went through its first bear market, the PE ratio of the A-shares has been consistently higher than the average level in mature markets and even other emerging markets. Given the A- and B-shares are subject to same earnings entitlements, the PE ratio of the A-shares has been consistently higher than the B-shares'. Comparing between the exchanges, the Shenzhen-listed A-shares started to have consistently relatively higher ratios than the Shanghai-listed A-shares from 2001; while the opposite trend is observed as for the B-shares.

In 1993, additional classes of stock were created to facilitate the direct listings of Chinese companies on foreign stock exchanges. They are known as H-shares (listed on the Hong Kong Stock Exchange), N-shares (listed on the New York Stock Exchange), L-shares (listed on the London Stock Exchange), and S-shares (listed on the Singapore Stock Exchange). The H-, N-, L- and S-shares carry the same rights and obligations as the A- and B-shares, but they can only be traded in overseas markets. These overseas shares constitute only a small proportion of a company's shareholding, and are not included in the study of this thesis.

Table 2.3: Comparison of Chinese A-, B-, and H-Shares

		A-shares	B-shares	H-shares
Differences	Trading Market	Shanghai A-shares market Shenzhen A-shares market	Shanghai B-shares market Shenzhen B-shares market	Hong Kong securities market
	Legal Investors	Chinese citizens, corporations and other organizations.	(i) Foreign countries' citizens, corporations and other organizations; (ii) Citizens, corporations and other organizations in Hong Kong, Taiwan and Macao; (iii) Chinese citizens inhabited overseas; (iv) Other investors permitted by the State Securities Committee.	(i) Foreign countries' citizens, corporations and other organizations; (ii) Citizens, corporations and other organizations in Hong Kong, Taiwan and Macao; (iii) Chinese citizens inhabited overseas; (iv) Other investors permitted by the State Securities Committee.
	Quoted Currenci-es	Renminbi	Shanghai market：U. S. Dollars Shenzhen market：H. K. Dollars	H. K. Dollars
Similarities	The rights and obligations of the A-, B- and H- share are identical, including voting rights and dividends.			

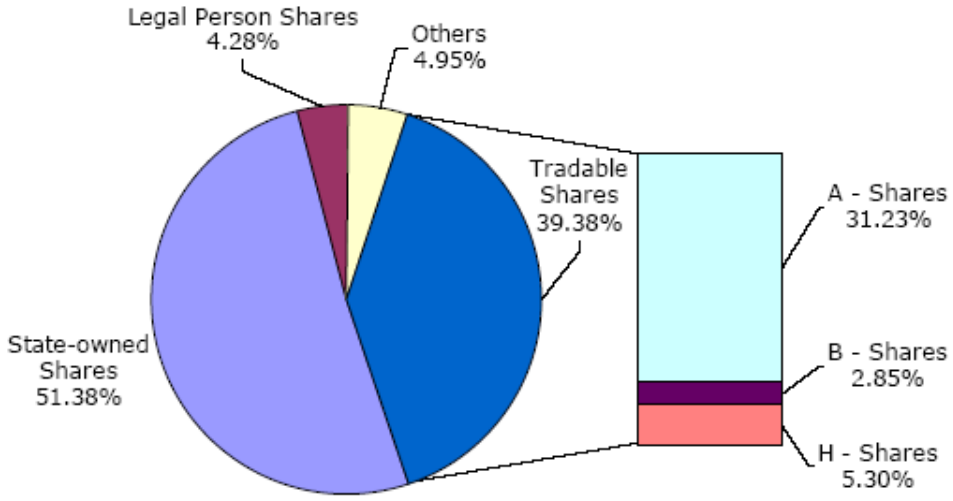
2.4 Non-Tradable Shares

An unparalleled feature of ownership structure of the Chinese stock markets is the presence of non-tradable shares (NTS). Chinese enterprises were run by the state under a planner economy system before the 1980s. Ever since the launch of the privatisation reform, selective previously state-owned enterprises have restructured and have issued shares. In an attempt to preserve control, a large number of outstanding common shares are kept by the government or government agencies. These types of shares are not allowed to be traded on either of the exchange, but can only be transferred privately or through auctions. Concretely speaking, Chinese

domestic shares can be put into four classes, namely, (1) government shares, held by the government through a designated government agency, State Assets Management Bureau (SAMB); (2) legal entity shares, also called restricted institutional shares, held by other state-owned enterprises or other economic entities besides individuals; (3) employee shares, held by managers and employees; and (4) ordinary domestic shares, that is the A-shares. The first three types fall into the category of NTS. The government shares, legal entity shares, and employee shares are initially sold at share's face value, which is the book value of a firm's total assets divided by the total number of shares declared in the prospectus, while the tradable A-shares are typically initially sold through firm-commitment underwriting mechanism with a lottery to allocate shares or throughauction mechanism. Although the NTS are not tradable, the employee shares are allowed to be listed after a three-year lock up period. Again, all the types of the domestic shares are entitled to the same voting rights and cash flow rights.

The following Figure 2.2 provides a perspective of the outstanding shares Chinese publicly-listed firms issued by February 2006.

Figure 2.2: Outstanding Shares by Class (As of February 2006)



Source: Bortolotti and Beltratti, 2006.

The presence of the NTS brings negative effects to the development of the Chinese financial market. For example, it harms market liquidity by reducing supply and pushing up the price of tradable shares since a large fraction of capital was suppressed; it is a major hurdle to market transparency; and it also leads to poor corporate governance. After some failed attempts, in April 2005, the Chinese authorities launched a structural reform programme aiming at eliminating the NTS. The first batch of trial companies started the reform on 19 May 2005. The reform allows shares held by the state and/ or legal person, which were prohibited from public trading, to be floated on the A-shares market after getting the consensus of the existing holders of the A-shares. The reform violates the legal agreement that the holders of the NTS made when companies went for IPOs. In order to make the go-public successful, the

NTS holders offer attractive compensations in forms of cash, shares, and/ or options to the existing A-shares holders. Until the end of 2006, there were only 18 firms from the SHSE and 22 firms from the SZSE which had not finished the reform[3]. Resulting from the successful reform, the Chinese A-shares started to recover from its five-year bearish market. The B-shares market also picked up the steam in early January of 2006 and jumped up 20% in just half a month upon the rumour that the A-shares and B-shares markets may merge after China completes its non-tradable shares reform initiative[4].

2.5 Regulations

In this section, I will briefly introduce some relevant regulations about B-shares listing, and then discuss three major recent regulation changes aiming to reduce/ remove the market segmentation.

The state regulation authority for the securities market is the China Securities Regulatory Commission (CSRC), which supervises stock listing, trading activities and settlement. A company which wants to issue and then list shares must apply for permission from the CSRC. Generally, companies allowed to list the B-shares have to fulfil a greater number of requirements than when issuing the A-shares. In Shenzhen, among a number of additional rules, the return on capital in the year preceding the listing must be no less than 10%; in Shanghai, among other rules, B-shares issuers must have been operating profitably for at least two consecutive years prior to listing. Companies have the B-shares listed are subject to International Accounting Standards,

[3] Source: http://www.p5w.net/stock/news/zonghe/200612/t699718.htm.
[4] See Tong and Yu, 2007.

and are expected to have more rigorous auditing process performed by international accounting firms operating in China.

Individual investors are allowed to hold up to 25% of a firm's B-shares, but the total foreign ownership of a firm cannot exceed 49%.

2.5.1 2001 Open B-Shares Market Reform

As suggested in Table 2.2, the B-shares market has experienced thin trading ever since its opening. This has concerned the government and CSRC for some time. Following the speech of Mr. Tu Guangshao, the President of Shanghai Stock Exchange on 17 April 2000 that the B-shares market would sooner be in the direction of internationalisation, and the announcement of Mr. Dai Xianglong, the Governor of People's Bank of China (PBC) on 16 June 2000 that the difficulty in the B-shares market would soon be solved[5], on 19 February 2001, the CSRC and the State Foreign Exchange Administration Bureau (SAFE) officially announced that domestic investors can open trading accounts for the B-shares, which previously were reserved for overseas investors since its inception 10 years ago[6]. A domestic investor has to open a bank account designated for trading the B-shares. The price of the B-shares jumped significantly immediately after the announcement. The B-shares market was then closed for a week after that and resumed trading on 28 February. Starting then, Chinese nationals with existing foreign currency deposit accounts with a domestic commercial bank were allowed to trade the B-shares. Those who opened a foreign currency deposit account with a domestic bank after 19 February would be allowed to

[5] China Securities, 27 April, 2001.
[6] More detail about the policy is available in the Appendix A.

trade the B-shares only from 1 June 2001 onwards.

The policy is aimed at allowing a relatively huge amount of domestic money enter and improve the activities of the B-shares market. But the purchase of the B-shares can be made only under certain conditions, e.g., a domestic investor has to open a bank account designated for trading the B-shares; foreign exchange in such an account has to be transferred from foreign banks. Although the price of the B-shares increased dramatically following the announcement, given the capital controls in China, there were still not enough arbitrage opportunities between the A- and B-shares markets, thus the price difference between the A- and B-shares still presented itself after the reform. The liquidity of the B-shares market did improve after the reform, however, the policy only made progress on this front in the first few months, after then the Chinese stock market came into a five-year bear market.

2.5.2 QFII Programme

Opening the B-shares market created a new avenue for Chinese domestic investors, however, foreign investors were still kept away from the fast-growing Chinese domestic market. Another important stock market liberalization policy enforced by China in the last decade is the so called QFII programme. To speed up the process of market liberalization, on 7 November 2002, the CSRC and PBC jointly announced the Provisional Measures on Administration of Domestic Securities Investments of Qualified Foreign Institutional Investors (the QFII Provisional Measures)[7]. The QFII scheme permits a QFII to invest in (i) shares listed in the Shanghai and Shenzhen Stock Exchanges (excluding the B-shares), (ii) government bonds listed in the

[7] See the Appendix B for details.

Shanghai and Shenzhen Stock Exchanges, (iii) convertible and enterprise bonds listed in the Shanghai and Shenzhen Stock Exchanges, and (iv) any other financial instruments approved by the CSRC. Only foreign institutional investors, such as fund management institutions, insurance companies, securities companies, and other asset management institutions who satisfy a series of strict criteria and aim at long-run investment could be selected as QFIIs. Acceptable foreign institutional investors who have Securities Investment Licenses from the CSRC, and an invest quota from the SAFE need to deposit their investments which are exchanged into Chinese currency through their designated custodial banks and select qualified securities deals to make their investments. One QFII cannot own more than 10% of shares of one company and one company cannot have more than 20% of its shares owned by QFIIs. Officially acted from 1 December 2002, the scheme opens the door for foreign investors to participate in China's major stock market, the A-shares market. As of 14 October 2004, a total of 25 foreign institutions have received QFII licenses[8] with quotas ranging from $50 million to $800 million, amounting to more than $2.8 billion authorized for investment in the Chinese markets.

Table 2.4: QFII Qualification Criteria

Category of Institution	Operational Track Record	Paid-Up Capital	Assets Under Management	Others
Fund Management Institutions	>5 years	-	>=US$ 10 billion	-
Insurance Companies	>30 years	>=US$ 1 billion	>=US$ 10 billion	-
Securities Companies	>30 years	>=US$ 1 billion	>=US$ 10 billion	-
Commercial Banks	-	-	>=US$ 10 billion	Top 100 ranking in the world on total assets

[8] A full name list of licensed QFIIs as of May 2008 is available in Appendix C.

Source: Yeo, 2003, The PRC Qualified Foreign Institutional Investors Market.

The QFII scheme is considered to be one of the most important stock market liberalization policies enforced by China in the last decade. Chinese authorities wanted the introduction of the QFIIs to help solve problems in the domestic market caused by lack of mature institutional investors. And QFIIs are also considered helpful in improving the corporate governance of listed firms. Experience from Taiwan [9] and South Korea [10] proved that after QFII programmes introduced, the perception of valuing blue chips, firms which return cash flows to investors and firms which concern long-term growth became prevailing, short-term speculation behaviour diminished and huge fluctuations, to some extent, have reduced. Through the introduction of the QFII programme, qualified foreign institutional investors would be attracted to take part in the Chinese domestic market and help establishing and improving the institutional investment culture in the market.

2.5.3 QDII Programme

QDII was initially proposed by the Hong Kong government to introduce mainland capital to the Hong Kong securities market and to attract more international capital, which was significant in helping the Hong Kong securities market get rid of the depression after the Asian Financial Crisis. When the scheme was firstly proposed, the CSRC was enthusiastic in promoting the scheme, while on the other hand, SAFE

[9] The QFII Programme in Taiwan began in 1990 with the issuance of the "Regulations Governing Securities Investment By Overseas Chinese and Foreign Nationals", which set out the basic rules dealing with foreign institutional investment.

[10] Korea announced guidelines for the limited opening up of its securities market to foreign investment in 1991. By 1998, with the exception of certain key industries, full liberalization of all listed securities to foreign investment was complete.

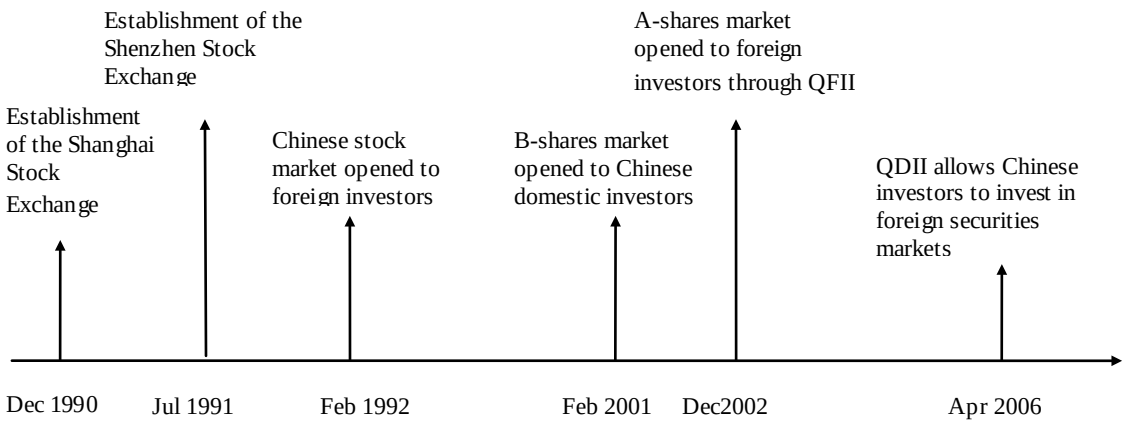
was hesitate due to its concern on the foreign exchange control. On 13 April 2006, the Chinese government finally announced the Qualified Domestic Institutional Investor (QDII) scheme, allowing Chinese institutions and residents to invest in foreign securities markets via certain fund management institutions, insurance companies, securities companies and other assets management institutions which have been approved by the CSRC.

The QDII scheme is considered to have made major progress in reducing the intensity of controls, particularly controls on capital outflow. With the same intention of introducing QFIIs, the QDII scheme is also a transitional system under the condition that the capital account is not completely open. Seeing successful experiences from other countries, policy makers believed that through the scheme, existing Chinese institutional investors could learn advanced skills from foreign investors and gain experience in investing overseas; Chinese individuals could find alternative investment opportunities; to a certain degree, the huge demand pressure of the domestic shares could be released; and the huge unbalance of the capital account could be improved.

Two years after the announcement, granted QDII quotas have reached nearly half billion U. S. dollars, and half of which were targeted the Hong Kong market. However, as the pressure on the appreciation of renminbi grows, the attitude of various government departments is becoming more receptive to the scheme, and the CSRC is becoming more conservative because the scheme might affect the Chinese A- and B-shares markets.

To summarize, the following Figure 2.3 provides a timeline of the major events of the Chinese stock market, including its set up and recent ownership restrictions regulatory changes.

Figure 2.3: Timeline of the Chinese Stock Market



CHAPTER 3

POSITED EXPLANATIONS OF THE PREMIUM IN THE DUAL-LISTED SHARES PRICE

3.1 Introduction

Why are shares owned by different kinds of investors priced differently? There have been various explanations put forward on the issue. Researchers, through studies in both Chinese stock market, which presents a relatively lower foreign class shares price, and other countries whose markets are also segmented but prohibit an opposite premium phenomenon, proposed factors such as, different risk premia required by foreign and local investors (Hietala, 1989; Bailey, 1994; Bailey and Jagtiani, 1994; Ma, 1996; Su, 1999, 2000; Eun *et al.*, 2001; Bergstrom and Tang, 2001; Chen *et al.*, 2001; Chan and Kwok, 2005), differences in general supply and demand conditions of restricted and unrestricted shares (Stulz and Wasserfallen, 1995; Domowitz *et al.*, 1997; Poon *et al.*, 1998; Bailey *et al.*, 1999; Sun and Tong, 2000; Bergstrom and Tang, 2001; Gordon and Li, 2003; Levi and Diao, 2005; Chan and Kwok, 2005; Yang and Lau, 2005), difference in market liquidities of the two segmented markets (Chen *et al.*, 2001; Chan *et al.*, 2002; Karolyi and Li, 2003; Chan and Kwok, 2005), information asymmetry between foreign and domestic investors (Chakravarty *et al.*, 1998;

Bergstrom and Tang, 2001; Chan *et al.*, 2002, 2004; Karolyi and Li, 2003; Chan and Kwok, 2005), speculative trading component (Mei *et al.*, 2005) and corporate governance (Tong and Yu, 2007; Lu, 2005; Darrat *et al.*, 2006), may have significant explanation powers to the price difference of different categories of shares. In order to have a precise picture of the premium between dual-listed common shares, a review of the prevailing explanations to the observed effect of ownership constraints on stock prices will be provided in this chapter.

The remainder of the chapter is organized as follows: Section 3.2 will give a brief review of the differential risk hypothesis which argues that the premium is caused by different risk free rates and different attitudes toward risk between foreign and local investors; Section 3.3 will introduce the differential demand hypothesis which argues that foreign and domestic investors groups have different demand curves to the local assets and the one which is less elastic pays higher price; Section 3.4 introduces the differential liquidity hypothesis which argues that the premium resulted in different liquidities of the two share classes, and investors who can only trade the illiquid class require a lower price as liquidity compensation; a careful review of the information asymmetry hypothesis is provided in Section 3.5, and this hypothesis argues that the premium is caused by unequally information sets foreign and local investors have access to; Section 3.6 introduces other newly proposed hypotheses regarding the premium, including speculative trading hypothesis and corporate governance hypothesis; finally, Section 3.7 summarizes and discusses.

3.2 Differential Risk Hypothesis

Hietala (1989) was the first author to attribute the premium between restricted shares and unrestricted shares to the different risks found by the two investors types. He extended the Sharpe (1964)-Lintner (1965)-Mossin (1966)'s Capital Asset Pricing Model to take into account the restrictions in the Finnish stock market, which, from 1984 to 1986, was partially segmented by means of domestic investors being eligible for both restricted and unrestricted shares and foreigners being limited to unrestricted shares. This market setting parallels the situation of Chinese stock market after February 2001. His one-time period equilibrium asset pricing model implies that for stocks available to both investors groups, i.e., unrestricted shares, the equilibrium price will be determined solely by the demand from one investor group and the stock will appear overpriced to the other investor group. Moreover, the legal restrictions on the ownership will prohibit investors from shorting and thus there will be no pressure toward price revisions. Hietala (1989) pointed out that an unrestricted stock is traded at a premium if and only if the price of the unrestricted stock is determined by foreign investors who require a lower risk premium on this stock than domestic investors do. In a practical way, the model suggests that "the smaller the *beta* of the unrestricted stock calculated with respect to the foreign investors' optimal portfolio relative to the *beta* of the restricted stock calculated with respect to the domestic investors' optimal portfolio, the larger the equilibrium premium". Alternatively, if the risk premium required by foreign investors is higher than or the same as the rate required by domestic investors, the unrestricted and restricted stocks should be traded at identical prices. His empirical test with the Finish data from January 1984 to June 1985

provides supportive evidence to the model: the price premium is positively correlated with the domestic *beta*s while the international betas are insignificantly different from zero.

Bailey (1994) was the first to uncover the Chinese A-shares premium with only preliminary data (two firms from the SHSE and six firms from the SZSE) at the start of the market (1992-1993). He attributed the higher A-shares price mainly to the difference of the returns that domestic and foreign investors required. Firstly, the cost of capital for the A-shares is relatively lower compared with their counterpart B-shares, since the lack of alternative investment opportunities to low-yielding bank accounts for Chinese residents drives domestic Chinese savings into stock investments. Secondly, if B-shares investors are primarily Hong Kong residents [1], Chinese political and economic risks are perceived to be the non-diversifiable systematic risks which cause unrestricted B-shares to be priced lower. However, as the study was carried out quite early, it is not possible to draw strong conclusions given the small sample size covered by the preliminary research.

Both Ma (1996) and later Eun *et al.* (2001) extended the equilibrium international asset pricing model of Eun and Janakiramanan (1986) [2] to propose that the price difference may be influenced by the costs of capital of the two investors groups and investors' attitudes toward risk. In Ma's (1996) model, markets are perfectly segmented, in other words, domestic investors are only allowed to hold the A-shares,

[1] See Bergstrom and Tang (2001), their result also suggests that investors in the B-shares are likely to be active investors in the Hong Kong stock market.
[2] Eun and Janakiramanan (1986) considered the impact of capital outflow to the securities price. In their two-country world model, domestic investors are only allowed to own a limited fraction of the number of shares outstanding from foreign firms. When this constraint is binding, two different prices occur in the foreign securities market.

foreign investors are only allowed to hold the B-shares, and no arbitrage is possible caused by government's regulations. The price ratio of the B-shares and A-shares can be expressed in the form of:

$$\frac{P_B}{P_A} = \frac{r_d}{r_f}\left(\frac{\mu_B - A_F \Gamma_B N_B - A_F \Gamma_{BC} N_C - \delta_B}{\mu_A - A_D \Gamma_A N_A - \delta_A}\right) \tag{3.1}$$

where P_i (i=A, B, C) refers to the vectors of the current prices of the A-shares, B-shares, and foreign shares respectively; r_d and r_f refer to the risk free rates in domestic country and foreign country respectively; μ_i (i=A, B) refers to the vector of the conditional expected value of the end-of-period price of the corresponding shares; A_i (i=F,D) refers to measure of risk aversion of respective investor groups; Γ_i (i=A, B) refers to covariance matrix of the prices of respective shares; Γ_{BC} refers to covariance matrix of the prices of the B-shares and foreign shares; N_i (i=A, B, C) refers to vector of the number of corresponding shares outstanding; δ_i (i=A, B) refers to vector of per share trading costs of corresponding shares.

It is suggested by (3.1) that the price ratio of the B-shares and A-shares is composed by two elements. The first element is the ratio of domestic risk free rate and foreign risk free rate. Intuitively, if the real interest rate in China is very low[3], the lower will be the yield on local bank accounts, the lower the ratio of the B-shares price to A-shares price, and the greater the price premium is. The second element suggests various factors affect the relative price of unrestricted shares and restricted shares, such as liquidities and trading costs of different shares, diversification value of

[3] See Gordon and Li, 2003.

unrestricted shares and investors' attitudes toward risk. Since Chinese investors cannot diversify overseas, their relative smaller investment opportunity set makes them more willing to take on more risk in the A-shares market. Thus, the greater the divergence in risk exposures between the A- and B-shares relative to their own investment benchmarks (Chinese market and world market portfolio returns, respectively), the greater the A-shares premium will be. Their work, up to my knowledge, provided empirically testable foundation for the first time among literature in the Chinese context.

Bergstrom and Tang (2001) investigated several factors, including the effect of information asymmetry between foreign investors and domestic investors, liquidity, diversification value of the foreign class shares, clientele bias, risk-free return differentials between foreign and domestic investors, as well as foreign exchange risks, in the context of cross-sectional and time-series analyses respectively, and provided empirical evidence to the differential risk hypothesis. They pointed out that while diversification benefits offered by the B-shares to foreign investors contribute to the relatively higher A-shares price in China, risk-free return differentials between foreign and domestic investors and foreign exchange risk also play roles in explaining variations in the premium from time to time. However, the constant term from their time series regression was highly negative, suggesting that other factors influencing the time variations were omitted, and a rigorous treatment of which is needed to improve the explanatory power of the model.

Su (1999, 2000) avoided problems in Stulz and Wasserfallen (1995)'s model that not accommodating the Chinese institutional settings by correcting the number of

outstanding shares as exogenously determined variable. By employing international capital asset pricing theory, he provided both theoretical and empirical explanation that why multiple investors pay different prices for domestic firms that issue the A- and B-shares at the same time. Under his model, the difference in prices for the A- and B-shares for the same firm can be expressed in terms of the difference in their expected excess returns:

$$(\mu_{a,i} - r_D) - (\mu_{b,i} - r_F) = \beta_{a,i,M}\gamma_D\sigma^2_{a,M} - \beta_{b,i,M}\gamma_F\sigma^2_{b,M} - \beta_{b,i,c,M}\gamma_F\sigma^2_{c,M} \quad (3.2)$$

where $\mu_{a,i}$ and $\mu_{b,i}$ are the expected returns for stock *i* which can be hold solely for domestic investors and foreign investors respectively; r_D and r_F are the risk free rates for domestic and foreign investors respectively; $\beta_{a,i,M}$ is the A-shares *beta* with respect to the A-shares market return for firm *i*; $\beta_{b,i,M}$ is the B-shares *beta* with respect to the B-shares market return for firm *i*; $\beta_{b,i,c,M}$ is the B-shares *beta* with respect to the international capital market return, which measures the diversification value of the B-shares for foreign investors; γ_D and γ_F are risk aversion coefficients; $\sigma^2_{a,M}$, $\sigma^2_{b,M}$ and $\sigma^2_{c,M}$ are the variances of corresponding markets portfolio returns.

As the A-shares and their corresponding B-shares are subject to identical future cash flow, the difference in their expected returns should be able to explain the difference in prices. The model posits that cross-sectional variations in expected excess returns between the A- and B-shares depend on shares' own market *beta*s and *beta*s with respect to the international equity markets. The lower the A-shares market *beta*, the higher the B-shares market *beta*, or the higher the *beta* of an individual B-shares with

respect to international financial market returns, the higher the foreign investor's required B-shares premium, thus the lower the B-shares price. By testing weekly market data of 47 firms from April 1994 to September 1996, he found that the cross-sectional excess of A-shares over B-shares average return is positively related to the A-shares market *beta*s, as the model predicted, and is negatively correlated to the B-shares market *beta*s with respect to Hong Kong Hang Seng market index. He also found that non-*beta* risk variables, such as the variance of returns and firm size do not appear to systematically affect returns.

Chan and Kwok (2005) asserted there is further evidence in support of the differential risk hypothesis. One of the important factors contribute to the dual class shares difference is that domestic investors may be highly risk tolerant because the Chinese stock market is highly speculative, thus they require a lower expected return, while investors in the B-shares markets are more mature and risk-averse, thus they require a higher risk compensation. Volatility of shares are used as risk proxy instead of *beta*s since previous research suggests that total risk, i.e., variance or standard deviation, is more appropriate to use to measure risk in emerging markets. Their result shows that the variation in the A-shares price premium across firms is positively associated with the volatility of both the A-shares and foreign shares. Therefore, this constitutes convincing evidence that the A-shares price premium is related to risk as perceived by domestic and foreign investors. While in their work, they raised the question "…why the investors are willing to pay a higher price for more volatile stocks", limited alternative investment opportunities available to Chinese investors could be a possible answer to the question.

However, the empirical findings have been mixed. Bailey *et al.* (1999) investigated 11 countries[4] whose stock market has restrictions on foreign ownership, and they found very little evidence that time-varying risk premia and risk exposures vary significantly across the two classes of shares, which suggests the unrestricted shares price premium (or unrestricted shares price discount in China) can hardly be explained by differences in required returns between domestic and foreign market participants. Chen *et al.* (2001) proposed a positive relationship between the A-shares premium and risk levels, which they proxied with the ratio of A-to-B shares return variances, while they did not find empirical support for this hypothesis. Eun *et al.* (2001) found empirical support that the A-shares premium is positively related to the covariance risk of the B-shares with the Morgan Stanley world market index and to the difference between world and Chinese risk-free interest rates, but no evidence of the negative relationship to the covariance risk of the A-shares with the Chinese market index was found. By applying the ratio of *beta*s of the two classes of shares as a proxy of risk differential, Darrat *et al.* (2006) re-examined the risk differential hypothesis with both pre- and post-2001 open market reform data. While the impact of relative risk is consistently positive in the post- period, the panel regression result exhibits insignificant coefficients in the pre- period.

3.3 Differential Demand Hypothesis

The differential demand hypothesis is based on the model developed by Stulz and Wasserfallen (1995). Their theory proposes that the demand functions for domestic

[4] These countries include: China, Indonesia, Korea, Malaysia, Mexico, Norway, Philippines, Singapore, Switzerland, Taiwan and Thailand.

shares differ between foreign and domestic investors in term of price elasticity. Given the assumptions that the firm is a monopolist in the capital market and faces a downward-sloping demand curve for the firm's shares on a risk-adjusted basis and there are no perfect substitutes for the securities, their model suggests:

$$\frac{P_U}{P_R} = \frac{1 - 1/\varepsilon_R}{1 - 1/\varepsilon_U} \tag{3.3}$$

where P_U and P_R refer the prices of unrestricted and restricted shares; ε_R and ε_U are the price elasticities of demands for restricted and unrestricted shares respectively.

In order to maximize market value, the optimum choice for the firm is to discriminate between local and foreign investors. If the price elasticity of the demand from foreign investors is lower than the price elasticity of the demand from domestic investors, then it is optimal for the firm to sell shares at a higher price to foreign investors. In the Chinese case, foreign investors' demand elasticity for local shares may be higher because they have easier access to diversification opportunities.

Domowitz *et al.* (1997) provided early evidence of the suggestion of different demand elasticities. They examined the Mexican market where an individual firm typically issues multiple classes of equity that differentiate between foreigners and domestic traders and even, in the case of financial firms, between domestic individuals and institution. Their result shows that the price premium for unrestricted shares is positively related to proxies for foreign demand and is negatively related to the relative supply of unrestricted shares measured by the ratio of unrestricted to total shares outstanding. The effect of differential liquidities is also examined in their

analysis, while only little evidence of liquidity effects is found in a short-run term. They conclude that the documented premium reflects the relative scarcity of domestic shares, consisting with Stulz and Wasserfallen (1995)'s hypothesis.

The framework on which Domowitz *et al.* (1997)'s work built follows Stulz and Wasserfallen (1995)'s approach but with some modifications according to the nature of Mexico's investment constrictions. One of the modifications also accommodates China's reality. In Stulz and Wasserfallen (1995)'s model, ownership restrictions can arise endogenously because domestic entrepreneurs may choose to price discriminate between the two investor groups, while this assumption is against the reality in both Mexico and China. As firms in China do not have the right of shares issuing but the CSRC does, they may be binding even if they find it is not optimal, especially when a large proportion of outstanding shares are kept by the state for control purposes.

Gordon and Li (2003) and Levi and Diao (2005) took into account of the above limitation into the Chinese case and modified previous studies by taking share supply as endogenous. They developed a general equilibrium framework to show that the A-shares premium is a natural consequence of the Chinese government acting as a discriminating monopolistic stock supplier in the segmented Chinese stock market.

Poon *et al.* (1998) proved the demand curve for equity shares is downward sloping by examining the impact of the initial listing of the B-shares issues on the prices of already listed A-shares.

Bergstrom and Tang (2001) argued that legal restrictions create the segmented market and limit investment opportunities. Thus, domestic investors have inelastic demands

for equity due to insufficient supply, pushing up the price of class A-shares.

Bailey *et al.* (1999) found increased flows of funds into internationally-oriented U. S. mutual funds are associated with larger foreign premium in their mixed countries database, while the case of China remains mysterious.

Sun and Tong (2000) offered another potential path to explaining the seeming anomaly discounts for unrestricted Chinese shares. They reported that the H-shares and red chips markets in Hong Kong provide good substitutes for the mainland of China's B-shares market, so that foreign investor demand for the B-shares is elastic. When more H-shares and red chips are listed in Hong Kong, foreign investors move away from the B-shares market and the B-shares discount becomes larger. Extending the work of Sun and Tong (2000), Yang and Lau (2005) found that the number and trading volume of Chinese firms traded in the U. S.[5] are also significantly negatively related to the A-shares premium, and the substitution effect from these stocks is even stronger than that from Chinese stocks listed in Hong Kong market.

Chan and Kwok (2005) conjectured that the cross-sectional variation in the A-shares premium is related to the relative supply of domestic A- and foreign B- / H-shares. They argued that in a perfect capital market world, asset value would be determined by the price of the marginal risk, and not by the supply of the asset. This is because there are substitutes for every asset in the perfect world, so that there is no scarcity of supply. However, in China, the aggregate supply of stocks is small. A large proportion of stocks is held by government and state-owned enterprises (SOEs). As these shares are not traded on the two official domestic exchanges, the amount of shares floating in

[5] When a firm cross-list in the U. S., it may list use its B-shares through an American depositary receipt (ADR).

the market is a small proportion of the shares outstanding. The insufficient supply of shares in the market, coupled with huge demand by retail investors, fuels speculation and bids up the price of the A-shares.

Darrat *et al.* (2006) employed the ratio of the outstanding B-shares to total outstanding shares to represent the relative demand factor across firms. It appears that the differential demand proxy contributes significantly to the persistent premium.

In a sum, all empirical evidences commonly agree that the A-shares premium in China is rooted in two causes: heavy demand of the A-shares by local investors, and limited supply due to the legal feature of NTS.

3.4 Differential Liquidity Hypothesis

There is extensive empirical evidence on how illiquidity affects security values and hence illiquid securities offer large price discounts (Wruck, 1989; Silber, 1991; Amihud and Mendelson, 1986, 1991; Kamara, 1994; Boudoukh and Whitelaw, 1993; Longstaff, 1995a, 1995b, 2001; Gardiol *et al.*, 1997). According to the differential liquidity hypothesis, the observed price premium is due to the B-shares' lower liquidity and hence higher trading costs. It is said that the A-shares market in China has been consistently and predominantly more liquid and active than the B-shares market given the constitution of the two markets, that the A-shares market is constituted by large retail investors, and the B-shares market consists of a small institutional investor base. In fact, as suggested in Table 2.2, the trading volume of the B-shares never reached 10% of the A-shares' through years.

Chen *et al.* (2001) found that the relatively illiquid B-shares have a higher expected

rate of return and are priced lower to compensate investors for increased trading costs. They computed the relative trading volume and relative turnover (trading volume relative to shares outstanding of the B-shares to the A-shares) and found that both are strongly negatively related to the premium, even after controlling for other factors such as the relative number of shares outstanding (which they related to the differential demand hypothesis), market capitalization and the volatility ratio of B-shares to A-shares. They argued that the A-shares premium is "primarily due to the illiquid B-shares market".

Chan and Kwok (2005) concluded there is evidence in support of the differential liquidity hypothesis which shows that the A-shares premium is positively related to the trading volume of A-shares and negatively related to the trading volume of B-shares. Therefore, the A-shares price premium reflects the difference in liquidity caused transaction cost between domestic and foreign shares.

Darrat *et al.*'s (2006) study showed the liquidity of the B-shares market did get improved in the post 2001 regulation relaxation period and a negative relationship between relative turnover and the premium is also found in both the pre- and post-deregulation periods.

Although the liquidity hypothesis is strongly supported by evidence from the above studies, there are different voices in literature. For example, Odegaard (2000) investigated price differences between different equity classes in the Norwegian stock market and found that liquidity does not seem to be a large factor in explaining price differences. Following Chen *et al.* (2001), Karolyi and Li (2003) did an event study on the 2001 open market reform. By proxying relative liquidity with the ratio of trading

volume in the B-shares over that in the A-shares, they found liquidity does not contribute to the premium decline after the B-shares market opened.

Chan *et al.* (2002) also rejected the liquidity-based explanation in the case of China based on their spread decomposition model. They questioned that usual measures of liquidity, such as bid-ask spreads, are themselves measures of information asymmetry. Rather than using bid-ask spread as other studies normally do, they, following Glosten and Harris (1988), separated out the bid-ask spread into three components: adverse selection cost which reflects information asymmetry, and inventory-holding cost and order-processing cost, which reflect the costs caused by liquidity issue. The result suggests the documented A-shares price premium is better explained by information asymmetry between domestic and foreign investors rather than differential liquidities.

3.5 Information Asymmetry Hypothesis

Differences in information and information-processing ability can also segment investors by nationality. Merton (1987) models the situation where some investors pay a premium for assets which they are more familiar with. French and Poterba (1991) noted that difficulties in generating and interpreting information about foreign securities markets may explain the preference in investing in domestic assets. Brennan and Cao (1997) present a model in which local and foreign investors have different endowments of information about the local stock market.

Many researchers (Chakravarty *et al.*, 1998; Bergstrom and Tang, 2001; Chan *et al.*, 2002) argued that one reason for the large price premium of the Chinese A-shares is that foreign investors have less information on Chinese stocks than domestic investors

do. The information disclosure quality of Chinese firms has been criticized especially in early years, though both local and foreign investors may not be able to get reliable information, local investors may have their own informal channels to get additional information about local economy and firms. Besides, foreign investors may find it more difficult to acquire and to assess information about local Chinese firms, relative to domestic investors, due to language barriers, cultural differences and different accounting standards (Kaye and Cheng, 1992; Sze, 1993). However, there are different views that information asymmetry not works against foreign investors all the time: the superior quantitative skills and experience of foreign institutional investors may give them an advantage in processing information.

Bailey *et al.* (1999) examined 11 countries with China included, and found supportive evidence: good information in the form of a high country credit rating or large firm size is associated with larger foreign premium.

Chakravarty *et al.* (1998) extended the asset-pricing model based on Grossman and Stiglitz (1980) for the case of China that incorporates asymmetric information and market segmentation in a noisy rational expectations framework. Their model predicts that whether cross-listing leads to a premium or discount in trading of the foreign class shares depends on the relative magnitudes of the information asymmetry effect and the diversification effect. The former effect leads to discounts for the B-shares, while the latter effect implies premium for the B-shares. Their theoretical argument also provided a possible explanation to the puzzle that why do foreign shares trade at such large discounts in China, but at premium in other markets. Empirically, a cross-sectional analysis is conducted among 39 dually listed firms on the Shanghai and

Shenzhen stock exchanges. The covariance between A-shares and B-shares returns, the variance of B-shares returns, and the coverage of Chinese companies in the English press are used as measures of information asymmetry, and the test results are consistent with their model predictions.

While applying Chakravarty *et al.* (1998)'s model to more firms (79 firms) and longer sample period (from January 1995 to August 1999), Bergstrom and Tang (2001) suggested that information asymmetry, although significant, does not demonstrate an overwhelming explanatory power. The information asymmetry hypothesis, therefore, should be of little relevance in explaining the A-shares premium.

Chan *et al.* (2002) found that, as expected, higher differences in the adverse selection component lead to higher A-shares premium. Cross sectionally, 43% of the variation in the premium can be explained in this way.

Karolyi and Li (2003) found evidence that foreign investors have less of an information disadvantage than local investors for large firms in China. Examined the event of the B-shares market opened to foreign investors, they found that the decline in the A-shares premium around this regulatory change is concentrated in small capitalization stocks.

Chan and Kwok (2005)'s argued that if there is information asymmetry, then they should observe smaller price premium in companies with higher market capitalization. They used two measures of market capitalization: market capitalization of free-floating shares and market capitalization of total shares in the companies. Based on the market capitalization of free-floating shares, the coefficient of the size proxy is, as

expected, significantly negative, though the coefficient is insignificant when using the market capitalization of total shares as the firm size proxy.

3.6 Other Hypotheses

Besides the above four prevailing explanations to the segmented assets pricing, there are other factors raised recently. A novel approach in examining the A-shares premium is to check for evidence of 'speculative' behaviour of domestic retail investors. Despite firm's fundamentals by which stock price is determined according to classic asset pricing model theory, behavioural finance supporters suggest speculative motive of investors is also an important determinant of stock prices.

Scheinkman and Xiong (2003) used overconfidence, the belief by investors that their opinions are more precise than they actually are, to derive an explicit dynamics for heterogeneous beliefs among investors and a resulting speculative component for stock prices in a continuous-time equilibrium model with risk-neutral investors. Their model shows that cross-sectionally, there should be a positive association between the volume of speculative trading, the size of the nonfundamental component and the volatility of stock prices. Furthermore, Hong *et al.*, (2006) showed that when investors have limited risk-bearing capacity, investors' speculative motives amplify the effect of asset float (the amount of tradable shares) on stock prices. The features of the Chinese stock market provide a prefect opportunity to test their theory. Based on their previous model, Mei *et al.*, (2005) conducted an empirical study using Chinese data. Their empirical statistics showed that the turnover rate of the A-shares is able to explain 20% of the cross-sectional variation in the A-shares premium, suggesting

speculative trading as an important determinant of stock prices.

There is also evidence from Chan and Kwok (2005) that these retail Chinese investors are not rational and the premium can be explained by their speculative nature.

Another alternative explanation to the premium is the corporate governance hypothesis, which is proposed by Tong and Yu (2007) and based on two assumptions. Firstly, corporate governance affects firm valuation; and secondly, the linkage between corporate governance and stock valuation is weaker in the A-shares market than in the B-shares market, in other words, foreign investors pay more attention to a firm's corporate governance practice than Chinese local investors. The second assumption can be viewed as a reflection of the risk differential hypothesis that Chinese local investors are lacking an alternative investment opportunity set, and thus have higher risk tolerance and care less about the effectiveness of a firm's corporate governance. They hypothesized that the A-shares premium phenomenon is driven by the corporate governance quality of the Chinese firms. The corporate governance quality is proxied by ownership concentration in the hands of the controlling shareholder, ineffective boards of directors with higher proportion of directors nominated by the parent company, dividend payout, level of information asymmetry, and institutional ownership. The cross-sectional result showed consistent evidence. Moreover, they found that the average premium increased substantially during the Asian Financial Crisis, a period of heightened concern over corporate governance by foreign investors.

Darrat *et al.* (2006) used floating ratio, i.e., the ratio of tradable shares to firm's total outstanding shares, to measure corporate governance. They argued that firms with less

non-tradable shares face less political pressure from government policies. As a consequence, the firms with higher floating ratios tend to have better corporate governance. They expected foreigners would be willing to pay more for firms with better corporate governance. Their panel regression result confirmed it. Lu (2005), moreover, found supportive evidence that firms with higher A-shares concentration ratio tend to have higher premium.

3.7 Summary and Discussion

The main explanations in the literature of the price premium of stocks with ownership constraints in segmented markets have been reviewed in this chapter, namely the differential risk hypothesis, the differential demand hypothesis, the differential liquidity hypothesis, the information asymmetry hypothesis, the speculative trading hypothesis and the corporate governance hypothesis. All these factors provide paths towards understanding the nature of the price premium in China, and also in other segmented markets. Interestingly, no single hypothesis for the existence of the price premium has come to dominate over others, but different factors, solely or jointly, are shown to be potentially important in unravelling the price difference with different samples. We are left, therefore, without a definite explanation. Attempts of resolving the price premium puzzle have continued and researchers from a variety of different disciplines have been trying to provide possible explanations from different aspects. However, most of the existing possible factors are mainly founded at the market level, and a more micro-based examination, I feel, has not been given enough attention until the corporate governance hypothesis was offered very recently. In the next chapter, I will try to ascertain whether there is empirical evidence to support that Chinese and

foreign investors' different perceptions toward firm fundamentals are contribute to the price premium. This examination will provide a new micro-based evidence of how firm-specific factors relates to the Chinese A-shares premium.

CHAPTER 4

A COMPLEMENTARY EXPLANATION OF THE CHINESE A-SHARES PREMIUM - FROM THE PERSPECTIVE OF INVESTORS' VALUATION PREFERENCES

4.1 Introduction

Have reviewed prevailing explanations of the price premium of dual-listed shares, I will provide a complementary explanation in this chapter. Extensive literature has provided empirical evidence that foreign investors, who most likely are institutional investors, are more sophisticated and show different preference in portfolio choice compared with local investors (see, e.g., Kang and Stulz, 1997; Grinblatt and Keloharju, 2000; Seasholes, 2000; Dahlquist and Robertsson, 2001; Aggarwal et al., 2005). It is indicated by a CSRC report in 2004 that the Chinese A-shares market has been dominated by domestic individual investors, while the B-shares market is mainly comprised of foreign institutional investors. The Chinese stock market had been

closed for almost one century before the new stock market was established in the early 1990s, and it is understandable the individual investors in this market have less experience compared with ones in other worldwide markets with relatively long histories. Also, compared with foreign institutional investors, Chinese individual investors who dominate the A-shares market are lacking a necessary reliable information channel, as well as advanced knowledge and techniques in processing information. Under this circumstance, herd trading, which consequently leads liquidity driven trading, is fairly common behaviour observed from the A-shares market.

In addition, Chinese investors are lacking an adequate investment channel. Before the new Chinese stock markets were established, bank savings[1] and treasury bonds were the only investment instruments available for Chinese residents. Because of the low or even negative real interest rates which resulted in the double-digit inflation in the late 1980s and the existence of only a few alternative investment vehicles[2], the introduction of stocks as a new investment option attracted a great deal of attention. This made the A-shares market the main if not the only place Chinese investors could put their money in besides bank savings. The lack of alternative investments plus inadequate supply of A-shares caused by the large proportion of non-tradable shares owned by the government makes the liquidity driven of A-shares trading more severe.

[1] The gross domestic 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, showing that China maintains one of the highest proportions of income savings in the world.

[2] The bond market and derivatives market in China are still undeveloped and suffered from severe liquidity problem. For example, according to the Financial Times on 1 August 1998, the amounts of issued enterprise bonds from 1995-1997 are 21.6, 26.8 and 25 billion renminbi respectively, which take up only 1.9%, 2% and 1.7% of the total amount of capital companies raised during the time; the trading volume of bonds and derivatives has been less than 0.1% and 0.01% respectively of the A-shares' for years. (Source: China Securities and Futures Statistical Yearbook, 2007)

The inadequate market regulations foster a speculative atmosphere in the stock market. Chinese investors are attested to the desire for quick gains from holding stocks according to a series of media reports. Based on interviews with individual investors, the Financial Times (11 July 1997) reports that interviewees often held shares for less than one month and that they acted on tips from friends, newspapers, and daily stock market programmes on the state-run television. Kang *et al.* (2003) concluded that the "super-speculative environment" in China results from "lack of reliable information on firms, the absolute dominance of individual investors who tend herd among themselves, the rampant market manipulation by syndicate speculators, and the lack of alternative means for building personal wealth". They concluded that trading decisions of A-shares investors are based on sentiment and news from informal sources.

In contrast, foreign institutional investors, who are better equipped and are more exposed to the world stock markets and therefore have more experience, tend to invest following the real value of the underlying assets. They seek the best investment opportunity as they see because otherwise they can always fulfil their diversification requirement from other markets. Chen *et al.* (2001) note that B-shares prices are more closely related to market fundamentals, i.e., common stream of cash flows, while A-shares prices are more likely to be influenced by non-fundamental factors. Chiang *et al.* (2008) also argues that it is reasonable to classify B-shares investors as more likely to be rational traders who focus on economic fundamentals, while A-shares investors tend to act as noise traders.

Following the above background, I will, in this chapter, propose a new hypothesis: besides the 'hard' segmentation caused by the government's segmentation policy, the Chinese A-shares premium also reflects 'soft' segmentation, caused by the different valuation preferences that local and foreign investors hold. Foreign investors are assumed to be more rational than Chinese local investors, and so will care more about firm fundamentals and be more sensitive to changes in the fundamentals. In contrast to the foreign investors, local investors put more weight on a stock's liquidity factor; the limited alternative investment opportunities made Chinese investors unable to care about firm fundamentals as much as foreigners do. As a result, firm fundamentals are expected to be negatively related to the premium. From the time-series perspective, when a firm's fundamental becomes less favourable, compared with foreign institutional investors, Chinese investors react to it less given their limited investment opportunities. The decrease in the A-shares price will thus be more than the decrease in the B-shares price, and the price disparity between the A- and B-shares would then rise. From the cross-sectional perspective, given the market environment Chinese investors faced, they may still accept a high price for those firms with less favourable fundamentals; while foreign investors would only pay a low price for such stocks as they can easily find a substitution in other overseas market. Hence, the less favourable a firm's fundamental is, the larger the difference between its A- and B-shares prices.

This examination also provides a possible path in answering the question that why the premium varies substantially across firms, which was raised earlier in Chapter 1. This chapter can be viewed as an exploratory investigation of the role of firm fundamentals, such as, financial leverage, profitability, growth prospects, dividend payout, corporate

governance and size, which have been suggested both in industrial experience and academic literature to be important in stock valuation, in contributing to the premium.

As an attempt to modernize China's banking and financial systems, the QFII programme is viewed as a tool not only to improve the investment environment in the Chinese domestic market, but also to improve the quality of corporate governance of the listed firms. It is hoped that the participation of QFIIs will bring not just capital, but most importantly, more advanced investment skills and perceptions to the A-shares market. The programme is designed to influence Chinese local investors' investing habits and behaviour, promoting corporate governance within the listed firms, and spurring on more effective functioning of the A-shares market. However, the effectiveness of such a policy, to my best knowledge, still lacks adequate attention. By comparing the effect of the firm fundamentals on the premium before and after the policy change, I will complement, to some extent, research done in the area. Specifically, I will compare the explanatory power of the firm fundamentals to the premium before and after the policy, to see whether the explanatory power dropped after QFIIs entered the A-shares market, as the difference in stock valuation preferences between the A- and B-shares investors should be narrowed. I will also examine whether firms with favourable fundamental indicators tend to have larger decreases in the premium around the QFII programme. The findings can serve as preliminary empirical evidence on the success of the policy and provide hints on future direction of Chinese stock market liberalization.

The remainder of the chapter is organized as follows: Section 4.2 discusses the expected relationships between firm fundamentals and the premium based on the new

hypothesis. Section 4.3 describes the data source, sample selection criterion and summary statistics. Section 4.4 introduces a dynamic panel data estimation technique and provides empirical evidence. Section 4.5 provides cross-sectional evidence before the 2001 reform, which opened the B-shares market to Chinese individual investors, after the 2001 event, and after the QFII programme respectively. Section 4.6 conducts event studies around the market reforms.

4.2 Relationships between the Premium and Firm Fundamentals based on the New Hypothesis

This section discusses the expected relationships between the Chinese A-shares premium and firm fundamentals. The firm fundamentals are measured by six indicators: financial leverage, profitability, growth prospects, dividend payout, corporate governance and size.

H. I. Firms with higher financial leverage tend to be associated with a higher A-shares premium.

Debt-to-equity ratio (D/E) is employed here to measure firm's financial risk. Whatever how the leverage affects firm value[3], the use of debt in companies' financing concentrates

[3] Different opinions exist regarding how the capital structure of a firm influences its value: traditional Modigliani-Miller theorem argues that in an efficient market without any form of friction, a firm's capital structure is irrelevant to its value (Modigliani and Miller, 1958), and it does not matter if the firm's capital is raised by issuing stock or selling debt. Extension of the MM theory takes tax and market forces into consideration and suggests loans provide tax shields, thus the more a company borrow, the lower its weighted averaged cost of capital, and so the higher its value (Modigliani and Miller, 1963; Brennan and Schwartz, 1978; Masulis, 1980, 1983; Long and Maltiz, 1985). Supportive evidence is found with Chinese data (see, e.g., Wang and Yang, 1998, 2002; Liu and Yuan, 1999; Hong and Shen, 2000). Other opinion argues that a firm's financial leverage is negatively related with its value: the increase of debt brings in various costs, i.e., bankruptcy cost, agency cost, hence the value of the firm would decrease (Myers and Majluf, 1984; Titman and Wessels, 1988; Rajan and Zingales, 1995). Supportive Chinese evidence is found by Lu and Xin (1998), Feng *et al.* (2000), Zhang *et al.* (2000) and Lu and Han (2001). Others argue the relationship between a firm's capital structure and its value is not linear but a trade-off of various costs and benefit of debt financing exists: the firm's value increases as the borrowing increases when the financial leverage is relatively low, but decreases when borrowing reaches an optimal level (Kraus and Litzenberger, 1973). The argument is also corroborated by Chinese data (Yan and Chen, 2002).

the firm's business risk on its stockholders. Both in the pricing model and the MM theory (Modigliani and Miller, 1958), borrowing, from whatever source, while maintaining a fixed amount of equity, increases the risk to the investor. It has been demonstrated, both theoretically and empirically, that *beta*, the systematic risk measurement, increases with financial leverage. As Hamada (1972) stated, the effect of financial leverage on *beta* can be expressed as the following equation:

$$b = b_U(1+(1-T)(D/E)) \tag{4.1}$$

where b_U is the firm's unlevered *beta* coefficient, that is, the *beta* it would have if it has no debt; the term (1-*T*) puts the equation on an after-tax basis. The equation suggests that in the mean-standard deviation version of the capital asset pricing model, the covariance of the asset's rate of return with the market portfolio's rate of return (the proxy *beta*), which measures the nondiversifiable risk of the asset, should be greater for the stock of a firm with a higher debt-to-equity ratio than for stock of another firm in the same risk-class with a lower debt-to-equity ratio. Bhandari (1988) argues that a natural proxy for the risk of common equity of a firm is that firm's debt-to-equity ratio and found supportive empirical evidence that the expected common stock returns are positively related to the ratio.

Foreign and Chinese domestic investors are considered to have different attitudes toward risks according to the differential risk hypothesis. Given the fact that Chinese residents lack investment opportunities, while foreign investors pursue the best investment opportunities available (since they have much more chances to diversify their risks in overseas markets), I argue domestic investors are not as sensitive as the

foreign investors are to the firm's financial risk. It is thus expected, cross-sectionally, that the A-shares price premium is higher for firms with higher financial leverage, holding other factors constant. In the time-series dimension, the change in financial structure shall not affect the amount or risk of the cash flows on the total package of debt and equity, but changes the risk of the individual securities. The higher financial leverage makes the equity riskier and increase the return that shareholders will require. Therefore, the extent of the influence on foreign investors' expected return is likely to be greater than on domestic investors' expected return. As a result, a positive relationship is expected to be observed between the price premium and firm's financial leverage.

H. II. Firms with better profitability have smaller price disparity in their A- and B-shares.

Two measurements, the return on equity (ROE) and earnings per share (EPS), are employed here to proxy firms' profitability. ROE measures a firm's efficiency at generating profits from its common equity, and shows how effective a company is in using investors' investment to generate earnings growth. According to Gordon's Dividend Growth Model (Gordon, 1959), a stock price is determined by a firm's future cash flow, which is further determined by the dividend growth rate, and its capitalization rate:

$$P_0 = \frac{D_0(1+g)}{k-g} \tag{4.2}$$

where P_0 is the current stock price, D_0 is the current dividend payment, g is the dividend growth rate which is assumed to be a constant, and k is the capitalization rate which investors required for their cost of capital.

If reinvestment is allowed, the dividend growth rate g can be written as the product of the return on equity (ROE) and the earnings retention ratio (b), therefore, (4.2) can be rewritten as:

$$P_0 = \frac{D_0(1 + ROE * b)}{k - ROE * b} \tag{4.3}$$

It can be seen clearly from equation (4.3), as ROE increases, the stock price would increase as well.

Earnings per share is defined as the total net income of the company divided by the total number of shares outstanding. It has been widely demonstrated in the accounting and finance literature that earnings have valuation and market information content, and have been implicitly recognized as a fundamental variable in stock price determination (see, e.g., Kleidon, 1986; Kormendi and Lipe, 1987; Campbell and Shiller, 1988). It is positively correlated with the term future cash flow in Gordon's model given a constant dividend payout ratio, and thus it shall also be positively correlated with the stock price. Empirical studies provide supportive evidence. For example, Kim (2007) found EPS and ROE were critical factors in determining the market price of stocks traded on the Korean Stock Exchanges. Sing *et al.* (2002) found EPS is a significant fundamental variable in explaining short-run dynamics of price changes of property stocks in Singapore and suggested institutional investors should pay more attention to EPS in their stock selection process. I assume the Chinese domestic investors pay less attention to firm's performance and, in contrast, foreign investors will to pay relatively more for firms which can generate more profit.

Therefore, a negative relationship is expected to be seen between the price premium and firm's profitability.

H. III. Companies with better future prospects have less price differences between their foreign and domestic classes.

Stock valuation relies heavily on the expected growth of a company. At the beginning of this chapter, I introduced the aspect that Chinese investors are said to desire quick gains from holding stocks and often held shares for less than one month. Following the new hypothesis, I argue these short-oriented and speculative traders care less or do not care at all about company's future prospects; contrarily, sophisticated foreign institutional investors pay a great attention on the persistence of company's earnings. Two measurements are used here to proxy the firm's future prospect: the forecast earnings growth which is defined as the difference of current earnings per share and the forecast earnings per share in one year relative to the current earnings per share, and the forecast sales growth which is defined as the difference of current sales and the forecast one year forward sales relative to current sales.

It is understood both theoretically and empirically that earnings forecasts can possess information content. Miller and Modigliani (1958) stated the necessity of considering the value of the "stream of profits over time". Chan and Chen (1991) propos e that the earnings prospects of firms are associated with a risk factor in returns. Firms judged to have strong prospects have lower expected stock returns since they are rewarded with lower costs of capital, than firms with poorer prospects. I assume since Chinese investors will not hold the shares long enough, they do not give much weight to a firm's forecast earnings growth. Hence, they might still pay a relatively high price for

shares of firms which do not have prospects of high earnings growth, and the expected earnings growth rate is thus expected to be negatively associated with the A-shares premium. As sales are the major source of earnings, a firm's sales prospects is also expected to be related with the price premium negatively.

H. IV. The price premium for firms which pay more dividends to their investors is smaller compared with those pay less.

The effect of dividends on the valuation of securities has been a controversial subject in financial research over the history. Ever since Miller and Modigliani (1958) pointed out, in a perfect world where there was no transaction costs, no taxes, and information is costless, that a firm's value, on which the value of the equities backed, is irrelevant with its dividend policy, researchers and practitioners have attempted to explain, in a more realistic world, how market price reacts to firms' dividend decisions. While there are many aspects of dividends unknown to researchers, we are confident that the stock price of a firm will generally rise when the firm announces an increase in the dividend and will generally fall when a dividend reduction is announced. Blume and Friend (1978) mentioned that in a survey of 1,041 American individual investors, a strong preference for dividend payout is revealed, even if retained earnings were reduced. If the proportion of corporate earnings paid out as dividends were to increase substantially, 41.8% of the respondents would plan to increase their stock holdings, while only 10.5% would plan a reduction. Moreover, it is commonly believed that dividend policy contains information content: only companies whose management think things look good tend to return cash flows to outside shareholders, and the announcement of a dividend is taken as a signal that higher future earnings are likely

to rise. If Chinese investors are indeed liquidity-driven, they would not take the firm's payout ratio into their account when making buying or selling decisions. In contrast, foreign investors would value the signal and desire the dividend income. As a consequence, the premia of firms paying more dividends are hypothesized to be less compared with those paying less. I thus expect high dividend payout ratio is negatively related to the A-shares price premium.

H. V. Firms with a smaller proportion of untradeable shares tend to have less price differences between their domestic class shares and foreign class shares.

It is believed that good corporate governance does increase the firm's market valuation (Bai *et al.*, 2004). From the standpoint of practitioners, a series of surveys with institutional investors and private equity investors focusing on emerging markets conducted by McKinsey shows that 80% of these investors are willing to pay a premium to well-governed firms[4]. Daoming Pu, deputy manager of JP Morgan Hong Kong office also pointed out that "if the proportion of shares in circulation is too low, we are not interested in"[5]. From a more academic point of view, Wang and Xu (2004) propose due to effective corporate governance, such firms tend to have higher returns over the long run. Based on China's unique government-owned untradable shares structure, discussed earlier in Chapter 2, the percentage of tradable A-shares relative to all outstanding A-shares is adopted here as a measure of the corporate governance, following Wang and Wu (2004). They argue that the floating ratio may reflect the expected corporate governance in China, thus would be helpful in predicting a firm's future cash flow. In addition, I argue that firms with higher floating ratios have fewer

[4] McKinsey & Company, 1999–2002, *The McKinsey Quarterly.*
[5] *International Finance News*, 2 December 2002.

non-tradable shares and thus face less political pressure from government policies and also suffer less manipulation from potential concentrated investors. As a consequence, firms with higher floating ratios tend to be more transparent and have better corporate governance. Since better corporate governance is an attractive feature when considering portfolio choice, it is hypothesized that foreign investors would pay relatively more for such feature, and thus a negative relationship between firms' corporate governance and their A-shares price premia should be observed.

H. VI. Firm's size is negatively related to the A-shares price premium.

The interpretation of how firm's size is related with its stock price or returns is two-fold. Firstly, it is widely documented in the finance literature that stock expected returns are negatively related to firm's size (see, e.g., Banz, 1981; Reinganum, 1981; Kato and Schallheim, 1985; Fama and French, 1992, 1993; Daniel and Titman, 1997), given which, foreign investors would price their shares higher for firms of a larger size. Assuming the pricing of domestic and foreign shares is driven by different forces, foreign investors would pay relatively more for firms with larger size and thus the A-shares premium would be negatively correlated with firm size. Secondly, the premium is expected to be negatively related to the firm size according to the information asymmetry hypothesis discussed in Chapter 3. Firm size can be viewed as a proxy for the difficulty of access to the relevant information of the firm; say, the bigger the firm, the more frequently it tends to be covered by the media and so it would generate less asymmetric information among investor groups. On both accounts, a negative relationship between firm's size and its A- and B-shares price premium is expected to be observed. Firm size is proxied by two measurements: market capitalization

calculated using tradable A-shares, and market capitalization based on total outstanding A-shares.

4.3 Data and Descriptive Statistics

To avoid the infancy period of the Chinese stock markets and RMB's foreign exchange rate regime adjustment periods in 1994 and 2005[6], the sample period starts from 1994 and ends in 2004. The 11 years sample period covers the period before Chinese domestic individuals were allowed to invest in once foreigner-only shares, the period after QFIIs were allowed to participate with once domestic-only shares, and the period between these institutional changes. All 86 firms, 42 from SHSE and 44 from SZSE, which issue dual-class shares by the end of the sample period, are examined. Full lists of companies included are available in the Appendices D and E. Most of our datasets are obtained from the Datastream of Thomson Financial, including trading data and companies' financial data; earnings and sales forecasts data are from I/B/E/S; ownership structure data is from the Beijing Tianxiang Investment Consultant. Datastream does not have separate information on tradable shares and nontradable shares; the data type "the number of shares in issue" covers both state shares, legal person shares and employee shares, which are classified as nontradable shares and ordinary tradable shares. Although the Datastream does contain data of "percentage of free float number of shares" and "total strategic holdings", the data provided is not consistent with ones I computed based on individual firms' financial statements. I thus use ownership structure data provided by the Beijing Tianxiang

[6] From January 1994, China started a market-based, managed floating exchange rate system pegging to U. S. dollars; from 21 July 2005, China switched its exchange rate regime to a managed float linked to a basket of currencies after a 2.1 percent appreciation against the dollar.

Investment Consultant. Because the firms do not release their financial reports on a finer frequency, analyses will be conducted on annual basis. The definition of explanatory variables is provided in the following Table 4.1.

Table 4.1: Description of Explanatory Variables

Factors	Variables	Abbr.	Definitions	Expected Signs
Financial Leverage	Debt-to-equity ratio	DTE	Annual ratio of total debt to common equity	+
Profitability	Earnings per share	EPS	Earnings per share for the fiscal year	-
	Return on equity	ROE	Net income divided by average total equity	-
Future Prospects	Forecast earnings growth	FEG	Difference between current and forecast one year forward EPS relative to the current EPS	-
	Forecast sales growth	FSG	Difference between current and forecast one year forward sales relative to the current sales	-
Dividend Policy	Dividend payout ratio	DIV	Dividends per share relative to earnings per share	-
Corporate Governance	Floating ratio	FR	Number of free-floating A-shares relative to the number of all outstanding A-shares	-
Firm Size	Market capitalization	LMCAP1	Natural logarithm of market capitalization calculated based on free float A-shares	-
		LMCAP2	Natural logarithm of market capitalization calculated based on total outstanding A-shares	-
Liquidity	Relative liquidity	LIQ	Relative turnover rate, which is calculated as the ratio of trading volume to the number of shares traded on the market, of the A-shares to B-shares	+

The following Table 4.2 presents descriptive statistics of the dependent variable and explanatory variables:

Table 4.2: Summary Statistics of Dependent and Explanatory Variables

	PRE	DTE	EPS	ROE	FEG	FSG	DIV	FR	LMCAP1	LMCAP2	LIQ
						Panel A: SHSE					
Mean	2.928	85.41	0.063	2.531	0.136	0.121	20.66	0.176	6.344	7.678	2.204
Median	1.624	60.09	0.094	4.850	0.010	0.030	0.000	0.118	6.454	7.761	1.326
Maximum	19.58	571.2	1.600	76.33	17.33	2.246	100.0	0.682	8.884	10.25	30.15
Minimum	-0.513	-212.8	-1.490	-88.51	-17.36	-0.750	0.000	0.033	3.022	4.344	0.059
Std. Dev.	2.970	87.47	0.256	16.97	3.057	0.475	28.57	0.123	1.077	0.998	3.371
Skewness	1.766	2.341	-1.410	-2.543	-0.417	1.696	0.995	1.235	-0.347	-0.471	4.645
Kurtosis	7.060	11.54	15.29	13.82	17.50	7.605	2.576	4.062	2.792	3.549	29.36
Jarque-Bera	509.1	1629	2789	2252	2241	216.7	71.61	129.5	9.230	20.86	13995
Probability	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0099***	0.0000***	0.0000***
						Panel B: SZSE					
Mean	1.845	60.34	0.120	5.434	0.310	0.028	25.85	0.279	6.538	7.598	6.337
Median	1.240	42.91	0.130	8.060	0.051	0.059	13.77	0.234	6.626	7.702	2.724
Maximum	8.775	513.9	1.192	131.2	9.333	1.323	100.0	0.826	8.975	10.13	90.35
Minimum	-0.493	-249.3	-1.593	-147.2	-5.857	-1.000	0.000	0.056	2.537	3.566	0.027
Std. Dev.	1.672	74.14	0.302	21.15	1.908	0.460	29.08	0.152	0.934	0.915	10.34
Skewness	1.492	1.841	-1.418	-1.570	2.220	-0.393	0.657	1.377	-0.655	-0.781	4.001
Kurtosis	5.075	11.50	10.34	18.14	11.34	3.723	2.086	4.421	4.115	5.281	23.67
Jarque-Bera	207.6	1287	978.5	3197	870.1	7.510	38.64	156.5	46.46	120.0	8004
Probability	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0233**	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
						Panel C: SHSE vs. SZSE *t* test					
t-stat	7.488	5.818	-4.584	-3.326	-0.908	2.478	-3.695	-17.38	-3.702	1.653	-25.42
p-value	0.0000***	0.0000***	0.0000***	0.0010***	0.3647	0.0143**	0.0002***	0.0000***	0.0002***	0.0990*	0.0000***

Notes: '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

Panel A and Panel B list the summary statistics for firms listed on the SHSE and SZSE respectively. Panel C lists *t*-statistics and corresponding *p*-values for hypothesis that there is no difference in the mean of various variables between firms listed on the

Shanghai and Shenzhen exchanges. Except for variables FEG and LMCAP2, the null hypothesis can be rejected at the 5% significance level, and LMCAP2 is also significant at the 10% level. Thus, separate examinations will be conducted for the firms listed on the two exchanges.

The average price premium in the Shenzhen market appears more modest: investors of the Shanghai A-shares pay almost four times the price that B-shares investors pay, for stocks with identical fundamental backups; while for the Shenzhen-listed shares, the A-shares are in general nearly three times more expensive. The Shanghai-listed firms are suggested to be significantly more financial risky than the Shenzhen-listed firms. Since the founding of new China, Shanghai has been the most economically developed city in China, and many of the largest stated-owned companies, e.g., the Shanghai Baoshan Iron and Steel Company, the Shanghai Petrochemical Company, were set up there. These large-scale state-owned enterprises became partially privatized and publicly listed after the SHSE established following the economics reform and Opening Up. The historical background for firms listed in the SZSE is very different. When the SZSE established in 1991, Shenzhen had only been designated as a special economic zone (SEZ) for about ten years. There were no large-scale state-owned enterprises, and foreign-funded enterprises were small in size. Even today, firms listed on the SHSE tend to be larger than those choosing the SZSE, which is evidenced by LMCAP2, the market capitalization calculated based on number of total outstanding shares. Since bank loans are the main source of capital for Chinese firms, and large state-owned companies normally face lower barriers and conditions and have bountiful mortgages to get bank loans, and it is no wonder that

the Shanghai-listed firms have significant higher financial leverage than the Shenzhen-listed firms. The Shenzhen-listed firms have significantly better profitability, measured by either EPS or ROE, than firms listed in Shanghai: the mean values of which of the Shenzhen-listed firms are about twice of which of the Shanghai-listed firms. While the Shenzhen-listed firms have higher forecast earnings growth in the near future, the Shanghai-listed firms, though not significant, are expected grow faster in annual sales. Comparing the Shanghai-listed firms, the Shenzhen-listed firms on average pay more proportion of their earnings back to investors; and a zero median value of the variable DIV indicates more than half of the Shanghai-listed firms do not provide dividends to investors. Since the Shanghai-listed firms are mainly previous state-owned enterprises, they in general have higher portions of outstanding shares kept by the government and other institutions, and so they tend to have lower FR ratios. Affected by the lower FR ratio, firm size, measured by the number of tradable shares, of the Shanghai-listed firms is significantly lower than that of the Shenzhen firms, although when measuring by the number of all outstanding shares, the Shanghai-listed firms are larger.

4.4 Dynamic Panel Data Analysis

4.4.1 Model Specification

Since the concerned factors vary both over time and across firms, I will consider a panel data model. To assess the relevance of the various possible firm fundamentals leading to the price premium, an error components model is implemented in the estimation:

$$PRE_{i,t} = \alpha_i + \beta X'_{i,t} + \gamma_i PRE_{i,t-1} + \varepsilon_{i,t} \quad (4.4)$$

where, $PRE_{i,t}$ represents the price premium for firm i in year t; $X_{i,t}$ is a vector of explanatory variables used to measure firm fundamentals; following Domowitz *et al.* (1997), the lagged price premium is included to reflect the trend of the price premium and filter out the autocorrelation; the firm-specific fixed effect is represented by the time-invariant coefficient α_i; $\varepsilon_{i,t}$ represents the error term and is assumed to be zero mean and be uncorrelated with either the lagged term $PRE_{i,t-1}$ or the proxy variables, that is $E(X'_{i,t}\,\varepsilon_{i,t}) = 0$ and $E(PRE_{i,t}\varepsilon_{i,t}) = 0$. Although a number of firm-specific variables are included in the model, there is no doubt some others are left out. The most important benefit of using a panel data method is its ability it gives us to control for unobservable firm-specific effects, which may correlated with other observables included in the model. Besides, panel data models facilitate a reduction in collinearity among the explanatory variables and improves efficiency in estimating model dynamics in short time-series.

4.4.2 Panel Unit Root Test

Previous studies utilizing the model specification (4.4), e.g., Domowitz *et al.* (1997), Sun and Tong (2000), Chen *et al.* (2001), Chan and Kwok (2005) and Fong and Wong (2007), failed to verify necessary stationarity conditions of the premium series or undertake tests for stationarity. As Bond (2002) explained, whilst the time series properties of the series are not crucial for the asymptotic distribution theory in this setting, they can nevertheless be crucial for the identification of parameters of interest and for the finite sample properties of particular GMM estimators. In order to avoid

any such potential problem, I will undertake a panel unit root test on the premium series as the first step before carrying on further analyses.

In the panel unit root test framework, tests can be roughly categorized as two main types: the first type of tests, i.e., LLC (Levin, Lin and Chu, 2002), IPS (Im, Pesaran and Shin, 1997, 2003), and Fisher-type (Maddala and Wu, 1999 and Choi, 2001), is constructed under the assumption that the individual time series in the panel are cross-sectionally independently distributed; the second type of tests releases this assumption and can be further distinguished into the covariance restrictions approach, adopted notably by Chang (2002, 2004), and the factor structure approach, including contributions by Bai and Ng (2004), Phillips and Sul (2003), Moon and Perron (2004), Choi (2002) and Pesaran (2007). Among all these methods, LLC, IPS and Fisher-type tests are most commonly used in practice[7].

Both the IPS and Fisher-type tests combine information based on individual unit root tests and relax the restrictive assumption of the LLC test that all time series share a common unit root. Maddala and Wu (1999) and Choi (2001) suggest using a nonparametric Fisher-type test (Fisher, 1932) which is based on a combination of the *p*-values of the test statistics for a unit root in each cross-sectional unit (the ADF test or other non stationary tests). The Fisher-type test overcomes the shortcomings of both the LLC and IPS frameworks: it does not require a balanced panel as is the case of the IPS test, while the LLC and IPS tests are constructed under the assumption that *T* is the same for all cross section units; it can be carried out for any unit root test

[7] A simple but detailed comparison of them is available with Laura Barbieri, Panel Unit Root Tests: A Review, Università Cattolica del Sacro Cuore, Dipartimento di Scienze Economiche, Sociali – Piacenza, (www3.unicatt.it/unicattolica/dipartimenti/DISES/allegati/LBarbieri43.pdf).

derived, and it is possible to use different lag lengths in the individual ADF regression while other tests require the same lag length in all models. Given the above advantages, the Fisher-type unit root test is adopted here.

The proposed Fisher-type test is:

$$P = -2\sum_{i=1}^{N} \ln p_i \tag{4.5}$$

which combines the *p*-values from unit root tests for each cross-section *i* to test for unit roots in panel data. Under the null hypothesis of a unit root, $-2\ln p_i$ has a χ^2 distribution with two degrees of freedom. This means that *P* is distributed as χ^2 with 2N degrees of freedom, as $T_i \to \infty$, for finite N.

When N is large, Choi (2001) proposed a modified *P* test, *Z* test:

$$Z = \frac{1}{2\sqrt{N}} \sum_{i=1}^{N} (-2\ln p_i - 2) \tag{4.6}$$

This statistic corresponds to the standardized cross-sectional average of individual *p*-values and converges to a standard normal distribution.

Table 4.3 presents the panel unit root test result utilizing both *P* test and Choi *Z* test. For both Shanghai shares and Shenzhen shares, the null hypothesis can be rejected.

Table 4.3: Fisher-Type Panel Unit Root Test

	Fisher-ADF		Fisher-PP	
	P test	*Z* test	*P* test	*Z* test
		SHSE		
Individual Intercepts	119.396	-3.211	115.972	-2.952

	(0.0146)**	(0.0007)***	(0.0245)**	(0.0016)***
Individual Intercepts & Individual Trends	97.145	-2.114	117.702	-2.529
	(0.0932)*	(0.0173)**	(0.0039)***	(0.0057)***
		SZSE		
Individual Intercepts	106.776	-2.142	106.899	-2.168
	(0.0475)**	(0.0161)**	(0.0467)**	(0.0151)**
Individual Intercepts & Individual Trends	95.702	-1.728	160.630	-3.837
	(0.0629)*	(0.0420)**	(0.0000)***	(0.0001)***

Notes: Number of lags included in the Fisher-ADF test is suggested by AIC. Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

4.4.3 Dynamic Panel Data Estimation

The unobserved idiosyncratic firm features captured by α_i can be wiped out with panel data by running the first difference equation:

$$PRE_{i,t} - PRE_{i,t-1} = \gamma(PRE_{i,t-1} - PRE_{i,t-2}) + \beta(X'_{i,t} - X'_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1} \quad (4.7)$$

In equation (4.7), the difference of the lagged term $PRE_{i,t-1} - PRE_{i,t-2}$ is correlated with the difference of the disturbance $\varepsilon_{i,t} - \varepsilon_{i,t-1}$, i.e., $E(dPRE_{i,t-1} d\varepsilon_{it}) \neq 0$. The conventional ordinary least squares (OLS) estimation is no longer appropriate as biased and inconsistent estimator will result.

Anderson and Hsiao (1982) suggested using the level $PRE_{i,t-2}$, or the lagged difference $dPRE_{i,t-2}$, as instruments for the differenced lagged endogenous regressor $dPRE_{i,t-1}$. Assuming there is no serial correlation, these instruments can be expected to be uncorrelated with the differenced error term:

$$E(PRE_{i,t-2} d\varepsilon_{it}) = 0 \text{ and } E(dPRE_{i,t-2} d\varepsilon_{it}) = 0 \quad (4.8)$$

Following the initial work of Anderson and Hsiao (1982), a more efficient generalized

method-of-moments (GMM) procedure is proposed by Arellano and Bond (1991), and then further generalized and extended by Ahn and Schmidt (1995), Arellano and Bover (1995) and Blundell and Bond (1998) just to mention a few. Arellano and Bond (1991) argue that additional instruments can be obtained in a dynamic panel model if one utilizes the orthogonality conditions that exist between lagged values of dependent variable and the disturbances. Following this, values of *PRE* lagged one period or more qualify as instruments in the first-differenced system, implying the following moment conditions:

$$E(PRE_{i,t-s} d\varepsilon_{i,t}) = 0\,,\ t=3,\ldots,T;\ s>=2 \tag{4.9}$$

GMM estimation based on (4.9) alone could be highly inefficient. In most cases, it is necessary to make use of the explanatory variables as additional instruments. Under the assumption that $X'_{i,t}$ are exogenous variables, $E(X'_{i,t}\,\varepsilon_{i,s}) = 0$ for all t, s=1,2,…,T, the explanatory variables can also be considered as valid instruments:

$$E(X'_{i,t-s}\, d\varepsilon_{i,t}) = 0\,,\ t=3,\ldots,T;\ s>=1 \tag{4.10}$$

However when the value of γ increases towards unity, and as the relative variance of the fixed effects α_i increases, the instruments used in the standard first-differenced GMM estimator become less informative. Blundell and Bond (1998) derived a consistent estimator for this problem by allowing use of an extended system GMM estimator. In addition to lagged levels of dependent variable as instruments for equations in first differences, they use lagged differences of dependent variable as instruments for equation (4.4) in levels.

$$E(dPRE_{i,t-1}\varepsilon_{i,t}) = 0 \text{, for } t=3,\ldots,T \tag{4.11}$$

When *X'* are exogenous, the following level moment conditions can also be used as additional instruments:

$$E(dX'_{i,t-s}\,\varepsilon_{i,t}) = 0 \text{, } t=3,\ldots,T;\ s>=1 \tag{4.12}$$

This technique is especially designed for situations with "small T, large N" panels, meaning few time periods and many individuals.

The consistency of the GMM estimators depends on the validity of two assumptions: firstly, the error terms are assumed not exhibit serial correlation, and secondly, the instruments are not correlated with error terms. To address these issues, two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) are used here. The overall validity of the moment conditions is checked by the Sargan test[8]. The null hypothesis of the instrumental variables are uncorrelated to some set of residuals is rejected if the Sargan test statistic registers a large value compared with a chi-squared distribution with the degree of freedom equals to the difference between the number of moment conditions and number of parameters. To check the serial correlation property of the level residuals, the Arellano-Bond m_1 and m_2 statistics are calculated. If the level residuals were indeed serially uncorrelated, then, by construction, the first-differenced residuals in (4.7) would follow a MA(1) process which implies that autocorrelations of the first order are non-zero but the second or higher order ones are zero. Based on the differenced residuals, the Arellano-Bond m_1 and m_2 statistics, both distributed as N (0,

[8] For more details, please see Baltagi, *Econometric Analysis of Panel Data*, 3rd Edition, p.141.

1) in large samples, test the null hypotheses of zero first order and second order autocorrelation, respectively. A significant m_1 and insignificant m_2 would suggest valid moment conditions.

The dynamic panel regression results, utilizing both the GMM-difference estimator and GMM-system estimator, of the Shanghai- and Shenzhen-listed firms are reported in Tables 4.5 and 4.6 respectively. Models A and B are based on the GMM-difference estimators and models C and D are based on the GMM-system estimators. In model A, the instrument set is equation (4.9), that is values of *PRE* lagged one period or more are used as instruments in the first-differenced system; in model B, instrumental set (4.10) is further added to the instrumental set (4.9); in model C, (4.11) is augmented with (4.9)-(4.10), that is lagged differences of *PRE* are used as additional instruments for equations in levels in addition to the instruments for equations in first differences; in model D, extra instrumental variables, (4.12), lagged differences of explanatory variables are added to the instrumental set of model C. Since I only have a short *T*, i.e., *T*=11, which is not sufficient to conduct the analysis in sub-periods to take into account of the policy changes, I will run the dynamic panel regressions over the entire sample period to get a evidence of how the firm fundamentals attribute to the A-shares premium on the SHSE and SZSE respectively. The tests results are reported in Tables 4.4 and 4.5.

Table 4.4: Dynamic Panel Regressions of Shanghai-Listed Firms

	GMM-DIFF		GMM-SYS	
	A	B	C	D

l.PREM	0.2086	0.2811	0.1755	0.2215	0.4067	0.3256	0.3411	0.2491
	(0.287)	(0.148)	(0.212)	(0.111)	(0.000)***	(0.005)***	(0.000)***	(0.009)***
DTE	0.0158	0.0388	0.0089	0.0191	0.0173	0.0102	0.0040	0.0028
	(0.646)	(0.257)	(0.533)	(0.180)	(0.169)	(0.413)	(0.304)	(0.452)
EPS	11.6732	9.2807	10.8950	4.5374	8.4752	6.5915	3.8519	2.4612
	(0.375)	(0.498)	(0.091)*	(0.490)	(0.195)	(0.302)	(0.391)	(0.568)
ROE	-0.2528	-0.0702	-0.2181	-0.0544	-0.1364	-0.1300	-0.0897	-0.0852
	(0.240)	(0.761)	(0.046)**	(0.625)	(0.175)	(0.183)	(0.204)	(0.208)
FEG	0.6033	0.6358	0.2130	0.2458	0.2512	0.2272	0.1666	0.1493
	(0.013)**	(0.011)**	(0.062)*	(0.030)**	(0.036)**	(0.051)*	(0.068)*	(0.088)*
FSG	1.8894	3.3845	0.6987	1.6272	1.2797	1.0902	1.4346	1.1022
	(0.294)	(0.053)*	(0.323)	(0.018)**	(0.065)*	(0.108)	(0.006)***	(0.029)**
DIV	-0.0396	-0.0395	-0.0303	-0.0247	-0.0208	-0.0236	-0.0207	-0.0243
	(0.185)	(0.198)	(0.012)**	(0.042)**	(0.103)	(0.056)*	(0.029)**	(0.008)***
FR	0.3834	-17.9195	3.2923	-13.6204	-2.1802	-5.7103	-3.4687	-5.0374
	(0.981)	(0.196)	(0.714)	(0.095)*	(0.723)	(0.311)	(0.291)	(0.088)*
LMCAP1	-2.3771		-2.3402		0.0165		0.2609	
	(0.140)		(0.005)***		(0.943)		(0.073)*	
LMCAP2		1.5518		2.0521		0.2415		0.3776
		(0.406)		(0.024)**		(0.195)		(0.001)***
LIQ	0.1948	0.2918	0.0476	0.1667	0.1839	0.1630	0.2622	0.2116
	(0.262)	(0.090)*	(0.553)	(0.034)**	(0.006)***	(0.014)**	(0.000)***	(0.000)***
Sargan test[a]	15.7227	16.2872	81.9780	85.0576	81.6467	85.2312	145.7353	152.8732
	(0.7850)	(0.7533)	(0.1974)	(0.1393)	(0.4590)	(0.3523)	(0.4439)	(0.2906)
m1[b]	-2.3084	-2.1357	-3.4044	-3.6209				
	(0.0210)**	(0.0327)**	(0.0007)***	(0.0003)***				
m2[c]	0.0276	0.4124	0.3907	0.9827				
	(0.9780)	(0.6801)	(0.6960)	(0.3258)				
Wald test[d]	40.82	37.36	38.58	36.32	113.25	122.5	254.85	281.13
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0001)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Notes: [a] The null hypothesis is that the instruments used are not correlated with the residuals.

[b] The null hypothesis is that the errors in the first difference regression exhibit no first-order serial correlation.

[c] The null hypothesis is that the errors in the first difference regression exhibit no second-order serial correlation.

[d] Wald test for all explanatory variables are jointly significant.

Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

In all models, validity of the instrument variables is confirmed by both the Sargan test and the Arellano-Bond serial correlation test. Highly statistically significant Wald statistics also confirmed all variables included in the regressions are jointly significant

in explaining the premium. Significant coefficients of LPREM in models C and D suggest first-order autocorrelation exists in the premium. Though not statistically significant at any conventional level, DTE shows positive sign, as the *H. I* expected, in all models. As measurements of firm profitability, EPS and ROE are found not to be contributing to the premium at any conventional significance level with only one exception in model B and when LMCAP1 is included, and so I would draw the conclusion that firm profitability is not an important factor causing the A-shares price premium, and local Chinese and foreign investors do not have much difference in valuing firm profitability. At the 10% significance level, all models confirm FEG drives the premium, however the sign of which is not what is expected. I find FEG is positively, rather than negatively, associated with PREM, suggesting it is actually A-shares investors who care more about firms' long term performance. This surprising result is also found with FSG, firm's prospect measured by the forecast sales growth, as supported by most of the models. DIV is found to be significantly negatively related to the premium as the *H. IV* expected. FR is found to be insignificant at the 5% level in all models. Because of the existence of the unique untradeable shares, firm size is measured by two approaches, one includes the untradeable shares into calculation of the market capitalization, and one does not. Most of the models show a positive relationship between the premium and firm size, although some of which are not statistically significant. This finding is contradictory with both previous evidence and the theoretical prediction discussed in the *H. VI*. In interpreting this, I would rather believe that the result suggests both local and foreign investors prefer to invest in larger firms, though the local Chinese pay relatively more attention to the firm size

factor. Relative liquidity enters the premium positively as expected, and confirms previous evidence that the A-shares investors prefer liquid shares.

Table 4.5: Dynamic Panel Regressions of Shenzhen-Listed Firms

	GMM-DIFF				GMM-SYS			
	A		B		C		D	
l.PREM	0.2793	0.2927	0.2167	0.1963	0.3058	0.2571	0.3477	0.3213
	(0.086)*	(0.082)*	(0.053)*	(0.082)*	(0.001)***	(0.004)***	(0.000)***	(0.000)***
DTE	0.0074	0.0054	0.0034	0.0032	-0.0001	-0.0024	0.0001	-0.0008
	(0.401)	(0.558)	(0.528)	(0.547)	(0.968)	(0.573)	(0.972)	(0.690)
EPS	1.1347	1.2570	1.7633	1.2487	1.7120	1.6437	1.0516	0.9754
	(0.628)	(0.605)	(0.053)	(0.184)	(0.049)**	(0.049)**	(0.096)*	(0.115)
ROE	-0.0132	-0.0186	-0.0317	-0.0279	-0.0362	-0.0377	-0.0280	-0.0282
	(0.650)	(0.535)	(0.018)**	(0.040)**	(0.003)***	(0.001)***	(0.001)***	(0.001)***
FEG	-0.1497	-0.1334	0.0222	0.0431	0.0388	0.0359	0.0628	0.0618
	(0.373)	(0.448)	(0.773)	(0.579)	(0.631)	(0.645)	(0.307)	(0.306)
FSG	-1.1085	-1.1464	-0.5028	-0.3667	0.2056	0.2472	-0.1004	-0.1330
	(0.376)	(0.379)	(0.422)	(0.563)	(0.742)	(0.682)	(0.784)	(0.714)
DIV	0.0083	0.0042	-0.0010	-0.0005	0.0007	-0.0006	0.0001	-0.0013
	(0.571)	(0.782)	(0.899)	(0.949)	(0.926)	(0.932)	(0.989)	(0.801)
FR	3.9933	-0.2083	-2.5703	-6.1592	-4.6904	-6.0629	-0.5609	-0.7515
	(0.554)	(0.974)	(0.531)	(0.105)	(0.076)*	(0.010)***	(0.521)	(0.339)
LMCAP1	-1.0120		-0.4590		0.2769		0.1195	
	(0.112)		(0.173)		(0.057)*		(0.091)*	
LMCAP2		-0.4194		0.1277		0.3489		0.1426
		(0.563)		(0.723)		(0.003)***		(0.016)**
LIQ	0.2882	0.2988	0.0908	0.0922	0.1268	0.1153	0.0742	0.0683
	(0.000)***	(0.000)***	(0.011)**	(0.010)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Sargan test[a]	20.9027	21.5443	64.1060	65.1666	79.2188	80.3416	128.0907	130.3495
	(0.8909)	(0.8701)	(0.6442)	(0.6085)	(0.4402)	(0.4056)	(0.9439)	(0.9256)
m1[b]	-2.7689	-3.0023	-4.2018	-4.1825				
	(0.0056)***	(0.0027)***	(0.0000)***	(0.0000)***				
m2[c]	0.8931	0.9898	2.3784	2.3559				
	(0.3718)	(0.3223)	(0.0174)**	(0.0185)**				
Wald test[d]	32.64	28.44	28.79	26.78	133.63	148.24	215.95	227.22
	(0.0003)***	(0.0015)***	(0.0013)**	(0.0028)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.000)***

Notes: [a] The null hypothesis is that the instruments used are not correlated with the residuals.

[b] The null hypothesis is that the errors in the first difference regression exhibit no first-order serial correlation.

[c] The null hypothesis is that the errors in the first difference regression exhibit no second-order serial correlation.

[d] Wald test for all explanatory variables are jointly significant.

Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

In the Shenzhen market, insignificant Sargan test statistics again confirm the overall validity of instruments used in all models. However, Arellano-Bond's second-order serial correlation test fails to reject at the 5% significance level in model B. Again, highly statistically significant Wald statistics confirmed all variables included in the regressions are jointly significant in explaining the premium. Highly significant and positive coefficients of LPREM in all models indicate strong mean reversion property of the premium. Same as what is found in the Shanghai market, the financial leverage is insignificant, at any conventional level, in explaining the premium in the Shenzhen market. EPS is found significant at the 5% level in Model C but not in other models, and I would consider it as not statistically important in explaining the premium. Hence, the result indicates there is not much difference in valuing EPS between investors of the A- and B-shares. However, the other profitability measurement, ROE, is found to be highly significant and negatively related to the premium in almost all the models, suggesting compared with the A-shares investors, the B-shares investors, as the *H. II* expected, give relatively more weight to ROE when valuing shares. Both the two measurements of firm prospects, FEG and FSG, are found no longer statistically significant at any conventional level. DIV is found no longer significant in affecting the premium in any of the models either. As the *H. V* expected, significant and negative coefficient of FR in model C, though not in other models, supports the B-shares investors value firms have less portions hold by the government. In models

C and D, the positive sign of firm size is again observed: the LMCAP1 and LMCAP2 are found statistically significant at the 10% and 5% levels respectively. The highly significant and positive liquidity factor again confirms the liquidity preference of the A-shares investors.

4.5 Cross-Sectional Evidence

The above panel analysis takes account of the entire sample period over 11 years but fails to take into account the declines in the price premium caused by the policy changes.

The following Table 4.6 compares the average premium before and after the 2001 open B-shares market reform and the QFII programme. Significant declines in the premium around the 2001 event are found on both exchanges. Significant decline in the premium around the QFII programme is found in the Shenzhen market only.

Table 4.6: *t*-Test of the A-Shares Premium Before and After Regulation Relaxations

	SHSE	SZSE
Averaged Premium (1994-2000)	4.1312	2.7944
Averaged Premium (2001-2002)	1.1446	1.18447
Averaged Premium (2003-2004)	1.0578	0.8662
pre-2001 vs. post-2001	-39.6835	-31.1437
	(0.0000)***	(0.0000)***
pre-QFII vs. post-QFII	-0.9950	-6.0514
	(0.3256)	(0.0000)***

Note: Values in the parentheses are *p*-values. '***' indicates significant at the 1% level.

In order to consider the influence of the policy changes, in this section, I split the sample into three sub-periods: the period when the A- and B-shares market are strictly

segmented runs from 1994 to 2000; the period when Chinese individuals can trade in the B-shares market but foreign investors are still kept away from the A-shares market, which includes 2001 and 2002; and the period when QFIIs are involved in the A-shares trading, which includes 2003 and 2004. Since each of the last two sub-periods only covers a very short time, i.e., two years, the dynamic panel data estimation will not be suitable any longer. Cross-sectional regressions based on OLS are employed. The specification is as follows:

$$PRE_i = C + \beta X_i' + \varepsilon_i \tag{4.13}$$

where C is a constant; $X_{i,t}$ is the same set of explanatory variables used in the panel analysis; error terms ε_i are *i.i.d.* and normally distributed. Values of the variables are taken from the averaged observations in the period. Such smoothing diminishes the influence of a few extreme outliers, i.e., large standard deviation and kurtosis in DTE, EPS, ROE, FEG and FSG suggested in Table 4.2.

After the relaxation in regulation in 2001, Chinese individuals rushed into the former prohibited market, and one may argue it is hard to distinguish which investor group is the main force driving the market price. However capital control in China still existed after the reform. Chinese investors have limited access to foreign currency which is required by the B-shares trading. The jump of the B-shares price only lasted for four months, but since the B-shares market fully opened in June, the trading activity went back to the pre-event level. Hence, I would consider it still the foreign investors who dominate the pricing in the B-shares market even after the deregulation. The influence of firm fundamentals in the price premium is expected still exist but the power may

become lower.

The participation of the foreign investors in the A-shares trading does not affect the A-shares premium directly. As introduced earlier, QFIIs who can be successfully granted licenses are in general those have the characteristic of long-term investment. For those firms issuing both the A- and B-shares, QFIIs should choose to stay in the B-shares market since the B-shares can return them the same dividends as the A-shares, but are associated with a lower price-to-earnings ratio. However another important motivation of introducing the programme is that the policy makers hope the QFIIs could bring their advanced investment perceptions and help in improving the highly speculative atmosphere in the A-shares market. If the programme functioned as anticipated, the influence of firm fundamentals to the premium should further decrease.

Tables 4.7 and 4.8 present the results of cross-sectional regressions for the three sub-periods in the Shanghai and Shenzhen markets respectively. Panels A, B and C refer to the three sub-periods respectively.

Table 4.7: Cross-Sectional Regression of Shanghai-Listed Firms

	Panel A		Panel B		Panel C	
C	6.8753	6.5921	1.6693	1.2881	1.4757	0.6135
	(0.0000)***	(0.0000)***	(0.0005)***	(0.0115)**	(0.0215)**	(0.5514)
DTE	0.0005	0.0008	-0.0002	-0.0001	-0.0009	-0.0007
	(0.8583)	(0.8104)	(0.6065)	(0.7045)	(0.2050)	(0.2395)
EPS	-3.7328	-4.3103	0.2829	0.1866	0.0575	-0.0180
	(0.1419)	(0.0671)*	(0.5535)	(0.6889)	(0.8010)	(0.9425)
ROE	-0.0038	0.0015	-0.0008	3.67E-05	-0.0031	-0.0037
	(0.9310)	(0.9719)	(0.7740)	(0.9893)	(0.2877)	(0.2103)
FEG	0.2143	0.2181	-0.0588	-0.0531	0.1534	0.2527

	(0.0857)*	(0.0813)*	(0.3770)	(0.4199)	(0.8096)	(0.1327)
FSG	0.2720	0.1273	-0.3929	-0.4114	0.4217	0.8381
	(0.7187)	(0.8549)	(0.2566)	(0.2272)	(0.4003)	(0.0782)*
DIV	-0.0135	-0.0137	-0.0033	-0.0028	-0.0026	-0.0028
	(0.0402)**	(0.0442)**	(0.2815)	(0.3326)	(0.5259)	(0.4903)
FR	-6.5867	-7.6353	-2.2712	-2.2642	-2.1747	-2.0597
	(0.0003)***	(0.0001)***	(0.0000)***	(0.0000)**	(0.0028)***	(0.0008)***
LMCAP1	-0.3179		-0.0132		0.0119	
	(0.1053)		(0.8032)		(0.9091)	
LMCAP2		-0.1885		0.0312		0.1183
		(0.2561)		(0.6179)		(0.4522)
LIQ	0.0869	0.0857	-0.0486	-0.0442	0.0324	0.0277
	(0.2266)	(0.2229)	(0.1658)	(0.1771)	(0.3986)	(0.4894)
Adj. R^2	0.6751	0.6564	0.4401	0.4420	0.2284	0.2470

Notes: Heteroscedasticity is corrected following White (1980). Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

For firms listed on the SHSE, among all the explanatory variables, DIV and FR are found to be significant at the 5% level before Chinese individual investors entered the B-shares market. As expected, the higher proportion of earnings returned to investors, the more free floating shares the company have, the narrower the gap in the A- and B-shares' prices. In the following two sub-periods, FR is found consistently statistically significant in affecting the price premium. Supporting my conjecture, the absolute value of coefficients of FR decreases through time, indicating as former prohibited investors get involved in the markets, their investment theories infiltrated and influenced their counterparts. At the 5% significant level, no other fundamental variables are found statistically significant related to the premium, suggesting the difference in valuation preferences between investors of the A- and B-shares disappeared as the two markets become more integrated.

Table 4.8: Cross-Sectional Regression of Shenzhen-Listed Firms

	Panel A		Panel B		Panel C	
C	3.1908	2.3765	0.3286	0.4333	0.2352	0.3273
	(0.0056)*	(0.0003)***	(0.8430)	(0.7915)	(0.6838)	(0.5459)
DTE	-0.0032	-0.0025	0.0033	0.0033	0.0029	0.0029
	(0.2883)	(0.2945)	(0.3389)	(0.3388)	(0.0636)*	(0.0614)*
EPS	0.7026	0.3009	0.5657	0.6554	-0.6433	-0.6292
	(0.4934)	(0.7574)	(0.7091)	(0.6458)	(0.2858)	(0.2971)
ROE	-0.0326	-0.0352	-0.0263	-0.0284	0.0246	0.0253
	(0.0133)**	(0.0094)***	(0.3868)	(0.3193)	(0.1755)	(0.1737)
FEG	0.1424	0.1493	-0.1263	-0.1224	0.3658	0.3880
	(0.0742)*	(0.0409)**	(0.1796)	(0.1879)	(0.1205)	(0.0941)*
FSG	0.4575	0.6537	0.2006	0.1902	0.5436	0.5514
	(0.1980)	(0.0310)**	(0.5883)	(0.6235)	(0.0975)*	(0.0955)*
DIV	-0.0053	-0.0040	0.0047	0.0047	-0.0010	-0.0011
	(0.5195)	(0.6235)	(0.3501)	(0.3593)	(0.7621)	(0.7654)
FR	-1.9665	-1.8038	-0.9821	-0.8809	-1.0218	-0.9754
	(0.0052)***	(0.0135)**	(0.0095)***	(0.0468)**	(0.0324)**	(0.0471)**
LMCAP1	0.0411		0.1037		0.0500	
	(0.8239)		(0.6655)		(0.4894)	
LMCAP2		0.1480		0.0767		0.0297
		(0.0094)***		(0.7084)		(0.6139)
LIQ	-0.0164	-0.0232	-0.0018	-0.0048	0.0627	0.0646
	(0.1958)	(0.0339)**	(0.9294)	(0.7704)	(0.0770)*	(0.0732)*
Adj. R^2	0.2810	0.3784	0.0908	0.1058	0.1681	0.1780

Notes: Heteroscedasticity is corrected following White (1980). Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

For firms listed on the SZSE, significant FR is also found throughout all the sub-periods. Same as what is found on the SHSE, the influence of FR to the premium decreased in the second sub-period, however it rebounded in the third sub-period, suggesting the QFII programme is not as successful, in term of influencing local investors' investing preference, as it is on the SHSE. Besides FR, selected variables also show significant roles in explaining the price premium among firms. Measured by ROE, firm's profitability is statistically significantly associated with the price

premium before individual Chinese entered the B-shares market, and the finding is robust to the finding from the panel data estimation. Foreign investors would like to pay a relatively higher price for firms which have higher return on equity. Firm's future prospects is also found affect the price premium at the 5% significant level in the first sub-period, but contradicting my prediction, the A-shares investors are found to care more about firm's growth prospects. Market capitalization measurement LMCAP2 is found to enter the premium with a surprising positive sign at the 1% significance level, indicating local investors care more about firm size. Liquidity factor is found to be significant at the 5% significance level, however, the negative sign, suggesting foreign investors pay more attention to liquidity, is also contradicted by my hypothesis and previous evidence. All the above findings with firm's future prospects, size and relative liquidity of the A- and B-shares are robust to the findings from the previous panel data estimation. In Panel B, the low adjusted R-square suggests the firm fundamentals do not well explain the premium, and no other factors, besides FR, are found to be significantly different in valuation preferences between investors of the A- and B-shares. In Panel C, at the 10% significance level, the financial leverage is found to play a statistically significant positive role, which is consistent with the expectation of *H. I*, in affecting the price premium. FEG and FSG are found to positively contribute to the premium at the 10% significance level. Liquidity factor is also found to be significant at the 10% level.

4.6 Event Study Analysis

What explains the decline of the A-shares premium? In this section, consequences of the policy changes and their relationships to the fundamental attributes will be

examined by investigating the cross-sectional variation in the changes in the price premium before and after the policy changes. Two models are employed as follows:

$$dPRE_{i,t} = C + \beta X'_{i,t-1} + \varepsilon_{i,t} \tag{4.14}$$

and $$\frac{dPRE_{i,t}}{PRE_{i,t-1}} = C + \beta X'_{i,t-1} + \varepsilon_{i,t} \tag{4.15}$$

Model (4.14) measures the simple change in the price premium and model (4.15) measures the relative change. Tables 4.9 and 4.10 present the regression results for firms listed in the Shanghai and Shenzhen markets respectively.

Table 4.9: Cross-Sectional Regressions of Change in the Shanghai A-Shares Premium

	2001 event				QFII event			
	model 1: dpre		model 2: relative dpre		model 1: dpre		model 2: relative dpre	
C	-1.3892	-1.3386	-0.6612	-0.5861	0.3605	-0.1584	2.0039	1.4932
	(0.0161)**	(0.0775)*	(0.1560)	(0.3252)	(0.5189)	(0.8082)	(0.1385)	(0.3259)
DTE	-0.0006	-0.0006	-0.0011	-0.0011	-0.0007	-0.0007	-0.0025	-0.0024
	(0.0815)*	(0.0790)*	(0.0262)**	(0.0361)**	(0.0036)***	(0.0123)**	(0.0515)*	(0.0671)*
EPS	-0.6543	-0.5152	-0.6114	-0.4665	-0.0641	-0.2946	0.0386	-0.2782
	(0.1498)	(0.3134)	(0.4428)	(0.4919)	(0.8898)	(0.5234)	(0.9691)	(0.7820)
ROE	0.0101	0.0086	0.0039	0.0021	-0.0010	0.0009	-0.0019	0.0009
	(0.2206)	(0.3761)	(0.8061)	(0.8846)	(0.8129)	(0.8305)	(0.8485)	(0.9297)
FEG	0.0253	0.0248	-0.0064	-0.0076	0.0607	0.1176	0.0799	0.2840
	(0.1439)	(0.2538)	(0.7322)	(0.7728)	(0.3614)	(0.1426)	(0.6933)	(0.3057)
FSG	-0.0362	0.0043	-0.1160	-0.0734	0.2041	0.2169	0.3663	0.4182
	(0.7860)	(0.9728)	(0.4760)	(0.6699)	(0.0038)***	(0.0012)***	(0.0679)*	(0.0611)*
DIV	-0.0004	-0.0005	-0.0004	-0.0004	0.0001	0.0010	-0.0032	-0.0022
	(0.6647)	(0.7187)	(0.7149)	(0.7261)	(0.9719)	(0.8033)	(0.5975)	(0.7275)
FR	-0.1702	0.1296	-0.3763	-0.1001	-0.2647	-0.1965	-0.6691	-0.8961
	(0.6359)	(0.6497)	(0.3047)	(0.6833)	(0.5848)	(0.6867)	(0.4579)	(0.4108)
LMCAP1	0.0969		0.0887		-0.0106		-0.1537	
	(0.1471)		(0.2072)		(0.8776)		(0.3333)	
LMCAP2		0.0666		0.0576		0.0482		-0.0720
		(0.3501)		(0.4158)		(0.5116)		(0.6409)
LIQ	0.0034	0.0044	0.0011	0.0021	-0.0420	-0.0387	-0.1382	-0.1328

	(0.8626)	(0.8042)	(0.9666)	(0.9400)	(0.0333)**	(0.0550)*	(0.0156)**	(0.0268)**
Adj. R^2	0.2864	0.1499	0.2838	0.2174	0.1592	0.1661	0.1289	0.1200

Note: Heteroscedasticity is corrected following White (1980). Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

When the B-shares market opened up to local Chinese individuals, the B-shares price increased dramatically leading to a decline in the A-shares price premium. If what is suggested by the cross-sectional regressions in the Table 4.7 is true, that is local investors in the Shanghai market do not value firm fundamentals, I should then expect the change (relative change) in the A-shares price premium is not related to firm fundamentals. The above regression confirms that both absolute and relative declines in the price premium are statistically significantly dependent on firms' financial leverage, which would indicate Chinese investors do care about firm's financial risk, though I did not find the leverage ratio significantly attributes to the level of price premium in either the pre-2001 event or the post-2001 event sub-sample. This might mean local investors' fundamental preference is not stable, and in the year 2000 local investors show significant preference in firm's financial risk. The negative coefficient indicates Chinese individual investors would like to pay more for firms with lower financial risk indicating by lower financial leverage. The liquidity factor is not found statistically significant as the expectation that Chinese investors prefer stocks which are more liquid.

The launch of the QFII programme introduced foreign institutional investors into the A-shares market, and the introduction of QFIIs is expected to bring rational and advanced investment perception to the speculative individuals in the A-shares market.

The above result suggests a large part of the decline in the premium around the QFII launch concentrates in firms with lower financial risk and higher forecast sales growth, however I would expect that influenced by foreign institutional investors' investing preference, and the decline in the A-shares price thus premium concentrates in shares with less favourable fundamental background. The result, in stead, suggests the more favourable firm fundamentals in common view, the greater their A-shares price drop. Larger decline in the premium is also found in firms with lower relative liquidity of their A- and B-shares.

Table 4.10: Cross-Sectional Regressions of Change in the Shenzhen A-Shares Premium

	2001 event				QFII event			
	model 1: dpre		model 2: relative dpre		model 1: dpre		model 2: relative dpre	
C	-0.8149	-0.8035	0.1178	0.1143	-1.8064	-1.9971	-2.1708	-2.4332
	(0.0012)***	(0.0023)***	(0.3759)	(0.4517)	(0.3247)	(0.2899)	(0.4024)	(0.3596)
DTE	0.0005	0.0004	-0.0013	-0.0013	-0.0011	-0.0014	-0.0021	-0.0024
	(0.6139)	(0.6016)	(0.0290)**	(0.0291)**	(0.4942)	(0.4001)	(0.3766)	(0.3196)
EPS	0.0218	0.0247	-0.1439	-0.1449	-1.1408	-1.1350	-1.2757	-1.2735
	(0.9158)	(0.9095)	(0.2374)	(0.2548)	(0.2020)	(0.2012)	(0.2779)	(0.2782)
ROE	0.0018	0.0018	-0.0036	-0.0036	0.0283	0.0280	0.0314	0.0312
	(0.2396)	(0.2101)	(0.0225)**	(0.0214)**	(0.2461)	(0.2381)	(0.3285)	(0.3213)
FEG	0.0011	0.0013	-0.0066	-0.0066	-0.0190	-0.0191	-0.0348	-0.0354
	(0.9549)	(0.9423)	(0.5896)	(0.5926)	(0.8114)	(0.7871)	(0.7533)	(0.7209)
FSG	0.1223	0.1208	-0.0060	-0.0058	-0.1280	-0.1349	-0.1894	-0.1982
	(0.1557)	(01630)	(0.9151)	(0.9200)	(0.8063)	(0.7848)	(0.7968)	(0.7776)
DIV	0.0008	0.0009	-0.0026	-0.0026	0.0002	9.80E-05	-0.0013	-0.0014
	(0.7380)	(0.7156)	(0.1031)	(0.1072)	(0.9669)	(0.9801)	(0.8318)	(0.7964)
FR	-0.0412	-0.0363	-0.3437	-0.3417	0.0839	0.3230	0.1645	0.4635
	(0.7958)	(0.8057)	(0.0258)**	(0.0189)**	(0.8867)	(0.6496)	(0.8481)	(0.6561)
LMCAP1	0.0037		0.0006		0.1762		0.2128	
	(0.9033)		(0.9773)		(0.3286)		(0.4010)	
LMCAP2		0.0011		0.0010		0.1701		0.2083
		(0.9700)		(0.9617)		(0.2955)		(0.3587)
LIQ	-0.0022	-0.0023	-0.0009	-0.0008	0.1899	0.2079	0.2592	0.2827
	(0.6993)	(0.6693)	(0.8238)	(0.8313)	(0.5354)	(0.4829)	(0.5514)	(0.5039)
Adj. R^2	0.1771	0.1753	0.4360	0.4361	0.2103	0.2860	0.1129	0.1860

Note: Heteroscedasticity is corrected following White (1980). Values in the parentheses are *p*-values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

For firms listed on the SZSE, no firm fundamentals are found to be statistically significantly associated with the absolute decline in the premium. However, the larger relative decline of the premium is found to be statistically significantly concentrated in firms with lower DTE, ROE and FR. The observation indicates that Chinese investors in the Shenzhen market also prefer lower financial risk firms, though it is hard to explain they also prefer firms with lower return on equity and less shares available to the public. No examined fundamentals seem statistically significant in affecting the premium change after the QFII programme launched, which indicates the investors in the Shenzhen market do not become 'wiser' as hoped.

4.7 Summary and Discussion

In this chapter, I proposed a complementary explanation of the Chinese A-shares premium. Under this proposal, the premium reflects different valuation preferences of the investors of the A- and B-shares: the B-shares investors place more value upon information on fundamentals concerning a firm and, in contrast, the A-shares investors value shares liquidity more highly. Foreign investors would like to pay relatively more for firms backed by better fundamentals, and so these firms tend to have lower prema. This is the first study in the literature tries to explain the premium via the perspective of firm-specific characteristics. By adopting a dynamic panel data analysis, cross-sectional regressions and event studies, the relationship between the Chinese A-shares price premium and firm fundamentals, i.e., financial leverage,

profitability, future prospectus, dividend payout, corporate governance and size, has been examined between the years 1994 and 2004. I found evidence that foreign and domestic investors have different preferences on firm fundamentals.

The dynamic panel data regression is conducted upon a widely used panel error component model in previous studies (see, e.g., Domowitz *et al.*, 1997; Sun and Tong, 2000; Li, 2004; Chan and Kwok, 2005), and this specification (equation 4.4) carries some robustness. Over the entire sample period, the premia in the Shanghai market are suggested to be positively associated with firms' future prospects and negatively associated with the proportions in the annual earnings paid as dividends; while for firms listed in the Shenzhen market, those with lower returns on equity and higher market capitalizations tend to have higher A-shares premia. For firms listed on both exchanges, stocks with higher liquidity have higher A-shares premia, and this provides evidence to support the hypothesis that the local Chinese investors place more value upon shares liquidity. Among the above significant factors, the influence of two of them, future prospects and market capitalization, is contradictory with my hypothesis. The evidence suggests that the local Chinese investors do care about companies' performance in the future, and not just trade their shares every a few months. The positive sign of market capitalization suggests that the local investors do value the size factor when making valuation decisions, and actually, that they would like to pay relatively more for firms with larger size than their foreign counterparts.

The cross-sectional regressions, which are conducted over three different sub-periods, suggest that firms with higher floating ratios tend to have lower premia throughout all the sub-periods. Besides the floating ratio, the Shanghai-listed firms with higher

dividend payout ratios also tend to have lower premia before the B-shares market opened to Chinese individual investors. In addition, for firms listed in the Shenzhen market, I found those having higher returns on equity and lower future prospects tend to have lower premia before the B-shares market opened. The effects of dividend payout ratio and return on equity in the Shanghai and Shenzhen markets are also confirmed in the panel data estimation. For firms listed in the both markets, no relationship is found, at the 5% significance level, between the firm fundamentals (apart from the floating ratio) and the premium, since the B-shares market opened to Chinese individual investors. The observation suggests as the Chinese stock markets become more integrated, the investing preferences of the different investor groups also become more integrated.

The event studies provide further evidence of what kind of firms tend to have the greatest decline in the premium around the time of regulation relaxations. The evidence from the Shanghai market shows that the decline in the premium around the 2001 event concentrates in firms with lower financial risk; and the evidence from the Shenzhen market shows that, besides the financial risk, the relative decline also concentrates in firms with lower return on equity and floating ratio. With respect to the QFII programme, a larger decline is found to be concentrated in the Shanghai-listed firms with lower financial risk and higher forecast sales growth. However, in the Shenzhen market, foreign investors' valuation perception seems not to affect local investors' perception.

My new hypothesis shed light on the interpretation of the Chinese A-shares premium in two respects: Firstly, it provides evidence of whether the Chinese A-shares market,

which is dominated by individual investors, is liquidity-driven in nature. It helps to provide an answer to the question: do local Chinese individuals indeed value more about stock liquidity but care less about company fundamentals? Secondly, it helps us to identify whether firms with certain types of fundamentals tend to have higher or lower premia, and if this is so, in what way. As I have discussed, as a result of the introduction of the QFII/ QDII programmes, the Chinese stock market has been speeding up its process of opening up to the outside world. The QFII is found, on the basis of empirical evidence, not to be effective in improving the Chinese investors' investment perception. This research also provides a reference for policy makers in understanding the different behaviour patterns of different investor groups and anticipating possible outcomes of further reforms. However, as the change of Chinese exchange rate regime in 2005, only two years after the QFII are included in the study, and the result might be speculative due to lack of enough observations. Further work could involve revisiting the topic when the influence of the change in the exchange rate regime is taken into account and the possibility of the investors having time-varying preference is incorporated explicitly.

CHAPTER 5

PRICE DISCOVERY IN CHINESE STOCK MARKETS

5.1 Introduction

In this chapter, I will conduct an empirical investigation into the existence and degree of the market segmentation by examining the manner of the relationships between locally-owned and foreign-owned Chinese listed shares. According to price discovery theory, a share's market price is an equilibrium outcome of different markets or market participants' responses to newly arrived information. However, since different markets or markets participants have various capabilities in obtaining and processing the information, they understand the information in different ways and the speed of their reactions to the information may also vary. Information asymmetry can thus emerge under such circumstances. Those participants who have information advantages are able to benefit from their position, while those with information disadvantage will then follow the leading investors. Hence, a lead-lag relationship or information diffusion is generated between different markets or market participants. Since the Chinese A- and B-shares are based on the same underlying assets and subject to same macroeconomic environments and microeconomic factors, their prices are supposed to share a common trend, however one may behave with some delay in incorporating information into the current market price, given the segmented market

structure and information asymmetry. If the A-shares market is the one which takes the leading role, the current B-shares price will actually be a reflection of the lagged price information in the A-shares market, and information of lagged A-shares returns will be helpful in forecasting current B-shares returns, and *vice versa*.

It is typically documented in the finance literature that domestic investors, compared with foreign investors, are better informed about the value of local assets (Brennan and Cao, 1997; Kang and Stulz, 1997; Choe, *et al.*, 2000; Hau, 2001; Dvorak, 2005), however, there is also evidence found supporting different opinion, namely foreign investors are better informed and outperformed than local investors (Grinblatt and Keloharju, 2000; Seaholes, 2000; Froot and Ramadorai, 2007). Among all the literature examining the information asymmetry between local investors groups and foreign investors groups, effort has also been made to verify the information adjustment process in the Chinese stock markets, and the findings are controversial.

The first set of literature supports the view that domestic investors are better informed about the value of local assets. Employing a Vector Error Correction Model (VECM), Sjoo and Zhang (2000) found supportive evidence in the Shenzhen market that there exists important long-run information diffusion from the A-shares to the B-shares between July 1993 and June 1997. Using direct graph theory and multivariate GARCH model estimation, Lin and Wu (2003) found that for the four Chinese domestic markets, spillover in mean returns went uni-directionally from the A-shares market to the B-shares market in the period of 5 January 2000 to 30 May 2003. In addition, Wu and Zhu (2002) examined daily return data of 75 firms one year before and after the 2001 event to identify how the information diffusion between the A- and

B-shares markets affected by the opening of the B-shares market, and they found the two markets were strictly segmented before the B-shares market opened to Chinese local individuals, while after the event, the two markets tended to be semi-segmented with information flows from Chinese investors to foreign investors. While considering daily return data may not be the best basis on which to uncover a rapid dynamic relationship, Chan *et al.* (2007) conducted a comprehensive analysis using high-frequency transactions data, which gives direct evidence of which market is faster in processing and discovering information and of the nature of the informational linkage between the A- and B-shares markets. Their results suggest that the local investors dominate the price discovery process both pre- and post- the 2001 open market reform. Wang (2006) applied a GARCH model to examine the cross-autocorrelation pattern between daily portfolios returns before and after China opened its once foreign-exclusive B-shares market, and a leading role of A-shares portfolio is identified. By implementing a nonlinear Granger causality test, Qiao *et al.* (2008) provided evidence of A-shares markets tend to lead their B-shares counterparts in the same stock exchange after the 2001 policy allowing domestic citizens to invest in the B-shares markets.

The second set of literature provides contrary evidence. Chui and Kwok (1998) argue foreign institutional investors, who are the major participants of the B-shares market, have noticeable professional experience and advanced knowledge in processing and analyzing information, and they also have better channels in exploring new information, while the A-shares market is mainly composed of individual investors who lack access to information and receive information slower than the foreign

participants. Those individuals are hence more likely to condition their trading decisions on the previous movements of the B-shares. Using weekly data between July 1993 and June 1997, Sjoo and Zhang (2000) found supportive evidence of foreign investors being better informed in the Shanghai market, which compared with the Shenzhen market, is more sizeable and liquid. Kim and Shin (2000) found although the A-shares tended to lead the B-shares before 1996, when the Asian Financial Crisis took place, the B-shares became more influential. Yang (2003) examined Shanghai A-shares, Shanghai B-shares, Shenzhen A-shares, Shenzhen B-shares, Hong Kong H-shares and red chip stock market price indexes, and concluded that foreign investors in the Shanghai B-shares market are better informed than Chinese domestic investors in the two A-shares markets and foreign investors in the Shenzhen and Hong Kong markets over time.

The third set of literature argues the information flow between domestic and foreign investors is bi-directional. Wo (1997) conducted a bivariate Granger causality test of A- and B-shares returns and found evidence of two-way information flows between January 1993 and October 1995. Chakravarty *et al.* (1998) also found there is a bi-directional information flow between the Chinese A- and B-shares markets, even if it is more likely the return of A-shares takes the leading role.

There is another set of literature which takes the view that there does not exist any information asymmetry between the different groups of investors. Chen *et al.* (2001) found there is no information feedback in Chinese stock markets and the A- and B-shares markets are perfectly segmented. The analyses of variance decompositions conducted by Darrat *et al.* (2006) suggested that there is no information asymmetry

between the A- and B-shares markets in both before and after February 2001 open market reform periods, though the prices of the two markets are closely linked over the long-run.

It can be seen from the above review of relevant studies that the issue of whether foreign investors are less well informed than Chinese domestic investors is controversial. This may simply reflect the fact that different data samples and different time periods are used in the various studies, as well as different methodologies having been employed in the research. I will, in this chapter, provide further evidence of the lead-lag effects between the Chinese A- and B-shares with a more complete dataset, which includes the time period after QFIIs entered the domestic market. This is the first contribution of this chapter.

Most previous studies used the official price indexes released by stock exchanges as the research object, however, firms which issue the A- and B-shares at the same time only comprise less than 10% of the listed firms included in calculating the official indexes. The inclusion of the other 90% firms is very likely to lead to biased results, and in order to avoid the sample selection bias I will conduct the investigation only based on stocks issued by dual-listed firms. This is the second contribution of this chapter: a new aggregated price, based on which following analyses conducted, will be constructed.

New econometric methodologies are employed. In addition to the traditional and most used Granger causality test, I also utilize the more recently developed Toda-

Yamamoto (1995) causality test to provide a more robust result. Besides the investigation based on the self-calculated aggregate price, I further examine the contribution of individual firms by employing a panel data analysis. Up to my best knowledge, this is the first time panel data techniques are used to examine the issue of information flows in the Chinese A- and B-shares markets. Panel data analysis enables us more power to identify data properties by providing a fuller insight into both the time-series and cross-sectional dimensions.

The fourth contribution of this chapter arises from looking further into sub-periods divided according to the policy changes when I examine more closely the effectiveness of the 2001 open market reform and QFII programme. The effect of opening the B-shares market to local Chinese investors has been examined extensively (as outlined previously), however the effectiveness of the QFII programme still lacks sufficient attention after its launch five years ago. The comparison of the interaction of different stock classes in different time horizons will provide some new empirical evidence of the effectiveness, in term of the market integration, of the QFII programme.

The remainder of this chapter is organized as follows: Section 5.2 will investigate the segmentation/ integration status of the Chinese stock markets, lead-lag relationships between the Chinese A- and B-shares, and short-run interactions between them, by using the self-calculated aggregate price. Employing recently developed panel data techniques, the issue will be re-examined in Section 5.3. Section 5.4 will provide a summary.

5.2 Investigation on An Aggregate Level

Lead-lag relationships between the Chinese A- and B-shares are firstly examined on an aggregate level. The use of aggregate price is consistent with most of previous studies regarding the information diffusion in the Chinese stock markets, however, my study will provide results from a more appropriate dataset and a more complete time span. Both a Granger-type causality test (1969) in a VAR framework, which is the most popular methodology that has been used in the field, and the most recently developed Toda-Yamamoto (1995) approach, are employed to detect lead-lag relationships in the Chinese markets. The Granger causality test requires precise knowledge of the integration properties of the system, thus pretests of unit roots and cointegrating rank will be conducted first. Section 5.2.1 describes the data and summary statistics. Econometric methodologies employed are introduced in Section 5.2.2, including Augmented Dickey Fuller (1979) and Phillips-Perron (1988) unit root tests, Johansen (1991, 1995) cointegration procedure, Granger-type and Toda-Yamamoto (1995) causality tests and Pesaran and Shin's generalized impulse response functions (1998). Empirical evidence will be provided in Section 5.2.3, and finally Section 5.2.4 summarizes.

5.2.1 Data and Preliminary Description

Daily adjusted closing prices of individual A-shares and B-shares are collected from the Datastream database. The prices of both the A-shares and B-shares are expressed in Chinese currency, yuan. The companies included in the sample are same as the ones used in Chapter 4, and the name lists are available in the Appendices D and E.

The aggregated price of A-shares portfolio and B-shares portfolio are computed by taking the weighted average price of individual shares and the number of total outstanding shares of each particular share class is used as the weight[1]. When there is no trading on a particular day, the price is considered as the closing price of the last trading day. The entire sample starts from 3 January 1994 and ends at 31 December 2004[2], and is further split into three sub-periods: 3 January 1994 to 16 February 2001, 28 February 2001 to 8 July 2003, and 9 July 2003 to 31 December 2004, to account for potential structural breaks as well as test the effectiveness of the structural changes brought by China's opening its once foreigner-only shares to domestic individual investors and opening the domestic market to certain foreign institutions respectively.

Table 5.1 provides a description of the summary statistics of the daily rate of return. The daily rate of return is calculated based on the conventional first difference of logarithmic prices: $R_{i,t} = \log P_{i,t} - \log P_{i,t-1}$, where $R_{i,t}$ denotes the rate of return for the *i*th market on day *t* and $P_{i,t}$ denotes the corresponding market price. On average, the A-shares bring higher returns to investors in the strictly segmented period, however since the B-shares made available to Chinese investors in 2001, the B-shares portfolio started to outperform slightly. Comparing between the exchanges, in all sub-samples, the Shenzhen A-shares provide higher rate of returns to investors comparing with the Shanghai A-shares, and the Shenzhen B-shares also generate higher returns with only one exception in the first sub-period. In addition, it is suggested that the B-shares

[1] Because of the existence of non-tradable shares in China, the use of the number of tradable shares as the weight is supposed to be more appropriate, however Datastream does not provide such information and the data provided by the Tianxiang Investment Consultant, obtained from individual companies' semi-annual reports, are not frequent enough to capture the change in the weight. In addition, the use of number of total outstanding shares as a weight is actually consistent with the way the official shares indexes released by the exchanges calculated.

[2] I did not include the more recent post-2004 data due to China's exchange rate regime reform in 2005. For more details, please refer to the Section 4.3.

listed on both exchanges have been exhibiting more volatile than the A-shares post the 2001 event. All series can be considered as normally distributed.

Table 5.1: Summary Statistics of Chinese Shares' Returns

	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
		Panel A: 3 Jan 1994-16 Feb 2001		
Mean	0.0002	-3.26E-06	0.0003	-0.0001
Median	0.0000	-0.0002	0.0000	-8.96E-05
Maximum	0.3072	0.4012	0.2916	0.4132
Minimum	-0.1794	-0.1292	-0.2043	-0.1860
Std. Dev.	0.0271	0.0240	0.0268	0.0256
Skewness	1.7602	2.8556	0.9907	2.4482
Kurtosis	24.8531	48.1984	19.8454	45.7553
Jarque-Bera	37951	160766	22284	143452
Probability	0.0000***	0.0000***	0.0000***	0.0000***
		Panel B: 28 Feb 2001-8 Jul 2003		
Mean	-0.0005	0.0003	-0.0004	0.0006
Median	0.0000	0.0000	0.0000	0.0000
Maximum	0.0908	0.0939	0.0892	0.0928
Minimum	-0.0571	-0.1002	-0.0607	-0.0909
Std. Dev.	0.0155	0.0226	0.0147	0.0237
Skewness	0.7059	0.2971	0.6568	0.4061
Kurtosis	8.3092	7.8847	9.0907	6.9000
Jarque-Bera	772.11	619.47	993.20	406.00
Probability	0.0000***	0.0000***	0.0000***	0.0000***
		Panel C: 9 Jul 2003-31 Dec 2004		
Mean	-0.0012	-0.0012	-0.0009	-0.0003
Median	-5.53E-05	-0.0006	-0.0008	0.0000
Maximum	0.0442	0.0590	0.0438	0.0751
Minimum	-0.0565	-0.0901	-0.0463	-0.0614
Std. Dev.	0.0140	0.0143	0.0126	0.0152
Skewness	-0.0517	-0.2309	0.3605	0.2031
Kurtosis	4.2414	9.4523	4.0200	5.9896
Jarque-Bera	25.023	674.77	25.162	146.78
Probability	0.0004***	0.0000***	0.0003***	0.0000***

Note: '***' indicates significant at the 1% level.

Table 5.2 provides statistic information on the pair-wise correlation between the return of different portfolios. Positive correlations are found with almost all pairs. The correlation of Shanghai A-shares returns and Shanghai B-shares returns increased from 0.27 to 0.67 after the open B-shares market reform, and further increased to 0.74 after the QFII programme operated. The same trend can be found in the Shenzhen market as well with the correlation increased from 0.28 to 0.68 and further to 0.77. The observation indicates the linkage between the Chinese A-shares and B-shares markets may, to some extent, have strengthened. The correlations between different exchanges reached the highest in the second sub-period. Overall, the linkage of the A-shares return between the Shanghai and Shenzhen markets is suggested to be closer than the B-shares'.

Table 5.2: Correlations of the Chinese Segmented Markets

	Panel A: 3 Jan 1994-16 Feb 2001			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.2663	0.7948	0.2508
RSHH_B	0.2663	1.0000	0.2419	0.6912
RSHZH_A	0.7948	0.2419	1.0000	0.2811
RSHZH_B	0.2508	0.6912	0.2811	1.0000
	Panel B: 28 Feb 2001-8 Jul 2003			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.6714	0.9124	0.6504
RSHH_B	0.6714	1.0000	0.6557	0.8798
RSHZH_A	0.9124	0.6557	1.0000	0.6768
RSHZH_B	0.6504	0.8798	0.6768	1.0000
	Panel C: 9 Jul 2003-31 Dec 2004			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.7402	0.8886	0.6799

RSHH_B	0.7402	1.0000	0.7569	0.7796
RSHZH_A	0.8886	0.7569	1.0000	0.7666
RSHZH_B	0.6799	0.7796	0.7666	1.0000

The natural logarithm and first difference of the constructed prices from different sample periods are plotted in Figures 5.1-5.3 respectively. All series seem autocorrelated in levels, while appear stationary in first differences. I thus would expect all the series to be I (1).

Figure 5.1: Plots of Chinese Shares' Price and Return (3 Jan 1994-16 Feb 2001)

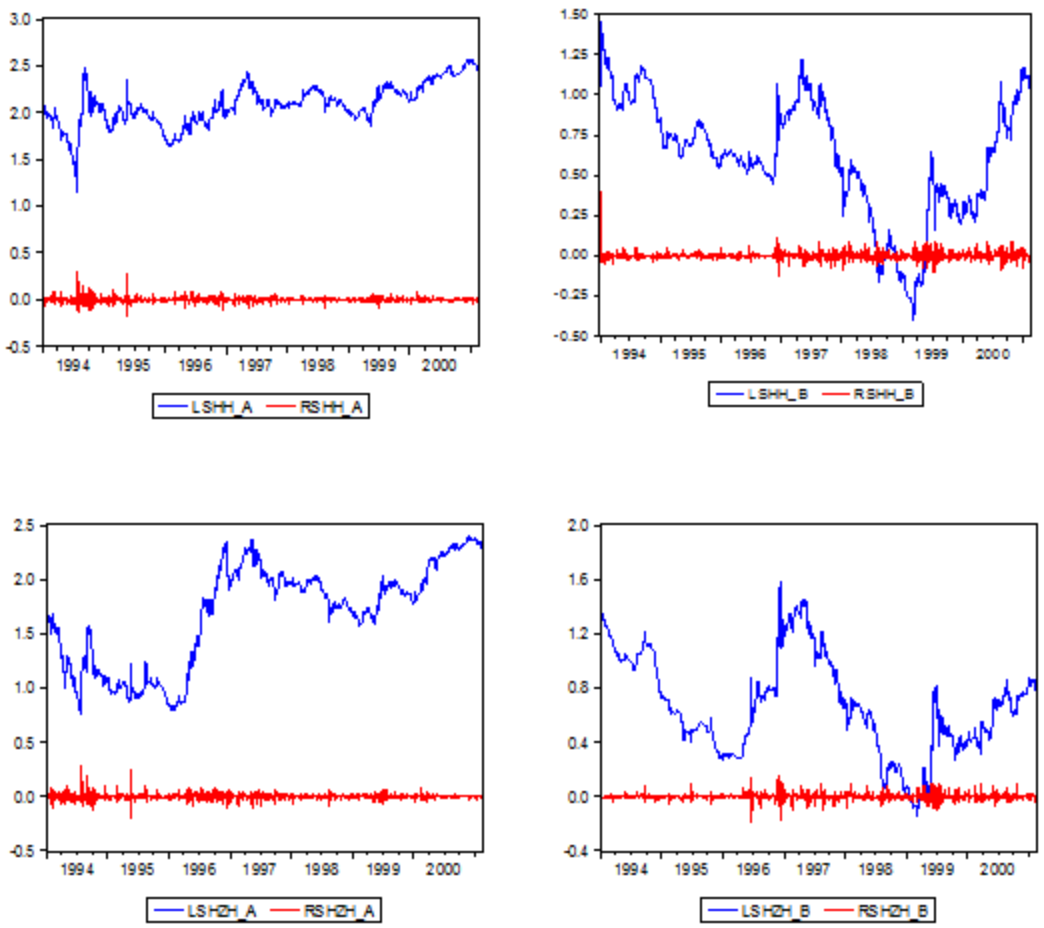


Figure 5.2: Plots of Chinese Shares' Price and Return (28 Feb 2001-8 Jul 2003)

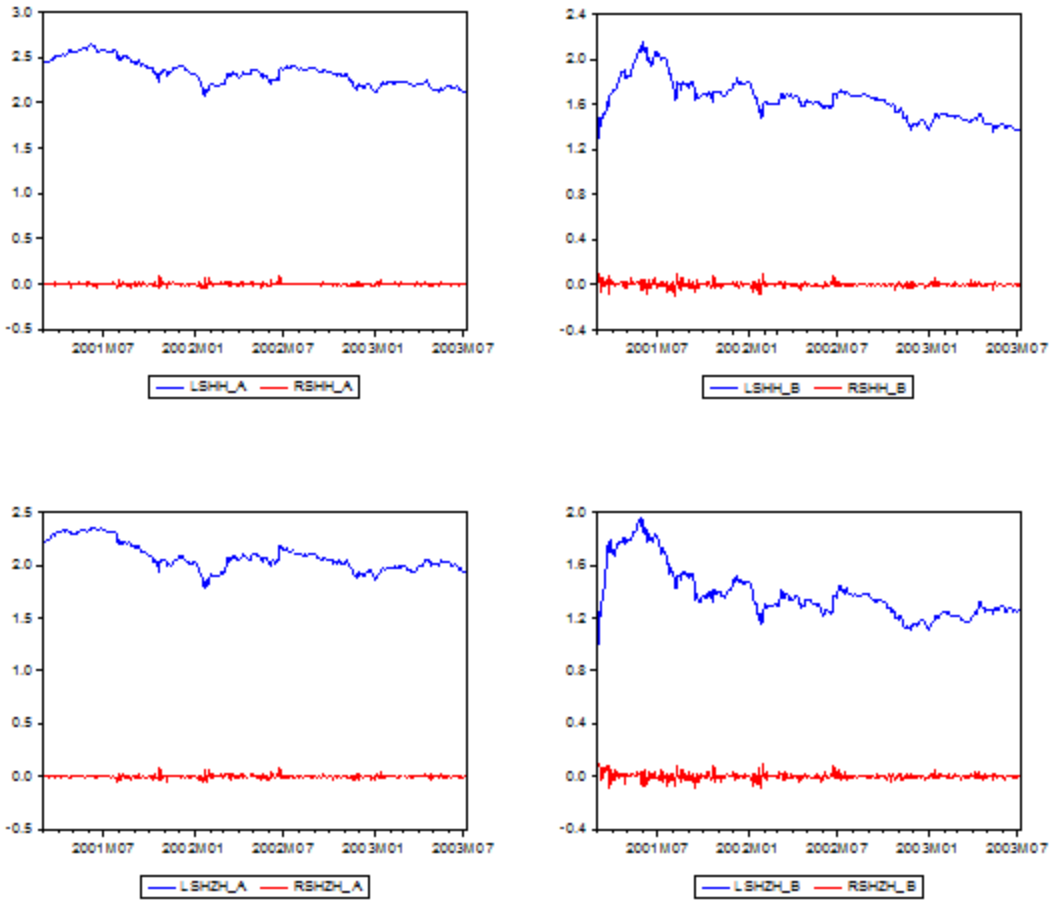


Figure 5.3: Plots of Chinese Shares' Price and Return (9 Jul 2003-31 Dec 2004)

5.2.2 Empirical Methods

In this section, econometric methodologies proceed in following empirical analyses are outlined briefly. Firstly, I conduct the Augmented Dickey-Fuller (1979) and Phillips-Perron (1988) unit root tests in levels and first differences for each series to see whether the series have mean reversed properties. Secondly, I apply the Johansen (1991, 1995) procedure to test for possible cointegration relationships between any

pairs of the markets. Thirdly, I test for Granger causality depending on whether the series examined share common trend in their movements: an error correction component justified by Engle and Granger (1987) will be employed if an assumption of cointegration is reasonable. In addition to the traditional Granger-type causality test, I also employ the Toda and Yamamoto (1995) procedure to consider the robustness of the results. Lastly, I further look at the generalized impulse response functions (GIRFs) suggested by Pesaran and Shin (1998) to capture the transmission of time-lagged information among markets and reveal the short-term dynamics of their causal linkages.

5.2.2.1 Unit Root Tests

There are a number of ways to conduct a unit root test (e.g., Dickey and Fuller, 1979; Phillips and Perron, 1988; Kwiatkowski *et al*, 1992; Leybourne and McCabe, 1994; Elliott *et al*, 1996; Perron and Ng, 1996; Ng and Perron, 2001), however, I will only discuss two of the most popular used techniques which will be applied in the following study: Augmented Dickey-Fuller test and Phillips-Perron test.

Augmented Dickey-Fuller (ADF) Test

The first unit root test has its roots in the paper by David Dickey and Wayne Fuller (1979) and is named after them. The intuition and process of it can be described as following:

Consider an AR (1) model:

$$y_t = c + \beta y_{t-1} + \varepsilon_t \tag{5.1}$$

where $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. y_t has a unit root if β=1. If one series has a unit root then its autocorrelations will be near one and will not drop much as lag length increases; it will have a long memory and exhibit trend behaviour. With the stochastic trend contains in y_t, standard regression inference measures can be very misleading in that *t*-values and *R*-square can both be overstated. Thus it is essential to identify the integration of the series when dealing with financial data.

By subtracting y_{t-1} from both sides, we can get a modified version of the AR (1) model:

$$\Delta y_t = c + \phi y_{t-1} + \varepsilon_t \tag{5.2}$$

where $\phi = \beta - 1$. The Dickey-Fuller test now tests the null hypothesis of a unit root $H_0 : \phi = 0$ against the alternative $H_1 : \phi < 0$. Since the test is done over the difference term, it is not possible to use standard *t*-distribution to as critical values. These critical values are derived from a limiting distribution that can be represented as a functional of Brownian motion and, to this day, they are derived in tables through simulation (see, e.g., MacKinnon, 1996) of this distribution.

There are three main versions of the DF test when considering whether to include a constant and/or deterministic trend:

Test for a unit root: $\Delta y_t = \phi y_{t-1} + \varepsilon_t$ (5.3)

Test for a unit root with drift: $\Delta y_t = c + \phi y_{t-1} + \varepsilon_t$ (5.4)

Test for a unit root with drift and deterministic time trend:

$$\Delta y_t = c + \gamma t + \phi y_{t-1} + \varepsilon_t \tag{5.5}$$

Each version of the test has its own distribution and critical values which depend on the size of the sample. A sample value less negative than the critical values suggests that we cannot reject the null that y_t has a unit root.

While the DF test only applies to AR (1) model, the Augmented Dickey-Fuller test is an extension version of the DF test for a larger and more complicated set of time series models. The testing procedure for the ADF test is the same as for the DF test but it is applied to AR (p) model:

$$\Delta y_t = c + \gamma t + \phi y_{t-1} + \delta_1 \Delta y_{t-1} + ... + \delta_p \Delta y_{t-p} + \varepsilon_t \tag{5.6}$$

where p is the lag order of the autoregressive process.

Choosing the order p of an autoregression is a very important issue as it requires balancing the benefit of including more lags against the cost of additional estimation uncertainty. On the one hand, if the order of an estimated autoregression is too low, potentially valuable information contained in the more distant lagged values will be omitted. On the other hand, if it is too high, more coefficients than necessary will be estimated, which in turn introduces additional estimation error. A widely used approach in practice, Akaike Information Criterion (AIC) is applied in the study to choose the optimal p. The calculation of AIC is as following:

$$AIC(p) = \ln(\frac{SSR(p)}{T}) + (p+1)\frac{2}{T} \tag{5.7}$$

where, SSR (p) is the sum of squared residuals of the estimated AR (p). The AIC estimator of p, $\hat{p}$, is the value that minimizes AIC (p) among the possible choices p = 0,1,…, p_{max}, where p_{max} is the largest value of p considered. The AIC trades off the two forces in the above equation: SSR (p) necessarily decreases when an additional lag added, while in contrast, the second term in (5.7) increases, so that the number of lags that minimizes the AIC is a consistent estimator of the true lag length.

Again, the ADF statistic does not have a normal distribution, and the critical values can be found in ADF simulation tables (see, e.g., MacKinnon, 1996).

Phillips-Perron (PP) Test

An alternative way to test for the stationarity of series is the Phillips-Perron test, which is also widely used in econometric software packages. Phillips and Perron (1988) developed a more comprehensive theory of unit root nonstationarity. Basically the test is similar to the standard DF or ADF test, but it is more powerful in term of it incorporates an automatic correction to the DF or ADF procedure to allow for autocorrelated residuals.

Consider the AR (1) model (5.1), the PP method modifies the t-ratio of the ϕ coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. The statistic PP test based on is:

$$\overline{t_\phi} = t_\phi \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)(se(\hat{\phi}))}{2 f_0^{1/2} s} \tag{5.8}$$

where $\hat{\phi}$ is the estimate, and t_ϕ is the *t*-ratio of ϕ, $se(\hat{\phi})$ is coefficient standard error, and *s* is the standard error of the test regression. In addition, γ_0 is a consistent estimate of the error variance in (5.3) calculated as $(T-k)s^2/T$, where *k* is the number of regressors. The remaining term, f_0, is an estimator of the residual spectrum at frequency zero, and is based on kernel-based sum-of-covariances in our tests.

Besides the advantage that the PP test corrects for any serial correlation and heteroskedasticity in the error term, it also has the advantage over the ADF test that the user does not have to specify a lag length for the test regression. Its disadvantage is that it is an asymptotic procedure and may not be fully appropriate with finite sample. In order to seek a more robust result, I will apply both the ADF and PP tests with the sample.

5.2.2.2 Cointegration and Error Correction Mechanism

The concept of cointegration is recognized as a milestone to examine the equilibrium relationships of two or more time series, which individually appear to be wondering erratically, in the long-run. The series are called cointegrated if there exists a causal relationship among them that a movement in one leads to a movement in the others at least given time for adjustment to short-run changes; in simpler words, in the long-run, they move together. When the series are cointegrated, the spurious regression will not be a problem. There are two approaches, the two-step Engle-Granger (1987) test and Johansen's (1991, 1995) test, popularly used in practice to examine the existence of such equilibrium relationships.

The insight on Engle-Granger's test is based on the DF test outlined above. Assume two time series y_1 and y_2 are both integrated to the same order I (1), if y_1 and y_2 are cointegrated, then there must exist a coefficient θ, makes $y_{2,t} - \theta y_{1,t}$ stationary. Otherwise, $y_{2,t} - \theta y_{1,t}$ is nonstationary, i.e., I (1), and series y_1 and y_2 are not sharing same trend. Thus, the two-step E-G test can be conducted as the following: firstly, run a normal OLS $y_{2,t} = c + \theta y_{1,t} + \varepsilon_t$, and save the residual ε_t, which can be viewed as the term $y_{2,t} - \theta y_{1,t}$; secondly, carry out a DF test on the residual series, without including a deterministic trend. If the unit root hypothesis is rejected then we conclude that y_1 and y_2 are cointegrated; however, if the unit root is accepted then conclude cointegrating relationship does not exist. One thing we need to mention is that the standard DF test critical values are not appropriate in the context of this residual based test. A set of critical values can be obtained from Engle and Granger (1987).

An alternative method of detecting any cointegrating relationship is Johansen's (1991, 1995) approach. It is becoming more and more popular in applied economics recently. The Johansen's approach is based on a vector autoregressive (VAR) system. The VAR system is described as a symmetric dynamic system where all variables are treated as endogenous. In particular, each variable in the system is explained as a linear function of its own lagged values and the lags of all the other variables in the model.

Consider a VAR which includes number p of lags,

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} \ldots + A_p y_{t-p} + \varepsilon_t \tag{5.9}$$

where y_t is a k-vector of non-stationary I (1) variables, ε_t is a vector of uncorrelated error terms.

The equation (5.9) can be rewritten as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \tag{5.10}$$

$$\text{where } \Pi = \sum_{i=1}^{p} A_i - I \,,\ \Gamma_i = -\sum_{j=i+1}^{p} A_j \tag{5.11}$$

of which, I is an identity matrix, Π can be interpreted as a long-run coefficient matrix which contains the information on the pos sible cointegration relationships.

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r<k$, then there exist $k \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is I (0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. Johensen's method is to estimate the Π matrix from an unrestricted VAR and to test whether one can reject the restrictions implied by the reduced rank of Π. If the variables are not cointegrated, then rank of Π will not be significantly different from zero. There are two test statistics for cointegration under the Johansen's approach, which are formulated as:

$$\lambda_{trace}(r) = -T \sum_{i=t+1}^{g} \ln(1 - \hat{\lambda}_i) \tag{5.12}$$

$$\text{and } \lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{5.13}$$

where T is the number of usable observations; $\hat{\lambda}_i$ denotes the estimated value of the characteristic root (eigenvalue) obtained from the estimated Π matrix; r is the number of cointegrating vector.

The trace statistic tests the null hypothesis of at most r cointegration relationships against an unspecified or general alternative in a likelihood ratio framework, while the maximum eigenvalue statistic conducts separate tests on each eigenvalue and tests the null hypothesis of r cointegration relationships against the defined alternative of r+1 cointegration relationships.

If the series being examined are cointegrated, then the relationship between them can be expressed as an Error Correction Mechanism (ECM), or VECM in a VAR framework. The VECM has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment from a disequilibria state to an equilibrium state.

Take a simplest possible version, consider a bivariate VAR system with one cointegrating equation and no lagged difference terms, the cointegrating equation is:

$$y_{2,t} = \beta y_{1,t} \tag{5.14}$$

The corresponding VECM is:

$$\begin{aligned} \Delta y_{1,t} &= \alpha_1 (y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{1,t} \\ \Delta y_{2,t} &= \alpha_2 (y_{2,t-1} - \beta y_{1,t-1}) + \varepsilon_{2,t} \end{aligned} \tag{5.15}$$

In this simple model, $y_{2,t-1} - \beta y_{1,t-1}$ is the so called error correction term, $\varepsilon_{i,t}$ (i=1,2) is the error in the VEC model. The error correction term can be considered as an equilibrium error. In long run equilibrium, it is zero, however, if y_1 and y_2 deviate from the long run equilibrium, the error correction term will be nonzero and each variable adjusts to partially restore the equilibrium relation. The coefficient α_i measures the speed of adjustment of the i-th endogenous variable towards the equilibrium. Assume the error correction term is positive, which implies that $y_{i,t-1}$ is too high to be in equilibrium. A negative α_i will then generate a negative $\Delta y_{i,t}$ and brings $y_{i,t}$ back to the equilibrium. In the case $y_{i,t-1}$ is below the equilibrium level, the opposite will hold: it will start increasing in the next period and the equilibrium error will be corrected in the model.

5.2.2.3 Causality Tests

Granger-Type Causality Test

The Granger-type causality test is one of the possible statistical tests that can be used to investigate the causality relationship between different markets. To detect the lead-lag relationship of A-shares and B-shares markets, in other words, the direction of the causality between A-shares and B-shares' returns, I will, in this section, introduce this most popular and representative methodology of practice.

Again, I use a simple bivariate VAR system as an example. The form of the causality test depends on whether the series being examined are cointegrated.

The following model is adopted if there is no cointegrating relationship between them:

$$\Delta y_{1t} = c_1 + \sum_{i=1}^{m} \theta_{11}^{i} \Delta y_{1,t-i} + \sum_{i=1}^{m} \theta_{12}^{i} \Delta y_{2,t-i} + \varepsilon_{1t}$$

$$\Delta y_{2t} = c_2 + \sum_{i=1}^{m} \theta_{21}^{i} \Delta y_{1,t-i} + \sum_{i=1}^{m} \theta_{22}^{i} \Delta y_{2,t-i} + \varepsilon_{2t} \qquad (5.16)$$

where Δy_{1t} and Δy_{2t} denote the return series for any two portfolios being examined, $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is the vector of the corresponding error terms and m is the optimal lag length obtained by using AIC.

If two series being examined are cointegrated, I then follow many studies in the field, for example, Kim and Shin (2000), to impose the error correction term on (5.16):

$$\Delta y_{1t} = c_1 + \alpha_1 ECM_{t-1} + \sum_{i=1}^{m} \theta_{11}^{i} \Delta y_{1,t-i} + \sum_{i=1}^{m} \theta_{12}^{i} \Delta y_{2,t-i} + \varepsilon_{1t}$$

$$\Delta y_{2t} = c_2 + \alpha_2 ECM_{t-1} + \sum_{i=1}^{m} \theta_{21}^{i} \Delta y_{1,t-i} + \sum_{i=1}^{m} \theta_{22}^{i} \Delta y_{2,t-i} + \varepsilon_{2t} \qquad (5.17)$$

The error correction term makes the VAR system does not throw away long run information caused by differencing. The Granger causality test examines the null hypothesis that $\theta_{12}^{i}=0$ or $\theta_{21}^{i}=0$, for all i (i=1,2,…,m), in the usual manner. If the null hypothesis that $\theta_{12}^{i}=0$ for all i (i=1,2,…,m) cannot be rejected I then conclude past values of Δy_2 are helpful in explaining Δy_1, thus Δy_2 Granger causes Δy_1; similarly, if the null hypothesis that $\theta_{21}^{i}=0$ for all i (i=1,2,…,m) cannot be rejected I then conclude past values of Δy_1 provide additional information in explaining Δy_2, thus Δy_1 is said Granger causes Δy_2. If both hypotheses cannot be rejected, then I conclude

the causality is bi-directional, i.e., past values of both variables provide additional information in forecasting the current value of the other variable.

Tests of the hypotheses require the Wald statistics which follow a chi-squared distribution, and it is essential to make sure all the variables included are stationary.

Toda-Yamamoto (1995) Causality Test

An alternative to the conventional Granger-type causality test is the so called Toda-Yamamoto (1995) causality test. This procedure was suggested with the objective to overcome the problem of invalid asymptotic critical values when causality tests are performed in the presence of non-stationary series. It has the advantage of avoiding pretesting the variables for the integration and cointegration properties, provided the maximal order of integration of the process does not exceed the true lag length of the VAR model.

The Toda and Yamamoto (1995) procedure is basically based upon the test equations of Granger, but augmented with extra lags (d_{max}) depending on the potential order of integration of the series of interest. If the series are assumed to be I(1), one extra lag is added to each variable in the test equation. If both variables are assumed to be I(0), no extra lag is added in the equation, and the Toda-Yamamoto test is equivalent to the Granger causality test. Modified Wald tests are then carried out on the matrix of the first k (number of lags suggested by the AIC) coefficients rather than all lagged coefficients to determine the direction of causality on a usual manner.

5.2.2.4 Generalized Impulse Response Functions (GIRFs)

The examination of causality in a VAR suggests which of the variables in the model statistically significantly impact on the future values of each of the variables in the system, but it cannot reveal whether changes in the value of a given variable have a positive or negative effect on the other variable in the system, or how long it would take for the effect of that variable to work through the system. Such information will, however, be given by an examination of the VAR's impulse responses.

The traditional impulse response function (TIRF) is defined as:

$$TIRF = (n, \delta, \varpi_{t-1}) = E\left[y_{t+n} \middle| \varepsilon_t = \delta, \varepsilon_{t+1} = 0, ..., \varepsilon_{t+n} = 0, \varpi_{t-1} \right] - E\left[y_{t+n} \middle| \varepsilon_t = 0, \varepsilon_{t+1} = 0, ..., \varepsilon_{t+n} = 0, \varpi_{t-1} \right] \quad (5.18)$$

where y_t is a random vector, ε_{t+i} is a random shock, ϖ_{t-1} is a specific realisation of the information set Ω_{t-1} and n is the forecast horizon. Thus we have a realisation of y_{t+n} generated by the system when it is hit by a shock of size δ for $i = 0$ while all shocks are equal to zero for $i = 1,2,\ldots,n$, and a realisation of y_{t+n} when $\varepsilon_{t+i} = 0$ for all $i = 0,\ldots,n$ (the benchmark representation). It measures the effect of a shock of size δ hitting the system at time t on the state of the system at time $t+n$, given that no other shocks hit the system.

However, TIRF suffers from a critical problem: it is not realistic to require the error terms of all other equations in the VAR system are held constant, since the error terms are likely to be correlated across equations to some extent. Different results may be obtained by assuming different ordering of variables entering the system.[3]

To address the problem of the ordering dependence of the TIRF, Pesaran and Shin

[3] For more discussion, see Enders, 2004, pp. 274-276.

(1998) proposed the Generalized Impulse Response Function (GIRF) methodology. Instead of controlling the impact of correlation among residuals, the GIRF follows the idea of a nonlinear impulse response function and computes the mean impulse response function. It computes the mean by integrating out all other shocks. When one variable is subjected to a shock, other variables also vary as is implied by the covariance.[4]

In an augmented vector autoregressive model described by Pesaran and Shin (1998):

$$x_t = \sum_{i=1}^{p} \Phi_i x_{t-i} + \Psi w_t + \varepsilon_t, \quad t=1,2,\ldots,T \tag{5.19}$$

where $x_t=(x_{1t},x_{2t},\ldots,x_{mt})$'is an $m\times1$ vector of jointly determined dependent variables, w_t is an $q\times1$ vector of deterministic and/ or exogenous variables, and $\{\Phi_i, i=1, 2,\ldots,p\}$ and Ψ are $m\times m$ and $m\times q$ coefficient matrices. Under certain assumptions[5], a generalized impulse response function can be expressed by:

$$\psi_j^g(n) = \sigma_{jj}^{-\frac{1}{2}} A_n \sum e_j, \qquad n=0,1,2,\ldots \tag{5.20}$$

which measures the effect of one standard error shock, i.e. $(\sigma_{jj})^{1/2}$, to the jth equation at time t on expected values of x at time $t+n$, and where A_n is a coefficient matrix and $A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + \ldots + \Phi_p A_{i-p}$, and e_j is an $m\times1$ selection vector with unity as its jth element and zeros elsewhere.

As for a VECM:

[4] For more details, see Pesaran and Shin, 1998, Generalized impulse response analysis in linear multivariate models, *Economics Letters*, 58(1): 17-29.
[5] See Lütkepohl, 1991 (Chapter 2), and Pesaran, M. H. and Pesaran, B., 1997 (Section 19.3).

$$\Delta x_t = -\Pi x_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta x_{t-i} + \Pi \Lambda w_t + u_t, \qquad t=1,2,\ldots,T \tag{5.21}$$

where $\Pi = I_m - \sum_{i=1}^{p} \Phi_i$, $\Gamma_i = -\sum_{j=i+1}^{p} \Phi_j$ for i=1,2,…,p-1, and Λ is an $m \times g$ matrix of unknown coefficients. The generalized impulse response function for x_t with respect to a shock in the jth equation is given by:

$$\psi_{z,j}^{g}(n) = \beta' B_n \sum \frac{e_j}{(\sigma_{jj})^{1/2}}, \qquad \text{n=0,1,2,……} \tag{5.22}$$

where β' is a cointegrating vector and B_n is a cumulative effect matrix.

5.2.3 Empirical Findings

In this section, the empirical evidence, by applying the outlined econometric techniques discussed above, is presented.

5.2.3.1 Unit Root Tests

Both the ADF and PP procedures are applied to verify the order of integration of the price series. Table 5.3 presents the results of tests on the levels of natural logarithm of the price series. Generally, the ADF and PP tests provide similar results. In Panel A, the null hypothesis of there is a unit root cannot be rejected at the 5% significance level for almost all the series, with one exception of the Shanghai A-shares when a time trend is included in the testing specification. In Panel B, both methods suggest the Shanghai B-shares prohibit a stationary property when considering a time trend in the model. The Shenzhen B-shares is suggested to be stationary by the PP test, whether or not a time trend is included, however there is not enough evidence of

rejecting the null hypothesis when the ADF is employed. In Panel C, all series are suggested to be nonstationary.

Table 5.3: Unit Root Tests on Levels

	ADF		PP	
	Intercept	Intercept&Trend	Intercept	Intercept&Trend
		Panel A: 3 Jan 1994-16 Feb 2001		
Shanghai A-shares	-2.5615	-4.2048	-2.5534	-3.8869
	(0.1013)	(0.0044)***	(0.1031)	(0.0127)**
Shanghai B-shares	-1.4003	-1.5098	-1.5801	-1.1061
	(0.5836)	(0.8263)	(0.4926)	(0.9265)
Shenzhen A-shares	-1.0187	-2.6085	-0.9252	-2.4250
	(0.7486)	(0.2765)	(0.7806)	(0.3663)
Shenzhen B-shares	-1.6445	-1.8472	-1.9024	-1.8263
	(0.4595)	(0.6812)	(0.3314)	(0.6917)
		Panel B: 28 Feb 2001-8 Jul 2003		
Shanghai A-shares	-1.3401	-2.5285	-1.1767	-2.7019
	(0.6122)	(0.3142)	(0.6861)	(0.2362)
Shanghai B-shares	-1.3231	-4.2917	-2.4617	-6.3963
	(0.6203)	(0.0034)***	(0.1255)	(0.0000)***
Shenzhen A-shares	-1.4094	-2.0795	-1.4094	-2.0182
	(0.5786)	(0.5557)	(0.5786)	(0.5897)
Shenzhen B-shares	-1.8607	-2.0757	-2.8012	-5.7566
	(0.3511)	(0.5578)	(0.0586)*	(0.0000)***
		Panel C: 9 Jul 2003-31 Dec 2004		
Shanghai A-shares	-0.8152	-1.9987	-0.6974	-1.7432
	(0.8133)	(0.5997)	(0.8447)	(0.7301)
Shanghai B-shares	-0.3058	-1.5547	-0.2422	-1.5492
	(0.9211)	(0.8088)	(0.9301)	(0.8109)
Shenzhen A-shares	-0.3984	-1.4262	-0.3304	-1.2790
	(0.9064)	(0.8520)	(0.9174)	(0.8913)
Shenzhen B-shares	-0.8235	-1.6019	-0.8188	-1.6454
	(0.8109)	(0.7908)	(0.8123)	(0.7723)

Notes: Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

Table 5.4 lists the results on first differences, all series are shown to be stationary. I thus conclude all the series can be seen as I (1), as price data is normally considered. The following analyses will be conducted under this condition.

Table 5.4: Unit Root Tests on First Differences

	ADF		PP	
	Intercept	Intercept&Trend	Intercept	Intercept&Trend
		Panel A: 3 Jan 1994-16 Feb 2001		
Shanghai A-shares	-9.0066	-9.0142	-43.1730	-43.1650
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Shanghai B-shares	-8.2987	-8.4278	-37.1084	-37.1120
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Shenzhen A-shares	-8.5971	-8.6391	-43.3935	-43.3981
	(0.0000)***	(0.0000)***	(0.0001)***	(0.0000)***
Shenzhen B-shares	-8.7027	-8.7691	-38.9491	-38.9417
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
		Panel B: 28 Feb 2001-8 Jul 2003		
Shanghai A-shares	-5.7083	-5.6994	-23.2990	-23.2858
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Shanghai B-shares	-5.9108	-5.9123	-23.0123	-23.1293
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Shenzhen A-shares	-5.8454	-5.8596	-23.2879	-23.2687
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Shenzhen B-shares	-7.8670	-7.8498	-23.0174	-23.0662
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
		Panel C: 9 Jul 2003-31 Dec 2004		
Shanghai A-shares	-4.2214	-4.2397	-18.8075	-18.7861
	(0.0007)***	(0.0043)***	(0.0000)***	(0.0000)***
Shanghai B-shares	-4.2600	-4.3257	-18.3068	-18.3142
	(0.0006)***	(0.0032)***	(0.0000)***	(0.0000)***
Shenzhen A-shares	-3.9686	-4.0677	-18.6440	-18.6505
	(0.0018)***	(0.0076)***	(0.0000)***	(0.0000)***
Shenzhen B-shares	-3.9193	-4.1356	-18.5659	-18.6728
	(0.0021)***	(0.0061)***	(0.0000)***	(0.0000)***

Notes: Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

5.2.3.2 Cointegration Test

Following the evidence that all the series are I(1), I applied the Johansen (1991, 1995) cointegration test to detect whether there exists any long-run relationship in the Chinese stock markets.

Table 5.5 summarizes results of the Johensan (1991, 1995) cointegration test, allowing for a linear deterministic trend in the data and an intercept in the cointegration equation and VAR, over the three sub-periods respectively. Number of lagged variables included in the test is selected according to the AIC. I also run Lagrange Multiplier (LM)-type autocorrelation tests on residuals to make sure the numbers of lags suggested produce White noises.

In the first sub-period, the null hypothesis of there exists zero cointegrating relationship between any markets cannot be rejected at the 5% significance level by either the trace statistic or the max-eigenvalue statistic. In the second sub-period, two cointegrating relationships are suggested at the 5% significance level: the Shanghai A-shares and B-shares, and the Shenzhen A-shares and B-shares are found move towards same trends over a long-term. However, what is surprising is that the test statistics suggest that the Chinese stock markets are segmented over the long-run in the third sub-period as no cointegrating relationship is found at any conventional significance level.

Table 5.5: Bivariate Johensan Cointegration Test

	lag		Trace	Max-eigenvalue
			Panel A: 3 Jan 1994-16 Feb 2001	
SHH_A & SHSH_B	7	r=0	10.8978	6.6323
			(0.2178)	(0.5335)

		r<=1	4.2655	4.2655
			(0.0389)**	(0.0389)**
SHZH_A & SHZH_B	7	r=0	7.9396	6.1554
			(0.4719)	(0.5933)
		r<=1	1.7841	1.7841
			(0.1816)	(0.1816)
SHH_A & SHZH_A	7	r=0	13.1579	12.0510
			(0.1091)	(0.1087)
		r<=1	1.1069	1.1069
			(0.2928)	(0.2928)
SHH_B & SHZH_B	5	r=0	9.7585	5.8369
			(0.2998)	(0.6342)
		r<=1	3.921643	3.9216
			(0.0477)**	(0.0477)**
Panel B: 28 Feb 2001-8 Jul 2003				
SHH_A & SHSH_B	2	r=0	38.1825	36.6949
			(0.0000)***	(0.0000)***
		r<=1	1.4876	1.4876
			(0.2226)	(0.2226)
SHZH_A & SHZH_B	5	r=0	17.5722	15.3844
			(0.0240)**	(0.0331)**
		r<=1	2.1878	2.1878
			(0.1391)	(0.1391)
SHH_A & SHZH_A	1	r=0	8.4284	5.1944
			(0.4208)	(0.7171)
		r<=1	3.2341	3.2341
			(0.0721)*	(0.0721)*
SHH_B & SHZH_B	6	r=0	21.9371	14.2020
			(0.0047)***	(0.0511)*
		r<=1	7.7351	7.7351
			(0.0054)***	(0.0054)***
Panel C: 9 Jul 2003-31 Dec 2004				
SHH_A & SHSH_B	5	r=0	9.2531	9.1628
			(0.3425)	(0.2729)
		r<=1	0.0903	0.0903
			(0.7638)	(0.7638)
SHZH_A & SHZH_B	1	r=0	8.7270	8.6045
			(0.3912)	(0.3205)
		r<=1	0.1225	0.1225
			(0.7264)	(0.7264)
SHH_A & SHZH_A	1	r=0	6.1142	5.8665
			(0.6820)	(0.6304)
		r<=1	0.2477	0.2477
			(0.6187)	(0.6187)
SHH_B & SHZH_B	1	r=0	8.3278	8.3224
			(0.4310)	(0.3469)
		r<=1	0.0055	0.0055

	(0.9403)	(0.9403)

Notes: Values in the parentheses are the MacKinnon-Haug-Michelis (1999) probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

The finding is consistent with that of Yang (2003) who reports no cointegrating relationship between the A- and B-shares markets based on market indexes from 2 January 1995 to 29 December 2000, the period before the B-shares market opened to local Chinese, and is also consistent with Yao (2003) who find daily closing prices of A- and B-shares indexes are cointegrated in the post-2001 event period. However, the finding does not conform to my expectation. The Chinese segmented markets have not become more linked after certain foreign investors can participate in the formerly restricted A-shares market.

5.2.3.3 Granger Causality Test

As introduced earlier, model (5.17) is employed in detecting causality with the post-2001 sub-sample, and in the absence of long-term equilibrium (cointegration) relations, studies following model (5.16) are conducted with the pre-2001 and post-QFII sub-samples. Numbers of lagged variables included in the tests are selected following the AIC and residuals autocorrelation tests. The chi-square statistics along with the corresponding probability values are presented in Table 5.6. Panel A refers to the sub-period before the 2001 open market reform; Panel B refers to the sub-period after the 2001 event and before the QFII programme; and Panel C refers to the post-QFII sub-period.

Table 5.6: Lead-Lag Relationships in the Chinese Stock Markets (Granger Causality Test)

	Panel A	Panel B	Panel C
SHH_A does not Granger cause SHH_B	3.4112	1.3034	3.9226
	(0.7557)	(0.2536)	(0.4166)
SHH_B does not Granger cause SHH_A	6.5071	4.3618	9.4607
	(0.3688)	(0.0368)**	(0.0506)*
SHZH_A does not Granger cause SHZH_B	4.9873	12.4980	0.0397
	(0.5454)	(0.0140)**	(0.8420)
SHZH_B does not Granger cause SHZH_A	8.1236	7.9181	1.13E-05
	(0.2292)	(0.0946)*	(0.9973)
SHH_A does not Granger cause SHZH_A	4.7540	0.0292	1.8271
	(0.5757)	(0.8644)	(0.1765)
SHZH_A does not Granger cause SHH_A	8.0718	0.0891	4.8114
	(0.2329)	(0.7653)	(0.0283)
SHH_B does not Granger cause SHZH_B	7.6323	24.2749	0.6318
	(0.1060)	(0.0002)***	(0.4267)
SHZH_B does not Granger cause SHH_B	23.3231	8.5154	0.4195
	(0.0001)***	(0.1300)	(0.5172)

Notes: Values reported in the parentheses are probability values. '*', '**' and '***' indicate significant at the 10%, 5% and 1% levels respectively.

I find in the time when the Chinese stock markets are strictly segmented, foreign investors in the Shenzhen market seem to have an information advantage over foreign investors in the Shanghai market. One possible explanation of this observation is that as surveys reveal most of participants in the Shenzhen B-shares market are investors from Hong Kong, and compared with foreign investors in the Shanghai market, they have a natural linkage with mainland listed firms and are more familiar with the investment environment in the mainland of China.

In the second sub-period, more information flows are detected as the markets became more linked. A statistically significant test statistic is found rejecting the null hypothesis of Shanghai B-shares returns do not Granger cause A-shares returns,

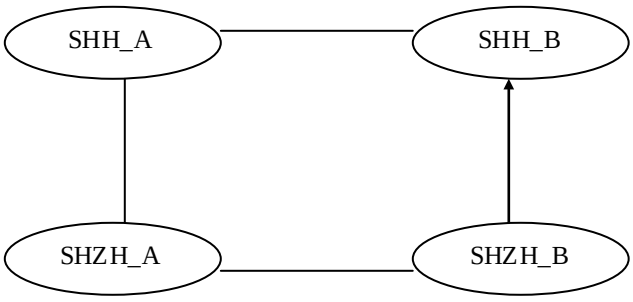
suggesting investors in the Shanghai B-shares market take a leading role. A bi-directional feedback between the A- and B-shares is found in the Shenzhen market. In addition, it is suggested the Shanghai B-shares investors are better informed over investors in the Shenzhen market, which is opposite with what was observed in the first sub-period.

In the third sub-period, information is found flow from the Shanghai B-shares market to the A-shares market.

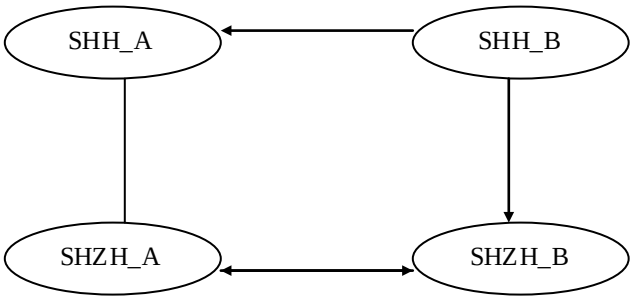
To summarize, at the 10% significance level, we can conclude the information flows in the Chinese stock markets as the following figure shows:

Figure 5.4: Lead-Lag Relationships in the Chinese Stock Markets (Granger Causality Test)

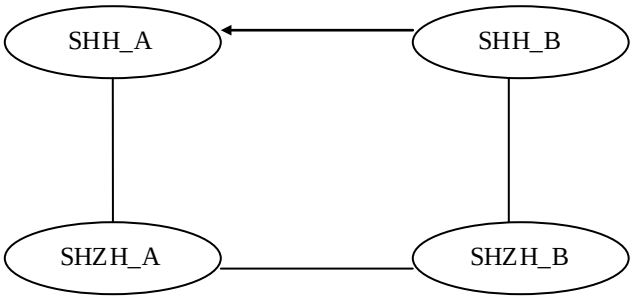
Period A: 3 January 1994 - 16 February 2001



Period B: 28 February 2001 – 8 July 2003



Period C: 9 July 2003 - 31 December 2004



In order to provide a more robust insight, I further conduct Toda-Yamamoto (1995) causality tests on level VARs. The test statistics are reported in Table 5.7, and the summarized information flows in the markets are presented in Figure 5.5.

Table 5.7: Lead-Lag Relationships in the Chinese Stock Markets

(Toda-Yamamoto Causality Test)

	Panel A		Panel B		Panel C	
	lag	chi-sq	lag	chi-sq	lag	chi-sq
SHH_A does not Granger cause SHH_B	7+1	3.2585	2+1	1.7149	5+1	7.0780

		(0.8601)		(0.4242)		(0.2149)
SHH_B does not Granger cause SHH_A		8.1876		5.6519		11.2726
		(0.3163)		(0.0593)*		(0.0462)**
SHZH_A does not Granger cause SHZH_B	7+1	4.8410	5+1	11.0776	1+1	0.0118
		(0.6794)		(0.0499)**		(0.9137)
SHZH_B does not Granger cause SHZH_A		8.1342		8.2327		2.64E-02
		(0.3209)		(0.1439)		(0.8709)
SHH_A does not Granger cause SHZH_A	7+1	4.9807	1+1	0.0195	1+1	1.6385
		(0.6623)		(0.8890)		(0.2005)
SHZH_A does not Granger cause SHH_A		9.3664		0.0895		5.0446
		(0.2274)		(0.7648)		(0.0247)**
SHH_B does not Granger cause SHZH_B	5+1	7.5494	6+1	23.4296	1+1	0.3852
		90.1829)		(0.0007)***		(0.5348)
SHZH_B does not Granger cause SHH_B		28.4249		9.1190		0.4597
		(0.0000)***		(0.1670)		(0.4978)

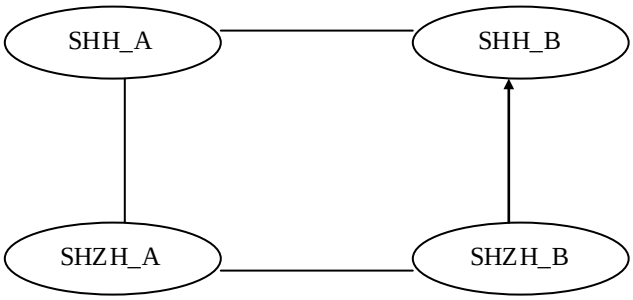
Notes: Values reported in the parentheses are significance levels associated with asymptotic Wald statistic for testing exclusion restrictions. '*', '**' and '***' indicate significant at the 10%, 5% and 1% levels respectively.

Very similar results are found with only two exceptions: instead of a bi-directional causality between the Shenzhen A- and B-shares markets, a uni-directional causality from the Shenzhen A-shares market to B-shares market is found using Toda and Yamamoto's (1995) methodology; and an additional uni-directional causality from the Shenzhen A-shares to Shanghai A-shares is detected.

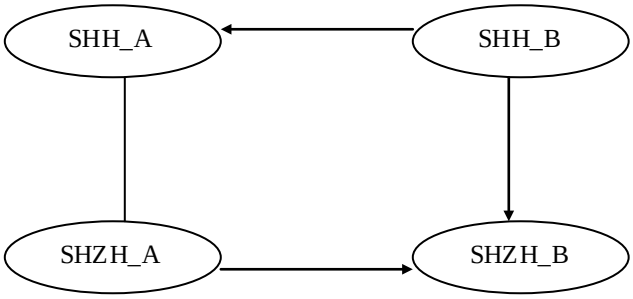
Figure 5.5: Lead-Lag Relationships in the Chinese Stock Markets

(Toda-Yamamoto Causality Test)

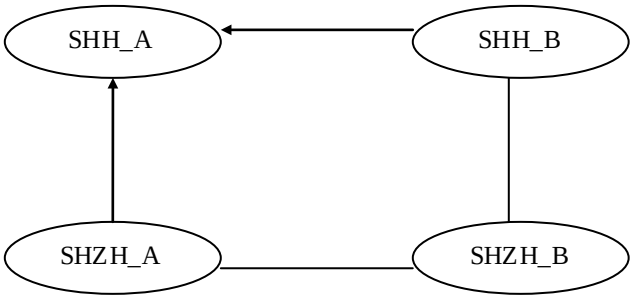
Period A: 3 January 1994 - 16 February 2001



Period B: 28 February 2001 - 8 July 2003



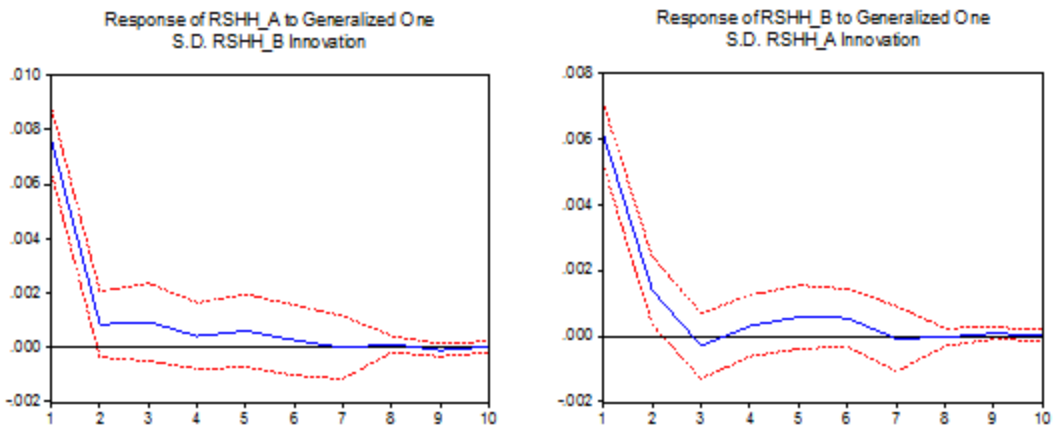
Period C: 9 July 2003 - 31 December 2004

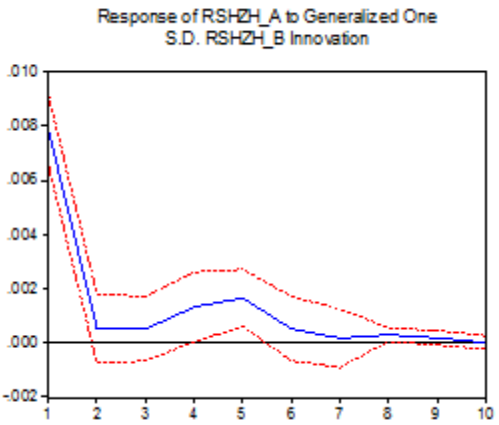


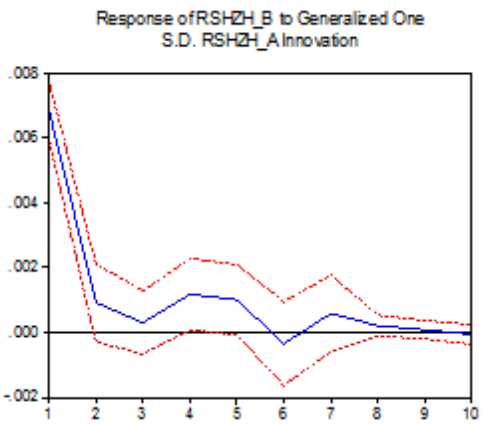
5.2.3.4 Generalized Impulse Response Functions (GIRFs)

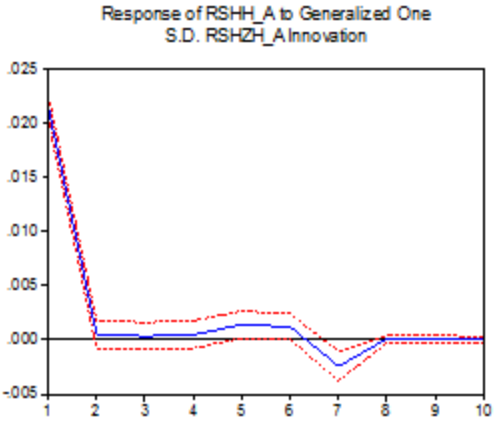
By conducting GIRF analyses suggested by Pesaran and Shin (1998), the short-term interactions between the Chinese A- and B-shares are revealed in this section. GIRFs are used to trace the response of the endogenous variables to an unanticipated shock in another variable. Figures 5.6 to 5.8 present the dynamic responses of one market to a generalized one-standard-deviation shock on the disturbance term from the other market in different sample periods respectively. The responses standard errors are generated following the Monte Carlo methodology in the Eviews and repeated 100 times. The Shanghai A- and B-shares and the Shenzhen A- and B-shares are considered in VECM frameworks, while others are conducted in VAR frameworks. I conducted estimation of the GIRFs 10 periods ahead. Numbers of lags included in the VARs (VECMs) are selected following the AIC.

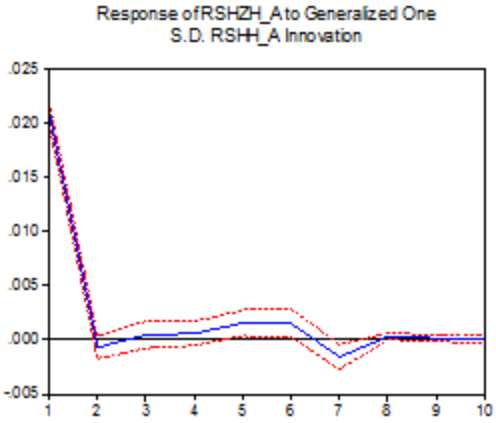
Figure 5.6: Dynamic Interactions in the Chinese Stock Markets (3 Jan 1994-16 Feb 2001)

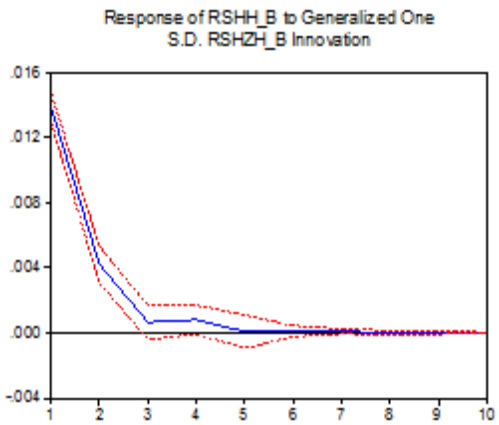



Response of RSHZH_A to Generalized One
S.D. RSHZH_B Innovation


Response of RSHZH_B to Generalized One
S.D. RSHZH_A Innovation


Response of RSHH_A to Generalized One
S.D. RSHZH_A Innovation


Response of RSHZH_A to Generalized One
S.D. RSHH_A Innovation


Response of RSHH_B to Generalized One
S.D. RSHZH_B Innovation

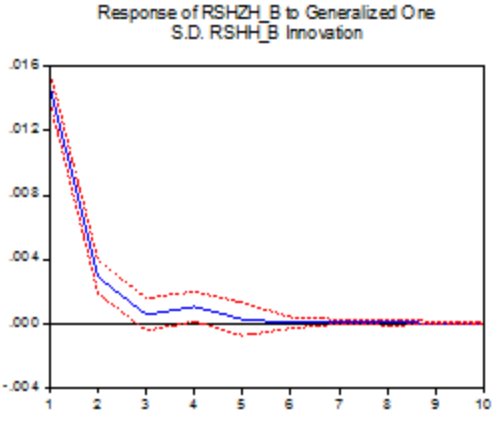
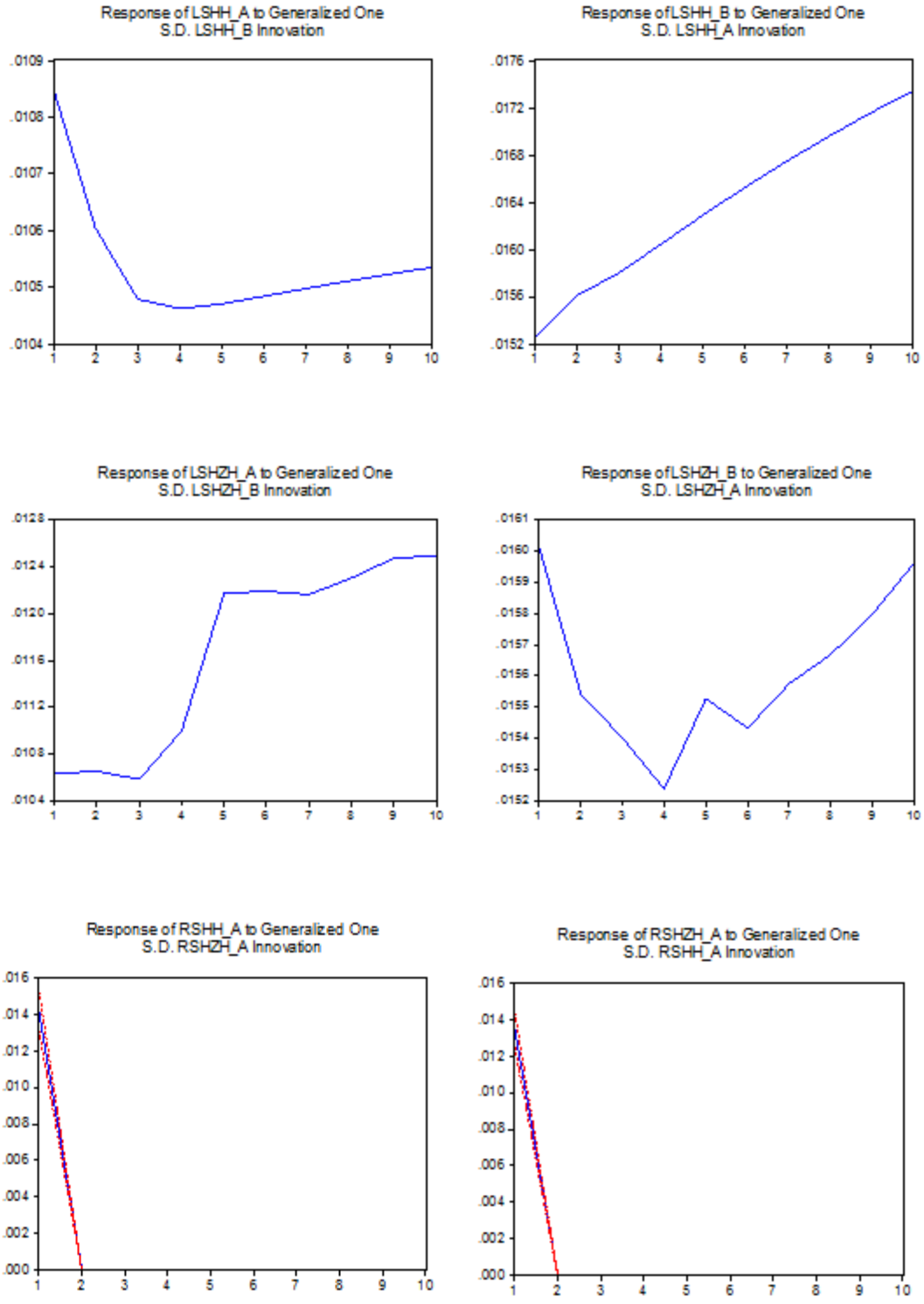

Response of RSHZH_B to Generalized One
S.D. RSHH_B Innovation

Figure 5.7: Dynamic Interactions in the Chinese Stock Markets (28 Feb 2001-8 Jul 2003)



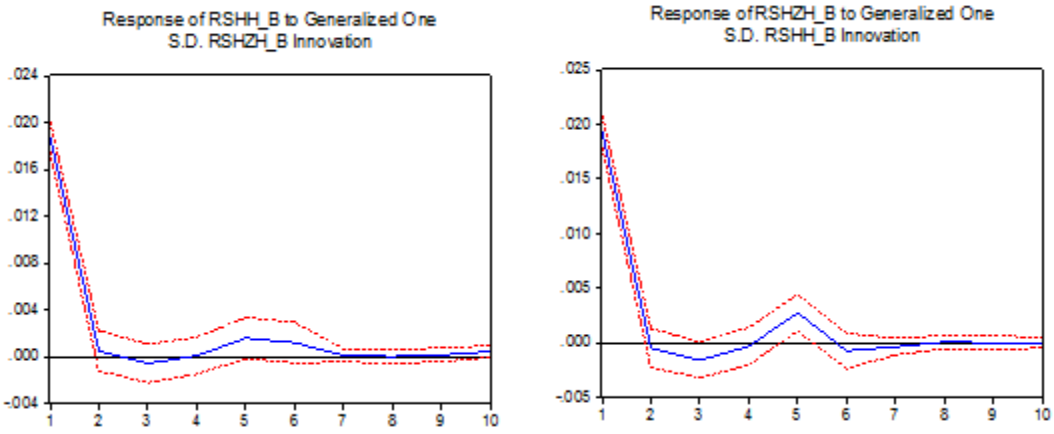
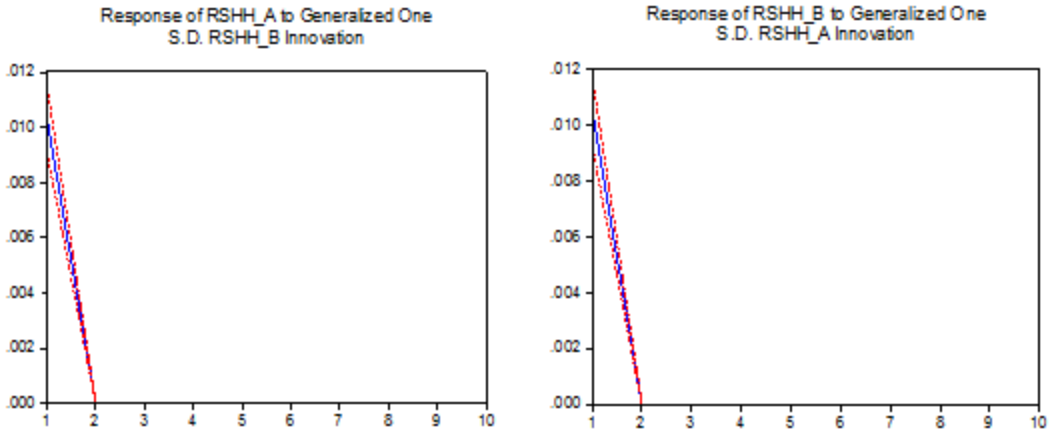
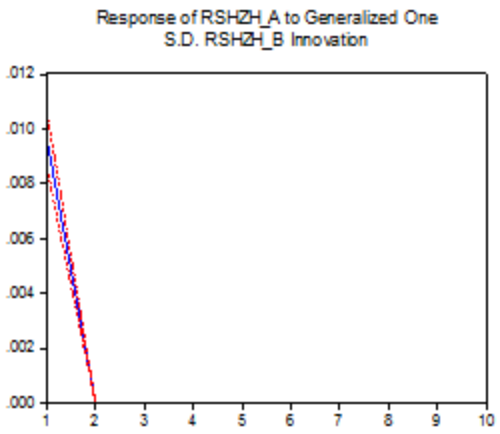


Figure 5.8: Dynamic Interactions in the Chinese Stock Markets (9 Jul 2003-31 Dec 2004)




Response of RSHZH_A to Generalized One
S.D. RSHZH_B Innovation
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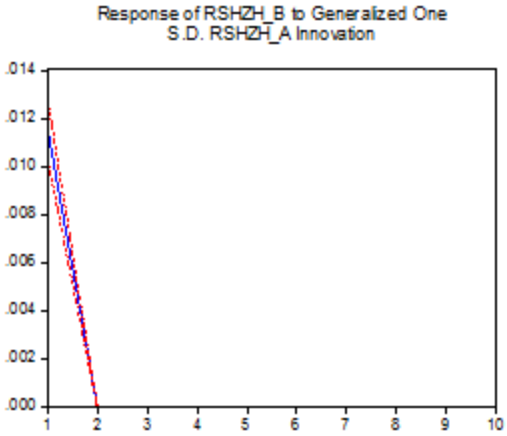
1 2 3 4 5 6 7 8 9 10


Response of RSHZH_B to Generalized One
S.D. RSHZH_A Innovation
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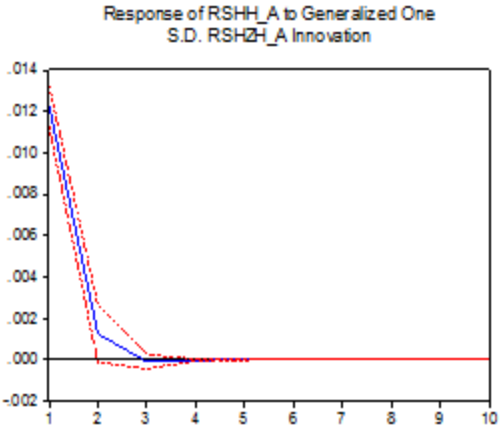
Response of RSHH_A to Generalized One
S.D. RSHZH_A Innovation
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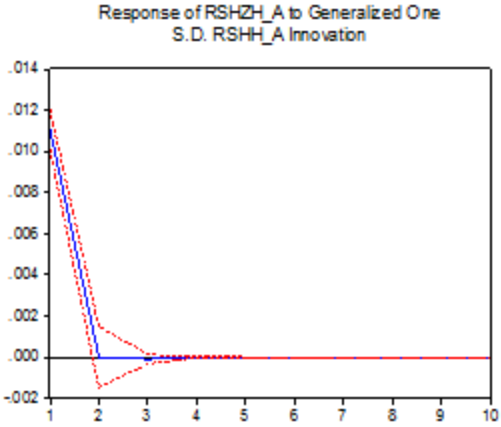
Response of RSHZH_A to Generalized One
S.D. RSHH_A Innovation
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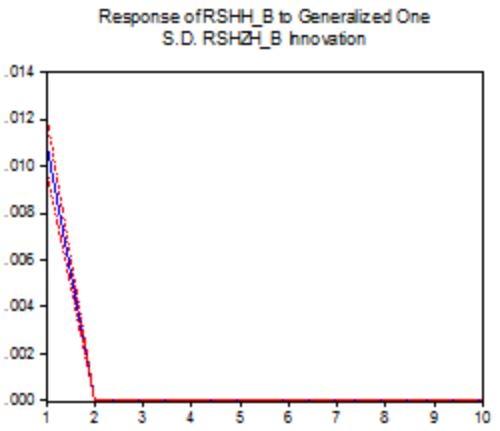
Response of RSHH_B to Generalized One
S.D. RSHZH_B Innovation
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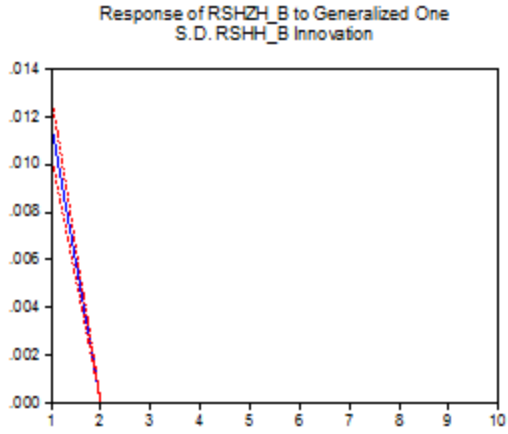
Response of RSHZH_B to Generalized One
S.D. RSHH_B Innovation
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Following observations are made:

(i) In the strict segmentation period,

When the system produces impact of one unit innovation on the Shanghai B-shares, the initial response of the Shanghai A-shares is positive and the scale is 0.0075. It descends to 0.001 after one trading day and gradually heads to zero and becomes stable on the seventh trading day. On the other hand, when the system generates impact of one unit innovation on the Shanghai A-shares, the initial response of the Shanghai B-shares is positive as well while the scale is 0.006, which is slightly smaller. It descends to negative at the third time unit and gradually adjusts back to positive direction with a maximum level of 0.0006. Again, on the seventh trading day, the impact diminishes to zero. Comparing investors of the Shanghai A- and B-shares, the foreign investors appear more easily overreact.

When an unexpected shock hits the Shenzhen B-shares, the initial response of the Shenzhen A-shares is positive. The scale is about 0.008. It drops immediately to 0.0005 on the second trading day and keeps the level until the third trading day when it converts to an uptrend. The trend lasts two time units, after then, the consistent influence gradually diminishes. Turning to the other side, when the initial shock happens with the Shenzhen A-shares, the initial response of the Shenzhen B-shares is slightly smaller as 0.007. It drops to 0.001 after one trading day and keeps dropping until the third trading day. It also converts to an uptrend from the third trading day but the trend only lasts one day. From day 4, it starts decreases and reaches negative level after two trading days. Then it rebounds again and gradually becomes stable after day 9. The Shenzhen B-shares market appears slightly more efficient than the Shenzhen

A-shares market as it takes less time for the B-shares to digest the innovation.

When an unexpected shock hits the Shenzhen A-shares, the initial response of the Shanghai A-shares is positive and the scale is about 0.022. It drops immediately to close to zero after one trading day and remains at this level for two days. Then it gradually increases to 0.002 and suddenly heads to a negative direction from day 6, and reaches the minimum level of -0.002 on day 7. After then, it heads back to zero and vanishes after day 8. When the hit happens with the Shanghai A-shares, the response of the Shenzhen A-shares is very similar but appears slightly negative on day 2.

The interactions between the Shanghai and Shenzhen B-shares are also very similar. The digests of the shocks are both centered in the first two trading days and descended gradually to zero in the next two days. More shock is digested within the first trading day in the Shenzhen market, however, it takes slightly longer time to completely digest the innovation from the Shanghai B-shares than the other way around.

(ii) After Chinese individual investors entered the B-shares market,

When the system produces one unit innovation on the Shanghai B-shares, in contrast to the downward bended response functions observed earlier in VAR models, the response function maintains its long run equilibrium in the VECM. This is as expected as the VECM (or the restricted VAR) has built in the cointegration relationship and the long-run behaviour of the endogenous variables has been restricted to converge to their equilibrium. The Shanghai A-shares initially exhibits a positive response of about 0.01085 and drops to below 0.0105 after two trading days,

and then it heads gradually to 0.0106. While when the system firstly produces an innovation on the Shanghai A-shares, the Shanghai B-shares react uni-directionally upward from the level of around 0.0153.

The effect of a shock to the Shenzhen B-shares on the Shenzhen A-shares was positive throughout the next 10 days time horizon. This positive impact is relatively stable in the first two trading days and reaches its minimum on the third day, then it jumps significantly and becomes stable again after four trading days. The impact the other way around is more volatile: the reaction of the Shenzhen B-shares to the Shenzhen A-shares' innovation descends continually in the first three trading days and reaches its minimum on day 4, and then becomes up and down in the next two days, before it becomes stable upwards from day 6.

When the system produces one unit innovation on the Shenzhen and Shanghai A-shares respectively, the other market responses initially around the level of 0.014. Since zero lags are suggested by AIC in the bivariate VARs, no responses are observed afterwards.

When an unexpected shock hits the Shenzhen B-shares, most of the impact on the Shanghai B-shares is absorbed within the first trading day. The impact is weakened after then and wonders around zero slightly until it vanishes on day 7. When an innovation starts from the Shanghai B-shares market, trend of the response observed in the Shenzhen B-shares market is largely similar and the response magnitudes are slightly larger.

(iii) After QFIIs entered the Chinese A-shares market,

When one unit of unexpected shock hits the Shanghai B-shares, the Shanghai A-shares give it an immediate response of 0.01. The response lasts one trading day. When an innovation starts from the Shanghai A-shares, the same observation is found with the Shanghai B-shares.

When one unit of unexpected shock hits the Shenzhen B-shares, the Shenzhen A-shares give it an immediate response of nearly 0.01. The response lasts one trading day. When an innovation starts from the Shenzhen A-shares, a same trend could be observed with the Shenzhen B-shares, however, the initial response is around 0.012.

When the system produces one unit innovation on the Shenzhen A-shares, the Shanghai A-shares response initially at the level of 0.012, and most of the influence is absorbed within the first trading day. On day 2, the influence drops to around 0.002, and lasts one trading day before the influence is absorbed completely. On the other hand, when the initial shock happens to the Shanghai A-shares, all influences are absorbed within the first trading day.

When one unit innovation hits the Shenzhen B-shares, the Shanghai B-shares response immediately at a level of 0.011, and the influence is absorbed within the first trading day. When the shock initially hits the Shanghai B-shares, a similar response is found with the Shenzhen B-shares.

5.3 Investigation on A Panel Level

Recent developments in the literature suggest that panel-data-based procedures have higher power than procedures based on individual time series. For example, Maddala and Wu (1999) argues, “the commonly used unit root tests like the Dickey-Fuller

(DF), augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests lack power in distinguishing the unit root null from stationary alternatives, and that using panel data unit root tests is one way of increasing the power of unit root tests based on a single time series". The introduction of a panel data dimension allows us to use both cross-sectional and time-series information to test the causality relationships between the different classes of shares. In particular, it offers us a larger number of observations, increasing the degree of freedom and reducing the collinearity among explanatory variables. Thus, I will employ a panel causality technique in this section in the hope that it will noticeably improve the efficiency of time series causality tests.

Despite the great deal of effort devoted empirically towards revealing the causal relationships between different investors groups in the Chinese stock markets by using time series techniques, no sufficient effort has been made to develop parallel panel data techniques. To my best knowledge, there is only one study so far in the Chinese stock markets segmentation literature that employs panel data cointegration techniques to investigate the nature of their relationships. Ahlgren *et al*. (2003) used panel data unit root and cointegration analyses to examine whether a long-run relationship between Chinese A- and B-shares prices exists for 88 firms, 44 from each exchange, over the period January 1993 to July 2002. However, they did not take account of the issue of which market is more likely to lead the other market. In addition, their work is limited by using only monthly data and did not cover the period after the QFII programme. I will, therefore, further extend the examination to a panel context in this section.

The remainder of the section is organized as follows: Section 5.3.1 introduces data and summary statistics; the econometric methodologies are introduced in Section 5.3.2; and Section 5.3.3 discusses empirical results.

5.3.1 Data and Preliminary Description

The data source and sample selection criterion is the same as what was used to compute the time-series aggregate price (see Section 5.2.1). A summary of the statistics of the returns is provided in Table 5.8. In all the three sub-periods, the returns can be considered as normal distributed.

Table 5.8: Summary Statistics of Chinese Shares' Returns (Panel Data)

	Panel A: 3 Jan 1994-16 Feb 2001			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
Mean	0.0005	0.0007	0.0004	0.0003
Median	0.0000	0.0000	0.0000	0.0000
Maximum	0.4515	0.5680	0.4343	0.8079
Minimum	-0.2755	-0.4055	-0.2474	-0.7101
Std. Dev.	0.0350	0.0466	0.0342	0.0405
Skewness	1.1723	0.1221	0.9484	0.3855
Kurtosis	14.6553	7.3437	13.0241	17.9279
Jarque-Bera	353411.3	41986.16	237160.9	413173.9
Probability	0.0000***	0.0000***	0.0000***	0.0000***
	Panel B: 28 Feb 2001-8 Jul 2003			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
Mean	-0.0005	0.0005	-0.0004	0.0009
Median	-0.0008	0.0000	0.0000	0.0000
Maximum	0.0983	0.1671	0.0973	0.1040
Minimum	-0.1066	-0.1563	-0.1082	-0.1642
Std. Dev.	0.0224	0.0272	0.0229	0.0297
Skewness	0.3828	0.2210	0.2618	0.1820
Kurtosis	6.5198	6.4905	6.1726	5.4028
Jarque-Bera	12599.1	12048.26	9689.189	5530.746
Probability	0.0000***	0.0000***	0.0000***	0.0000***

	Panel C: 9 Jul 2003-31 Dec 2004			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
Mean	-0.0014	-0.0015	-0.0010	-0.0007
Median	-0.0011	0.0000	0.0000	0.0000
Maximum	0.0966	0.1178	0.0976	0.0973
Minimum	-0.1088	-0.1466	-0.1069	-0.1067
Std. Dev.	0.0226	0.0229	0.0233	0.0220
Skewness	0.0105	-0.0619	-0.0060	0.1101
Kurtosis	5.0358	5.6960	4.7070	5.0830
Jarque-Bera	2602.694	4570.503	1794.891	2701.245
Probability	0.0000***	0.0000***	0.0000***	0.0000***

Note: '***' indicates significant at the 1% level.

Table 5.9 provides the pair-wise correlations of the different shares' returns. It is not surprising that in general the linkage, which is measured in a panel data framework, is weaker, than when it is measured with aggregate price, since the use of average prices eases variations across firms. All the markets are positively correlated, and the same trend can be found with what was observed from the correlations of aggregate prices, except that the linkage between the Shanghai A- and B-shares after the QFII programme does not seem to be enhanced, but in fact is slightly reduced.

Table 5.9: Correlations of the Chinese Segmented Markets (Panel Data)

	Panel A: 3 Jan 1994-16 Feb 2001			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.1971	0.4213	0.1987
RSHH_B	0.1971	1.0000	0.1402	0.2827
RSHZH_A	0.4213	0.1402	1.0000	0.2980
RSHZH_B	0.1987	0.2827	0.2980	1.0000
	Panel B: 28 Feb 2001-8 Jul 2003			
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.5319	0.5209	0.4274

RSHH_B	0.5319	1.0000	0.4301	0.6641
RSHZH_A	0.5209	0.4301	1.0000	0.5761
RSHZH_B	0.4274	0.6641	0.5761	1.0000
		Panel C: 9 Jul 2003-31 Dec 2004		
	RSHH_A	RSHH_B	RSHZH_A	RSHZH_B
RSHH_A	1.0000	0.4761	0.4006	0.3585
RSHH_B	0.4761	1.0000	0.3055	0.3732
RSHZH_A	0.4006	0.3055	1.0000	0.6653
RSHZH_B	0.3585	0.3732	0.6653	1.0000

5.3.2 Empirical Methods

Following the empirical methods applied to the aggregate price, in this section, I will focus on conducting panel unit root and cointegration tests to identify the segmentation/ integration of the Chinese stock markets, and a panel causality test to trace the lead-lag roles between the markets. Three steps are involved. As a first step, stationarity of the series is examined by using Fisher-type ADF and PP panel unit root tests. The testing procedure has been explained in Section 4.4.2. Following is the residual-based and combined-Johansen panel cointegration tests, to identify long-run equilibria between the markets. For causality test, I consider a typical example of traditional panel data causality tests following Holtz-Eakin *et al.* (1988).

5.3.2.1 Panel Cointegration Test

For testing the cointegration in the Chinese stock markets, I consider three methods: residual-based Pedroni (1999, 2004) and Kao (1999) tests, and a Fisher-type test using an underlying Johansen methodology (Maddala and Wu, 1999). Ahlgren *et al.* (2003) also employed the combined-Johansen procedure in their study.

Pedroni (1999, 2004) Panel Cointegration Test

Based on the following equation (5.23):

$$y_{it} = \alpha_i + \sum_{j=1}^{m} \beta_{ji} x_{jit} + \varepsilon_{it} \tag{5.23}$$

Pedroni's (1999, 2004) method tests the null hypothesis that the residual term $\varepsilon_{it} = \rho_i \varepsilon_{it-1} + u_{it}$ is I (1) through two different sets of statistics. One group of the tests is termed as 'within dimension' (panel tests) which pools the data across the 'within' dimension and takes into account common time factors and allows for heterogeneity across members. This group of test statistics includes a variance ratio statistic, a non-parametric Phillips and Perron type ρ-statistic, a non-parametric Phillips and Perron type *t*-statistic and a Dickey–Fuller type *t*-statistic[6]. The null hypothesis for this group of tests is $\rho_i = 1$, and the alternative hypothesis is $\rho_i = \rho < 1$. The other group of the tests is termed as 'between dimension' (group tests) which allows for heterogeneity of parameters across members. This group of test statistics includes a Phillips and Perron type ρ-statistic, a Phillips and Perron type *t*-statistic and an Augmented Dickey–Fuller type *t*-statistic[7]. The null hypothesis for this group of tests is $\rho_i = 1$, and the alternative hypothesis is $\rho_i < 1$, for all *i*. All the seven statistics are normally distributed.

Kao (1999) Panel Cointegration Test

Same as the Pedroni's approach, Kao (1999)'s test also follows the basic idea of Engle-Granger (1987) and is residual-based.

Consider the following panel regression model:

[6] For more details and mathematical representations of the tests, refer to Pedroni (2004).
[7] For more details and mathematical representations of the tests, refer to Pedroni (2004).

$$y_{it} = \alpha_i + \beta x_{it} + e_{it} \tag{5.24}$$

where both y_{it} and x_{it} are I (1) and noncointegrated.

For Kao's DF and ADF test, the following regression can be run on the estimated residual term:

$$e_{it} = \rho e_{it-1} + v_{it} \tag{5.25}$$

$$\text{or} \quad e_{it} = \overline{\rho} e_{it-1} + \sum_{j=1}^{p} \varphi_j \Delta e_{it-j} + v_{it} \tag{5.26}$$

In order to test the null hypothesis of no cointegration ($\rho = 1$), Kao constructed four DF test statistics and one ADF test statistic[8]. If the null hypothesis can be rejected, then y_{it} and x_{it} are considered to be cointegrated.

By Monte Carlo comparison, Gutierrez (2003) claims when the time-dimension of the panel is large, Pedroni's tests have higher power than Kao's.

Combined Johansen Panel Cointegration Test

Fisher (1932) derives a combined test that uses the results of the individual independent tests. Maddala and Wu (1999) use Fisher's result to propose an alternative approach to testing for cointegration in panel data by combining tests from individual cross-sections to obtain a test statistic for the full panel. If π_i is the *p*-value from an individual cointegration test for cross-section *i*, then under the null hypothesis for the panel,

[8] For more details, please see Kao (1999).

$$-2\sum_{i=1}^{N}\log(\pi_i) \rightarrow \chi^2_{2N} \tag{5.27}$$

p-values from individual independent tests are obtained by employing Johansen (1991, 1995) procedure introduced in Section 5.2.2.2.

5.3.2.2 Panel Causality Test

To identify directions of the information flows in the Chinese stock markets, I estimate a Granger-type causality model based on Holtz-Eakin *et al.* (1988, 1989), assuming the causalities among cross sections are homogeneous. The Holtz-Eakin *et al.* (1988, 1989) model is as follows:

$$y_{i,t} = \alpha_0 + \sum_{j=1}^{m}\alpha_j y_{i,t-j} + \sum_{j=1}^{m}\delta_j x_{i,t-j} + f_i + u_{i,t} \tag{5.28}$$

where $y_{i,t}$ is the dependent variable at time t for stock i; $x_{i,t}$ is the causal variable at time t for stock i; α's and β' are the coefficients on the dependent and causal variables respectively; f_i is a fixed effect; m is the number of lags included; and $u_{i,t}$ is a white noise error term. In order to eliminate the fixed effects $f_{i,,}$ equation (5.28) needs to be first differenced:

$$y_{i,t} - y_{i,t-1} = \sum_{j=1}^{m}\alpha_j(y_{i,t-j} - y_{i,t-j-1}) + \sum_{j=1}^{m}\delta_j(x_{i,t-j} - x_{i,t-j-1}) + (u_{i,t} - u_{i,t-1}) \tag{5.29}$$

As introduced in Section 4.4.3, this specification introduces a problem of simultaneity because the error term is correlated with the regressor, $y_{i,t} - y_{i,t-1}$. To deal with the problem, an instrumental variable procedure is traditionally used in estimating the model, which produces consistent estimates of the parameters. A widely used

estimator is the panel GMM estimator proposed by Arellano and Bond (1991)[9]. This method has been shown to produce more efficient and consistent estimators compared with other procedures. Then the Wald test is conducted in a usual manner, that is, whether or not x Granger causes y can be tested through a joint hypothesis of $\delta_1 = \delta_2 = ... = \delta_m = 0$. If the null hypothesis can be rejected, then $x_{i,t}$ is considered Granger cause $y_{i,t}$; otherwise, $x_{i,t}$ is considered not Granger cause $y_{i,t.}$.

By interchanging $y_{i,t}$ and $x_{i,t}$ as dependent and independent variables in (5.28), which variable is taking the leading role can be assessed.

5.3.3 Empirical Findings

5.3.3.1 Unit Root Test

Tables 5.10 and 5.11 present results for the Fisher-type ADF and PP panel unit root tests on level and first difference of the variables respectively.

Table 5.10 Panel Unit Root Test on Levels

	Fisher-ADF				Fisher-PP			
	Individual Intercept		Individual Intercept and Trend		Individual Intercept		Individual Intercept and Trend	
	P test	*Z* test	*P* test	*Z* test	*P* test	*Z* test	*P* test	*Z* test
	Panel A: 3 Jan 1994-16 Feb 2001							
LSHH_A	91.1007	-0.9278	159.303	-4.9562	100.668	-1.9376	210.97	-7.3718
	(0.2304)	(0.1768)	(0.0000)***	(0.0000)***	(0.0791)*	(0.0263)**	(0.0000)***	(0.0000)***
LSHH_B	96.0991	-1.3097	39.2821	5.2327	96.0300	-1.8124	39.7175	4.78848
	(0.2602)	(0.0952)*	(1.0000)	(1.0000)	(0.2618)	(0.0350)**	(1.0000)	(1.0000)
LSHZH_A	75.8343	0.8695	91.5537	-0.8775	73.6115	0.9199	102.119	-2.3213
	(0.6706)	(0.8077)	(0.2205)	(0.1901)	(0.7344)	(0.8212)	(0.0656)*	(0.0101)**
LSHZH_B	94.1441	-1.0280	61.9366	2.8301	99.5714	-2.6691	59.0672	1.10789
	(0.2107)	(0.1520)	(0.9661)	(0.9977)	(0.1180)	(0.0038)***	(0.9823)	(0.8660)

[9] For more details, see Section 4.3.3.

Panel B: 28 Feb 2001-8 Jul 2003								
LSHH_A	75.5303	0.9031	155.346	-5.0978	74.2651	0.5821	160.204	-5.4973
	(0.8258)	(0.8168)	(0.0000)***	(0.0000)***	(0.8517)	(0.7197)	(0.0000)***	(0.0000)***
LSHH_B	219.778	-6.2113	848.705	-23.8783	277.036	-9.4250	1063.09	-28.4603
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHZH_A	68.7181	1.0171	130.374	-3.0311	69.0788	0.6129	120.698	-3.0262
	(0.8863)	(0.8454)	(0.0009)***	(0.0012)***	(0.8800)	(0.7300)	(0.0054)***	(0.0012)***
LSHZH_B	131.276	-3.4869	594.71	-17.5535	246.317	-8.4549	965.734	-26.2341
	(0.0007)***	(0.0002)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Panel C: 9 Jul 2003-31 Dec 2004								
LSHH_A	61.9038	2.3720	62.1447	1.5499	61.1656	2.6706	63.4183	1.3597
	(0.9843)	(0.9912)	(0.9834)	(0.9394)	(0.9869)	(0.9962)	(0.9777)	(0.9130)
LSHH_B	33.3711	5.6191	54.1547	2.7579	36.6867	5.3372	65.0601	1.3553
	(1.0000)	(1.0000)	(0.9983)	(0.9971)	(1.0000)	(1.0000)	(0.9683)	(0.9123)
LSHZH_A	41.8377	3.9077	40.7865	3.5976	42.0353	3.6803	45.4997	2.8920
	(1.0000)	(1.0000)	(1.0000)	(0.9998)	(1.0000)	(0.9999)	(0.9998)	(0.9981)
LSHZH_B	29.6247	5.5699	34.8007	3.7618	32.4934	5.4985	42.5558	3.1067
	(1.0000)	(1.0000)	(1.0000)	(0.9999)	(1.0000)	(1.0000)	(1.0000)	(0.9991)

Notes: Numbers of lags included in the tests are selected by AIC. Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level. *P* test statistic follows asymptotic chi-square distribution and *Z* test statistic follows asymptotic normal distribution.

Similar results are provided by using the Fisher chi-square statistic and the Choi *Z*-statistic. In the first sample period, the null hypothesis of all time series being unit root nonstationary cannot be rejected for almost all the four classes of shares with except for the Shanghai A-shares [10]. The result suggests that at least one of the Shanghai A-shares can be considered as stationary. In the second sample period, all test statistics are shown to be highly significant for the B-shares listed on both exchanges. When individual intercepts are included in the test specifications, both the Shanghai A-shares and Shenzhen A-shares are suggested to be nonstationary,

[10] I also run the IPS and LLC tests to identify the property of the Shanghai A-shares: at the 5% significant level, the null of unit root exists cannot be rejected by both of them when individual intercepts are included in the test specifications; when both individual intercepts and trends are included, the LLC test still supports the existence of unit root, however, the IPS test does not.

however when individual trends are augmented, it is suggested that at least some of the Shanghai A-shares and Shenzhen A-shares can be considered as stationary. Thus I would consider all the four types of shares are I(0) in the second sub-period. In the third sample period, the null hypothesis cannot be rejected for all the shares, which implies that prices of all the shares in the Chinese stock markets contain unit roots.

Table 5.11 presents results of the panel data unit root tests on first difference for those variables contain unit roots at levels. In all the sample periods, the null hypothesis can be rejected at the 1% significance level.

Table 5.11 Panel Unit Root Test on First Differences

	Fisher-ADF				Fisher-PP			
	Individual Intercept		Individual Intercept and Trend		Individual Intercept		Individual Intercept and Trend	
	P test	Z test	P test	Z test	P test	Z test	P test	Z test
Panel A: 3 Jan 1994-16 Feb 2001								
LSHH_B	5162.79	-66.5045	9142.81	-91.6061	3011.46	-48.500	11303	-104.672
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHZH_A	4648.8	-62.019	8745.1	-88.4303	3081.14	-50.3965	10289	-98.534
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHZH_B	5278.01	-68.6074	6997.68	-77.7254	6334.02	-77.4742	11055	-103.656
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Panel C: 9 Jul 2003-31 Dec 2004								
LSHH_A	4797.64	-65.2725	5136.94	-66.997	6219.33	-76.658	7020.47	-81.5771
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHH_B	5945.51	-74.5771	6800.4	-79.7245	6257.32	-76.7482	7332.73	-83.5726
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHZH_A	4871.75	-65.9472	5276.13	-68.199	6021.68	-75.7316	6743.72	-80.3036
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
LSHZH_B	4858.1	-66.3975	5264.09	-68.7849	6075.13	-76.0848	6864.33	-81.0508
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Notes: Values in the parentheses are probability values. '***' indicates significant at the 1% level.

Thus, I would consider prices of the Shanghai A-shares before the 2001 open market reform and prices of all the classes of shares after the 2001 reform and before QFIIs entered the A-shares market as I(0), and prices of all other shares as I(1).

5.3.3.2 Cointegration Test

The next step is to test for the existence of long run relationships between the I (1) variables. Tables 5.12 and 5.13 provide the empirical results employing the residual-based Pedroni's and Kao's approaches, and the combined-Johansen approach, respectively.

Table 5.12 Residual-Based Panel Cointegration Tests

	SHH_A & SHH_B		SHZH_A & SHZH_B		SHH_A & SHZH_A		SHH_B & SHZH_B	
	Panel A: 3 Jan 1994-16 Feb 2001							
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-	-	-0.2990	0.3815	-	-	-0.0353	0.3987
Panel rho-Statistic	-	-	6.8876	0.0000***	-	-	6.9698	0.0000***
Panel PP-Statistic	-	-	0.5683	0.3395	-	-	0.7094	0.3102
Panel ADF-Statistic	-	-	2.0896	0.0450**	-	-	1.6966	0.0946*
Group rho-Statistic	-	-	9.6358	0.0000***	-	-	9.7695	0.0000***
Group PP-Statistic	-	-	-0.3600	0.3739	-	-	1.8927	0.0665*
Group ADF-Statistic	-	-	2.7582	0.0089***	-	-	-0.2721	0.3844
Kao t-Statistic	-	-	-0.2540	0.3997	-	-	9.2938	0.0000***
	Panel B: 9 Jul 2003-31 Dec 2004							
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	9.3904	0.0000***	3.9350	0.0002***	-0.1776	0.3927	-0.1437	0.3948
Panel rho-Statistic	2.9839	0.0047***	6.9475	0.0000***	6.9549	0.0000***	6.9527	0.0000***
Panel PP-Statistic	-5.1641	0.0000***	-3.3846	0.0013***	-0.4445	0.3614	-1.5092	0.1277
Panel ADF-Statistic	-0.5188	0.3487	5.2313	0.0000***	5.7369	0.0000***	3.7923	0.0000***
Group rho-Statistic	5.1603	0.0000***	9.7453	0.0000***	9.7418	0.0000***	9.7471	0.0000***
Group PP-Statistic	-4.9387	0.0000***	-2.8696	0.0065***	-1.5930	0.1122	-1.2437	0.1841
Group ADF-Statistic	0.6613	0.3206	10.602	0.0000***	8.3636	0.0000***	-0.1366	0.3952
Kao t-Statistic	-3.4317	0.0003***	-3.7462	0.0001***	0.6412	0.2607	0.9143	0.1803

Notes: The first seven statistics in each panel are from Pedroni's approach, and the last statistic is from Kao's ADF approach. Individual intercepts are included in both test specifications. Lag length is selected according to AIC.

'*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

In the first sample period when the Chinese stock markets were strictly segmented, the null hypothesis of there is no long-run equilibrium relationship between the Shenzhen A-shares and B-shares can be rejected by two of the four Pedroni's panel test statistics, and by two of the three Pedroni's group test statistics. The less performed Kao's ADF test statistic is not significant at any conventional level, suggesting the Shenzhen A-shares and B-shares are not cointegrated. This empirical evidence is inconsistent with Ahlgren *et al*. (2003)'s finding.

As for the B-shares markets of Shanghai and Shenzhen, one (two) of the four Pedroni's panel test statistics and one (two) of the three Pedroni's group test statistics can be rejected at the 1% (10%) significance level. The Kao's ADF statistic can be rejected at the 1% significance level, suggesting the existence of a long-run relationship.

After QFIIs entered the former restricted A-shares market, the linkage between the Chinese A-shares and B-shares are suggested to be strengthened in both exchanges. Both the Pedroni's statistics and the Kao's statistic indicate there exist long-run equilibrium relationships between the A- and B-shares. This evidence is inconsistent with the previous finding when pure time series were examined.

Two of the four Pedroni's panel test statistics and two of the three Pedroni's group test statistics suggest the Shanghai and Shenzhen A-shares are cointegrated at the 1% significance level. However, the Kao's ADF test does not provide supportive evidence

of the existence of the cointegrating relationship at any conventional significance level.

As for the Shanghai and Shenzhen B-shares, two of the four Pedroni's panel test statistics and one of the three Pedroni's group test statistics suggest the existence of a long-run equilibrium relationship at the 1% significance level. However, the Kao's ADF test does not support this evidence at any conventional significance level.

Table 5.13 Fisher-Johansen's Panel Cointegration Test

		lag=1		lag=2		lag=3		lag=4	
		Trace	Max-eigen	Trace	Max-eigen	Trace	Max-eigen	Trace	Max-eigen
Panel A: 3 Jan 1994-16 Feb 2001									
SHZH_A & SHZH_B	r=0	166.2	139.8	136.9	125.9	114.1	109.9	120.2	118.1
		(0.0000)***	(0.0001)***	(0.0001)***	(0.0013)***	(0.0110)**	(0.0217)**	(0.0038)***	(0.0055)***
	r<=1	141.8	141.8	114.0	114.0	94.58	94.58	82.65	82.65
		(0.0000)***	(0.0000)***	(0.0112)**	(0.0112)**	(0.1617)	(0.1617)	(0.4592)	(0.4592)
SHH_B & SHZH_B	r=0	139.9	115.8	96.32	78.13	73.86	61.65	109.4	97.06
		(0.0001)***	(0.0122)**	(0.1689)	(0.6600)	(0.7777)	(0.9682)	(0.0330)**	(0.1561)
	r<=1	151.3	151.3	128.5	128.5	99.91	99.91	103.4	103.4
		(0.0000)***	(0.0000)***	(0.0013)***	(0.0013)***	(0.1134)	(0.1134)	(0.0741)*	(0.0741)*
Panel C: 28 Feb 2001-8 Jul 2003									
SHH_A & SHH_B	r=0	127.3	120.5	98.80	95.75	91.24	88.69	92.97	88.14
		(0.0039)***	(0.0123)**	(0.2026)	(0.2683)	(0.3853)	(0.4594)	(0.3381)	(0.4757)
	r<=1	101.3	101.3	89.37	89.37	90.30	90.30	96.35	96.35
		(0.1569)	(0.1569)	(0.4393)	(0.4393)	(0.4121)	(0.4121)	(0.2545)	(0.2545)
SHZH_A & SHZH_B	r=0	91.33	82.65	86.33	78.87	70.06	65.27	61.34	57.11
		(0.2740)	(0.5212)	(0.4091)	(0.6377)	(0.8621)	(0.9353)	(0.9702)	(0.9892)
	r<=1	98.97	98.97	94.93	94.93	87.00	87.00	85.58	85.58
		(0.1265)	(0.1265)	(0.1948)	(0.1948)	(0.3898)	(0.3898)	(0.4315)	(0.4315)
SHH_A & SHZH_A	r=0	138.7	122.9	121.5	104.7	112.2	94.59	105.1	92.04
		(0.0002)***	(0.0036)***	(0.0047)***	(0.0631)*	(0.0218)**	(0.2015)	(0.0596)*	(0.2569)
	r<=1	120.0	120.0	119.2	119.2	117.4	117.4	108.7	108.7
		(0.0061)***	(0.0061)***	(0.0070)***	(0.0070)***	(0.0094)***	(0.0094)***	(0.0361)**	(0.0361)**
SHH_B & SHZH_B	r=0	94.95	101.2	76.29	80.54	69.92	71.67	51.32	51.54
		(0.1945)	(0.0974)*	(0.7129)	(0.5867)	(0.8646)	(0.8289)	(0.9981)	(0.9980)
	r<=1	56.32	56.32	57.85	57.85	60.07	60.07	61.04	61.04
		(0.9913)	(0.9913)	(0.9869)	(0.9869)	(0.9775)	(0.9775)	(0.9720)	(0.9720)

Notes: Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

According to the Fisher-Johansen's panel cointegration test, at the 5% significance level, cointegrating relationships are only suggested between the Shenzhen A- and B-shares in the first sub-period when more than two lags are included. After QFIIs involved in A-shares trading, the A- and B-shares in the Shanghai market are suggested share a common trend in the long-run when one lag is included. However, such a relationship is not found elsewhere at the 5% significance level. Generally, these results are consistent with what was observed on an aggregate level.

5.3.3.3 Panel Granger Causality Test

Table 5.14 presents the result of panel causality test following Holtz-Eakin *et al.* (1988, 1989), and the directions of information flows, in the Chinese stock markets are summarized in Figure 5.9.

Table 5.14 Lead-Lag Relationships in the Chinese Stock Markets (Panel Causality Test)

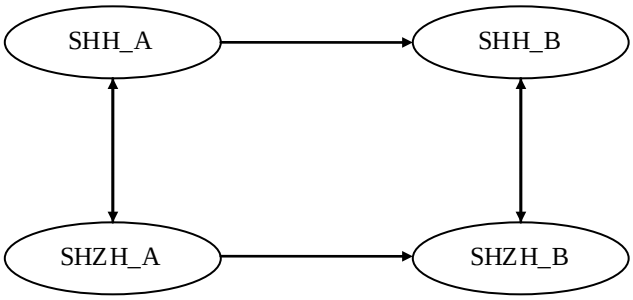
	lag=1	lag=2	lag=3	lag=4
	Panel A: 3 Jan 1994-16 Feb 2001			
SHH_A does not Granger cause SHH_B	16.2077	26.4511	27.3540	41.1295
	(0.0001)***	(0.0000)***	(0.0000)***	(0.0000)***
SHH_B does not Granger cause SHH_A	0.0113	3.8384	0.9577	8.7562
	(0.9154)	(0.1467)	(0.8115)	(0.0675)*
SHZH_A does not Granger cause SHZH_B	4.7250	13.7588	17.1843	12.6885
	(0.0297)**	(0.0010)***	(0.0006)***	(0.0129)**
SHZH_B does not Granger cause SHZH_A	0.0077	2.6839	2.8720	25.9239
	(0.9299)	(0.2613)	(0.4118)	(0.0000)***
SHH_A does not Granger cause SHZH_A	0.0574	14.5461	6.8414	15.0043
	(0.8106)	(0.0007)***	(0.0771)*	(0.0047)***
SHZH_A does not Granger cause SHH_A	0.7074	9.6036	5.4125	35.9260

	(0.4003)	(0.0082)***	(0.1440)	(0.0000)***
SHH_B does not Granger cause SHZH_B	0.7908	12.5473	27.5391	51.8462
	(0.3739)	(0.0019)***	(0.0000)***	(0.0000)***
SHZH_B does not Granger cause SHH_B	13.1514	11.3863	14.7197	6.9108
	(0.0003)***	(0.0034)***	(0.0021)***	(0.1407)
		Panel B: 28 Feb 2001-8 Jul 2003		
SHH_A does not Granger cause SHH_B	23.3546	11.4703	39.7086	8.7455
	(0.0000)***	(0.0032)***	(0.0000)***	(0.0678)*
SHH_B does not Granger cause SHH_A	11.1533	17.6330	6.9066	10.2561
	(0.0008)***	(0.0001)***	(0.0749)*	(0.0363)**
SHZH_A does not Granger cause SHZH_B	77.9265	42.0739	40.6801	13.0615
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0110)**
SHZH_B does not Granger cause SHZH_A	17.3286	18.1838	10.3156	34.4365
	(0.0000)***	(0.0001)***	(0.0161)**	(0.0000)***
SHH_A does not Granger cause SHZH_A	15.0374	9.1151	0.0166	10.9524
	(0.0001)***	(0.0105)**	(0.9994)	(0.0271)**
SHZH_A does not Granger cause SHH_A	7.4968	2.0176	5.0572	8.6987
	(0.0062)***	(0.3647)	(0.1677)	(0.0691)*
SHH_B does not Granger cause SHZH_B	67.7736	47.3258	13.5146	75.6120
	(0.0000)***	(0.0000)***	(0.0036)***	(0.0000)***
SHZH_B does not Granger cause SHH_B	16.9028	15.2377	10.4776	51.6682
	(0.0000)***	(0.0005)***	(0.0149)**	(0.0000)***
		Panel C: 9 Jul 2003-31 Dec 2004		
SHH_A does not Granger cause SHH_B	5.9396	18.0758	16.6064	20.3977
	(0.0148)**	(0.0001)***	(0.0009)***	(0.0004)***
SHH_B does not Granger cause SHH_A	15.1087	16.1130	27.7101	15.5640
	(0.0001)***	(0.0003)***	(0.0000)***	(0.0037)***
SHZH_A does not Granger cause SHZH_B	0.5937	7.5315	12.1069	12.4294
	(0.4410)	(0.0231)**	(0.0070)***	(0.0144)**
SHZH_B does not Granger cause SHZH_A	4.5336	9.0043	8.8459	5.3925
	(0.0332)**	(0.0111)**	(0.0314)**	(0.2493)
SHH_A does not Granger cause SHZH_A	0.2307	9.5888	15.6790	17.1371
	(0.6310)	(0.0083)***	(0.0013)**	(0.0018)***
SHZH_A does not Granger cause SHH_A	7.7907	20.9120	19.4874	17.9932
	(0.0053)***	(0.0000)***	(0.0002)***	(0.0012)***
SHH_B does not Granger cause SHZH_B	0.3106	10.7496	19.5028	17.7990
	(0.5773)	(0.0046)***	(0.0002)***	(0.0014)***
SHZH_B does not Granger cause SHH_B	7.9590	25.2559	24.3478	29.4417
	(0.0048)***	(0.0000)***	(0.0000)***	(0.0000)***

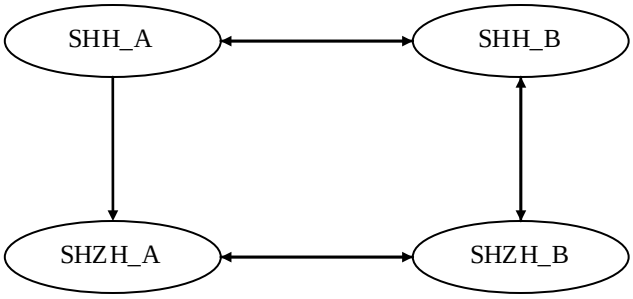
Notes: Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

Figure 5.9: Lead-Lag Relationships in the Chinese Stock Markets (Panel Causality Test)

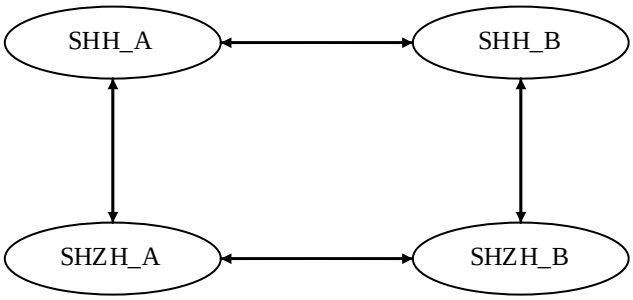
Period A: 3 January 1994 - 16 February 2001



Period B: 28 February 2001 - 8 July 2003



Period C: 9 July 2003 - 31 December 2004



5.4 Summary and Discussion

The information hypothesis discussed in Chapter 3 attributes the Chinese A-shares premium to the asymmetric information local and foreign investors hold. It argues that the foreign investors in the Chinese stock market find it more difficult to assess information regarding the local economy and firms. However, the argument that foreign investors are less informed about local assets than Chinese investors itself is not definite and needs further verification. Literature explaining the premium with the information asymmetry hypothesis commonly uses firm size as a proxy of the asymmetric information, however, if the assumption that local investors have an information advantage over foreign investors does not hold, it will not be appropriate to treat firm size as asymmetric information, but may be more appropriate to consider it as a firm fundamental proposed in Chapter 4. An extensive literature, discussed in Chapter 3, tested the argument that local investors are better informed, employing different samples and methodologies, but results are controversial. In this chapter, I contribute to the literature of whether Chinese investors indeed have an information advantage over foreign investors in the Chinese stock markets, with more up-to-date

data, a more appropriately constructed index, and more advanced econometric techniques.

Considering that the official A-shares index, although widely used in existing literature, is not representative, I constructed an aggregate price of Chinese shares using the price of individual dual-listed shares weighted by the number of tradable shares. Based on the newly created aggregate prices, I then conducted time series unit root and cointegration tests followed by a Granger causality test on stationary VARs (VECMs) and the Toda-Yamamoto causality test on level VARs to identify direction of information flows between the Chinese A- and B-shares markets. The results suggest the Chinese A- and B-shares were perfectly segmented before the B-shares market opened up, and after which, long-run equilibrium relationships between them can be observed in both Shanghai and Shenzhen. This finding is consistent with previous literature (see, e.g., Yang, 2003; Yao, 2003; Darrat *et al.*, 2006). There had not been a study examining the lead-lag relationship of the Chinese A- and B-shares investors after QFIIs entered the A-shares market. My study covered this period, however, I did not see any cointegrating relationship after the QFII programme launched as expected, and this finding is quite surprising. The Granger causality test and the Toda-Yamamoto causality test provide similar results, that there was no information transmission between the A- and B-shares markets before the B-shares market opened and more information flows were identified after the 2001 and QFII deregulations. The evidence supports the second set of literature in that it seems the B-shares investors are better informed in the Shanghai market. As for the Shenzhen market, the information flow, after the 2001 open market reform, between the A- and

B-shares is suggested to be bi-directional by the VECM Granger causality test, and uni-directional from the A-shares to the B-shares by the Toda-Yamamoto causality test. However, it is surprising to see no information transmission is suggested by either of the causality test after QFIIs entered the Shenzhen A-shares market. In addition, the manner of information transmission between the A- and B-shares markets in short-run was looked into through generalized impulse response functions, and double-way feedbacks are suggested.

Trying to provide more robust and insightful evidence, I conducted a causality test using a panel data set, for the first time in the area of Chinese segmented stock markets. The panel data technique incorporates both time-series and cross-sectional information and is consequently considered to be more powerful than time-series techniques alone. Residual-based panel cointegration tests confirm the segmentation status of the Chinese A- and B-shares markets before the 2001 deregulation, which is consistent with previous time-series' findings but contrast with the finding of Ahlgren *et al.* (2003), which is so far the only study done with panel data themselves. This technique also provides supportive evidence that the markets are more linked after QFIIs entered the A-shares market. However, the combined Fisher-Johansen cointegration method provides opposite findings. Using traditional Holtz-Eakin *et al.* (1988, 1989) panel causality procedure, I find before the 2001 event, the Chinese local investors are indeed better informed than foreign investors, as the information hypothesis about the premium puzzle argues. After the deregulation, the Chinese stock markets are more linked, and bi-directional feedbacks between the markets are identified.

Although different results are suggesting by the pure time-series and panel-data methods, both of them suggest there is not always a flow of information from the A-shares investors to the B-shares investors, but after 2001, the B-shares investors tend to have information advantage over the A-shares investors. This finding indicates the information hypothesis alone cannot well explain the Chinese A-shares premium. Especially after 2001, it should be that other factors are responsible for the existence of the premium.

CHAPTER 6

WHY IS CHINA UNIQUE? A CROSS-COUNTRY COMPARISON

6.1 Introduction

The phenomenon of market segmentation is not unique to China, and is observed in a large number of countries, especially emerging markets. For instance, Finnish law allows foreign investors to own up to 20% of the shares of any Finnish company; and at the same time, Finnish investors were prohibited from investing in foreign securities, at least until 1986 (Hietala, 1989). The Thai stock market maintains two separate listings, the Main Board and the Alien Board: the Alien Board is designed for common stocks which have reached foreign ownership limits, and foreign investors are only allowed to hold shares listed on the Alien Board (Bailey and Jagtiani, 1994). The Singapore and Malaysian markets parallelled those in Thailand in creating a distinct market for foreign investors when the foreign ownership limit for a particular stock is reached (Bailey and Jagtinai, 1994). The Philippine market lists Class B shares available to both locals and foreigners, and Class A shares for locals only (Bailey and Jagtinai, 1994). Mexican equity is also characterized by the existence of multiple classes of shares that differentiate between national and foreign investors (Domowitz *et al.*, 1997). In Switzerland, local firms issue bearer shares and registered

shares to maintain domestic control (Stulz and Wasserfallen, 1995). In all the above mentioned countries, otherwise identical equities are priced differently by foreign and local investors. It is typically recorded in the literature that foreign investors who face the restrictions in investing in local assets need to pay a premium to enjoy the diversification benefit, e.g., Bailey *et al.* (1999) suggest, in such markets, foreigners have often paid premia of 20, 50 or even 100% above the price of an otherwise identical security available only to locals. However, there exists an interesting puzzle marked China unique, among the markets which have similar market segmentation feature: in all these segmented markets, China is the only country where foreign investors enjoy a lower price, rather than a higher premium, for identical assets.

The question of why China is different from other countries, which have similar institutional settings with aspect of foreign ownership restrictions, has long been raised, and is mentioned in a large number of Chinese stock market segmentation studies (as was discussed in Chapter 3). Bailey *et al.* (1999) mentioned "it is difficult to explain why Chinese investors pay large premia for restricted shares relative to what foreigners typically offer for matching unrestricted shares". Until today, the puzzle is still not solved satisfactorily, and we still do not know what makes the Chinese segmented markets so different. All the Chinese A-shares premium related studies (as discussed in Chapter 3) ended up examining what factors cause the price premium in China. Those same examined factors, very often individually, have corroborated the foreign class shares price discount in other segmented markets. This leads to a natural empirical question: can the *same* set of factors corroborate both the local class shares price premium in China, and the foreign class shares price premium

in the other countries? Interestingly, this research question appears has not to have been considered since the question was raised ten years ago. After Bailey *et al.* (1999), no studies comparing the segmented markets in different countries have been made, to the best of my knowledge. In pursuit of financial market liberalization, most of the governments removed the market segmentation restrictions to allow investors invest freely, while a few of them, e.g., China, Thailand, The Philippines, still remain. In this chapter, I will try to shed light on the puzzle by providing some cross-country comparison evidence. A few countries, i.e., China, Singapore and Thailand, which have similar dual-listing market frameworks will be compared and contrasted to see whether the premia in these countries can be explained using *same* factor(s), and whether there exists any particular reason makes China unique. Restricted to limited data and literature, this evidence can only be viewed as preliminary. As mentioned in Chapter 3, four principal factors, namely differential risks, differential demands, differential liquidities, and asymmetric information, are popular in explaining the price premium/ discount in China and other segmented markets. I will base my examination, therefore, on these four factors. This cross-country comparison is the first time this approach has been taken to try to understand the Chinese premium puzzle. Additionally, the literature in the dual-listed stocks pricing in Thailand and Singapore is very limited, and a secondary contribution of this work is to enrich the results in this literature.

The remainder of the chapter is organized as follows: Section 6.2 introduces the background of the Singapore and Thai stock markets, which also impose limited ownership restrictions on foreign investors and adopt dual-listing institutional systems,

and compares their institutional settings with the Chinese stock market. The data used in the cross-country comparison is described in Section 6.3. A preliminary description of the premia in the sample countries is provided in Section 6.4. Section 6.5 compares the explanatory power of the popularly used four premium contributors to the premia in the sample countries. Section 6.6 proposes and examines potential reasons for why China is unique. And finally Section 6.7 provides summary and discussions.

6.2 Institutional Settings

Although the three sample countries, China, Singapore and Thailand, are similar in that they all adopt the dual-listing market system, they have their own features. In order to better understand the issue, background information on the foreign ownership restrictions and common shares classifications in Singapore and Thailand, and an institutional comparison of the sample countries will be provided in this section. A brief review of the relevant literature of the two respective sample markets will also be provided.

6.2.1 Singapore

Different from the Chinese stock market before 2001, the Singapore market is a classic example of a mildly legally segmented market because the capital restriction flow is unidirectional. Singapore regulations permit companies to impose restrictions on foreign holdings of equity ownership of local firms in some industries, and the maximum holdings can vary across industries and across companies. In most instances, foreign investors [1] are restricted to common shares of a firm with a

[1] A foreigner is more strictly defined as an individual who is not a citizen or permanent resident of Singapore; or a

maximum limit that varies between 20% and 30%. However, under certain conditions, the percentage could be slightly different in certain industries and firms across industries. For example, if the shareholders and the stock exchange agree on certain amendments, foreign investors can hold shares of banks up to 40%; in other sectors, the maximum foreign ownership holding is even higher, 45% to 55%; while in national defence-related industries, foreign investors can hold at most 25% common shares of the firm; and certain firms and industries are allowed to choose their own foreign equity ownership restrictions. As in China and other segmented markets, the intent of the Singapore foreign ownership restrictions is to ensure local control of domestic firms, especially those firms and industries considered strategically important to national interests. Under the restrictions, foreign investors who bought shares that were legally registered in the name of local investors had to wait for registration of their shares when the foreign ownership limit was reached and became binding. Only when some other foreign investors had sold their shares to local investors and these shares were registered in local investors' names, could foreign investors on the waiting list register the shares in their own names. When waiting for the registration, the foreign investors may lose their benefits, e.g., dividend incomes, rights, and bonus issues.

In the late 1970s and early 1980s, foreign investors' interests in the Singapore market increased. As more and more shares were bought by foreigners, it became difficult to find a willing seller at the single quoted price, which was too low, given the rising

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corporation, wherever incorporated, in which citizens or permanent residents of Singapore of any corporate body constituted by any stature of Singapore do not have an interest, in the aggregate, in at least 50% of the issued share capital of such corporation; or any legal entity (other than an individual or a corporation) which is not owned or controlled by the Government of Singapore or any authority thereof, and is considered by the directors to be a foreign person. (Lam, 1997).

demand for the stocks. An unlisted market then emerged, where stocks were traded at a much higher price than the officially quoted price. Foreign investors would like to pay a premium to buy the shares from another foreign investor, rather than buy the shares from Singapore local investors and wait a long time to register them in their own names. Facing this situation, the Singapore stock exchange began to quote companies' local and foreign stocks separately. The separate listings of local and foreign shares first started with the Singapore Airlines (SIA) and Singapore Press Holdings (SPH) on May 3, 1988. Under the separate listing system, a stock is traded on the local counter before the foreign holdings reach the regulatory limit, and the same stock begins to be traded on the foreign counter once the foreign ownership reaches the limit. Same as the Chinese A- and B-shares, the local and foreign shares of Singapore domestic equity are identical in terms of dividends, voting rights, and other characteristics. In October 1990, the Singapore government allowed local investors to buy and trade foreign class shares. These foreign class shares would still be registered as foreign class. This mildly segmented market setting paralleled the Chinese market after 2001, when Chinese investors entered the B-shares market, that domestic class shares are restricted to local investors, while all investors can trade foreign class shares. Different from the Chinese market setting, the Singapore government does not impose any restrictions on the residents of Singapore with regard to their holdings of foreign securities and investments, and the Singapore residents are free to invest abroad. By June 30, 1995, there were a total of 35 companies that carried restrictions on foreign ownership, of which, 17 companies have separate listed stock series.

The Singapore foreign counter prices are typically higher than the prices on the local counter since the separate listing system was enforced. From 1988 to 1996, the average foreign shares premium was about 32% according to Bailey *et al.* (1999). The high price premium and highly active trading of the foreign counter shares brought a series of problems of the development of the local counter, especially the capital market's main function, resources reallocation, was deteriorated by the separate listing. Under the situation, the Singapore government decided to let the listed companies themselves solve the problem by possibly merging the separate listings. Followed by 11 other companies, the Singapore Technologies Industrial Corp. (STIC) started the abortion of the separate listing system in August 1997.

6.2.2 Thailand

The framework of the Thai foreign ownership restrictions and the creation of the Thai dual-listing system are very similar to Singapore's. In Thailand, foreigners are generally limited to a maximum of 50% ownership of Thai firms. For example, a limit of 25% is imposed on firms in the sector of banking and finance. Same as in Singapore, the percentage limits on the amount of equity that can be registered by foreigners can vary across industries and across firms within an industry under certain conditions. As more and more foreign investors became interested in the Thai market, foreign capital started rush into Thailand from the mid-1980s. The foreign ownership limits of many Thai companies became binding consequently. In order to register the shares in their own names, foreign buyers had to wait until other foreign investors sold their shares and the ownership limit therefore loosened. The Stock Exchange of Thailand (SET) thus inaugurated the Foreign Board/ Alien Board in September 1987

to facilitate trading for foreign investors. As a result, the Thai market has kept two separate listings for common stocks which have reached foreign ownership limits: one for local investors and the other for foreign investors. For companies which have reached their foreign ownership limit, local Thai investors continue to trade shares on the Main Board, while foreign investors trade among themselves on the Alien Board. Shares with separate trading are typically those consisting of large and well-established companies and hence preferred by foreign investors, while the rest of the markets gets less interest from them.

The Main Board and Foreign Board shares are also identical in all respects, e.g., dividends, voting rights, and procedures for settlement and registration. However, share prices on the Foreign Board are typically higher than those on the Main Board (Bailey and Jagtiani 1994). In the period of 1988 to 1992, the average price premium of the Alien Board to the Main Board varied between 5% and 20% (Bailey *et al.*, 1999).

Although trading is formally segmented into distinct boards for local investors and foreign investors, investors can cross to the other board, but at a cost. Foreign investors can also invest in the Main Board by registering under nominee names (usually their brokers). However, they will lose out all the benefits offered by the company, e.g., rights offerings, dividends, but the nominee will receive them. Furthermore, foreign investors can only sell Main Board holdings back into the Main Board market. On the other hand, Thai local investors can buy Alien Board shares freely, but must pay a price premium and only register them as Main Board shares. Since registration on the Main Board would forfeit the value of the Alien Board

premium, local investors may choose hold the Alien Board shares unregistered, however, this would result in losing cash and stock dividends, warrants, other distributions, and voting rights. To avoid losing the premium and other benefits, local investors may only sell an Alien Board share back into the Alien Board market.

In both Singapore and Thailand, the inter-market investment barriers and excess foreign demand provides an economic justification for the creation of separate markets for the local and foreign shares of domestic equity. In China, as introduced in Section 2.2, the motivation of the creation of the B-shares market was to solve the demand of foreign exchange for the development of domestic enterprises, and this does not ensure there would be enough demand of the Chinese B-shares from the foreign investors. Suggested in Section 2.3, the Chinese B-shares market has suffered from thin transaction and sever liquidity problems. From this point of view, the excess demand of foreign class shares in Singapore and Thailand, while less demand in China, could be a reason for the opposite premium in China.

6.3 Data

Daily data are collected from Datastream. Prices of restricted shares and unrestricted shares of the sample countries are all expressed in each country's local currency. As in the previous chapters, the test period lies between 1994 and 2005, when the foreign exchange rate regime was stable in China.

I identified securities in each country with substantial trading activities in both the restricted and unrestricted shares markets. For Singapore, since the dual-listing system was abolished in August 1997, I included all 13 companies that had separate listings

by the end of the period and had data available in the Datastream. Appendix F lists these 13 companies along with the dates of the separate listings and the respective foreign ownership limits, which ranged from 15% to 49%. Sample selection for Thailand is more difficult since the trading is not as active as the Singapore shares. Foreign trading switches to the Alien Board whenever a particular company reaches its foreign ownership limit, and returns to the Main Board if foreign ownership drops below the limit. Furthermore, a company may hit the limit and nominally appear on the Alien Board while experiencing little or no actual volume there. Therefore, I selected 64 companies based on their use in previous studies, i.e., Bailey and Jagtiani (1994) and Bailey *et al.* (2007). A full list of the Thai sample companies is available in Appendix G.

Because of the limited time span the three markets overlapped, the first test period covers three and a half years from 3 Jan 1994 to 30 June 1997, which is after the Chinese exchange rate reform in 1994 and before the separate listing system in Singapore abolished in August 1997. 71 out of 86 Chinese companies which have data as of the end of the sample period are included[2]. To avoid the Asian Financial Crisis from July 1997 to the end of 1998, which may have discouraged foreign investors from investing in the Thai stock market[3], the second test period lies between 1 January 1999 and 30 June 2005, and only Thailand and China are included in the study.

[2] Local B-shares trading codes for the companies excluded are 200429, 200488, 200530, 200581, 200725, 200726, 200761, 200869, 900936, 900940, 900943, 900945, 900947, 900952, 900955.

6.4 Preliminary Description of the Premium/ Discount

Figure 6.1 plots the average daily domestic class shares price premia in China, Singapore and Thailand respectively, between 3 January 1994 and 30 June 2005. The price premium is described as: $PRE_t = \frac{PL_t - PF_t}{PF_t}$, where PL_t and PF_t are equally weighted cross-sectional average prices of local class shares and foreign class shares respectively. The graph shows the magnitude of the premium in China is relatively large. The average Chinese B-shares premium over the entire sample period is 2.15. The premium also exhibits much more volatility. In contrast to the persistent, higher local shares price in China, in Singapore, all the local shares are priced lower during the sample period. In addition, the Singapore discount is relatively stable through the time. The interesting finding lies in the Thai case: opposed with what was documented by Bailey and Jagtiani (1994)and Bailey *et al.* (1999), which are limited with the data pre-1994, that foreign investors offer consistent higher prices for Alien shares through time, I found the higher Alien shares price did not always present themselves- there were a few time points, mainly centered between mid-2001 and mid-2003, when the Alien shares are instead priced lower. This is the period that the Thai economy recovered from the Asian Financial Crisis[4].

[4] During the period, the SET Index increased 154%, the SET 50 Index increased 158%, the daily capital flow increased nearly twice, and the market capitalization increased 187% (Source: Stock Exchange of Thailand).

Figure 6.1: Dual-Listed Shares Price Premia in China, Singapore and Thailand

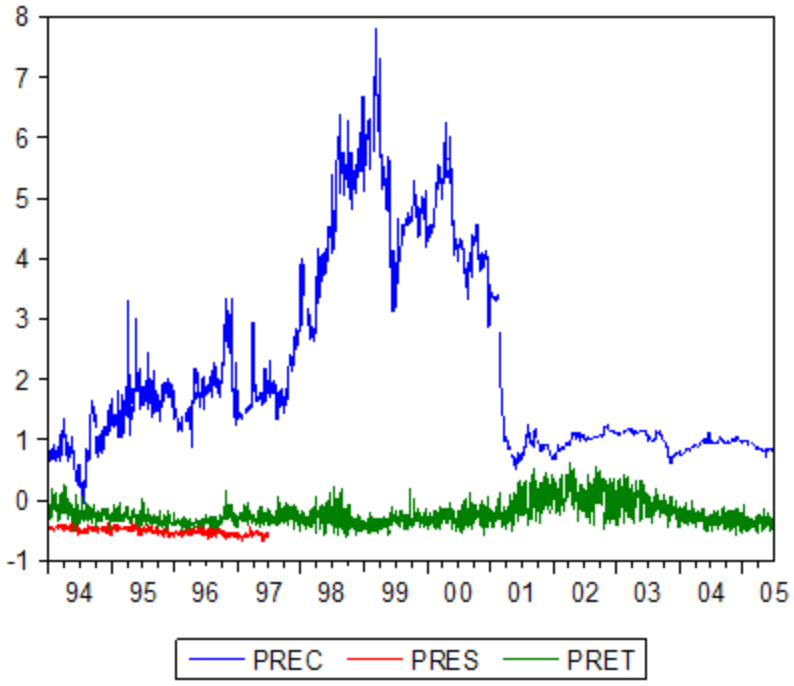

Table 6.1 presents the summary statistics of the average daily price premia in the three sample countries over 3 January 1994 and 30 June 1997 respectively. The Thai premium is further split and examined according to whether it is positive or negative, i.e., whether the Alien Board shares are priced lower or higher, than the Main Board shares.

Table 6.1: Summary Statistics of the Premia in Sample Countries (3 Jan 1994-30 Jun 1997)

	China	Singapore	Thailand (full sample)	Thailand (positive premium)	Thailand (negative premium)
Mean	1.492	-0.516	-0.285	0.091	-0.294
Median	1.576	-0.514	-0.303	0.085	-0.310
Maximum	3.456	-0.276	0.253	0.250	0.000
Minimum	-0.041	-0.705	-0.523	0.000	-0.520

Std. Dev.	0.549	0.057	0.115	0.073	0.100
Obs	865	873	857	20	837

In China, the foreign class shares were traded at prices lower than the prices of their local class counterparts through all the time in the period [5]. The average premium was 1.492, with maximum and minimum premia equalled to 3.456 and -0.041 respectively. The situation in Singapore was opposite: the foreign counter shares were priced higher without any exception and the average premium was -0.516. The maximum and minimum premia equalled to -0.276 and -0.705. Compared with the Chinese example, the relative price gap between the local and foreign counters was much smaller. The average magnitude of the relative price difference between the local and foreign boards was even smaller in Thailand, with the premium value of only -0.285, however the standard deviation of the premium was relatively large. On 20 out of the 857 sample dates, the Thai Alien shares were priced higher than their otherwise identical counterparts.

Table 6.2 presents the summary statistics of the premium for China and Thailand over the latter sample period, 1 January 1999 to 30 June 2005, respectively. Similarly, I split the Thai sample into positive and negative premium sub-samples.

Table 6.2: Summary Statistics of the Premia in Sample Countries (1 Jan 1999-30 Jun 2005)

	China	Thailand (full sample)	Thailand (positive premium)	Thailand (negative premium)
Mean	2.1588	-0.1819	0.1824	-0.2782
Median	1.0657	-0.2400	0.1700	-0.2900

[5] Though there were two exceptions: the average premium was -0.02 on 28 July 1994 and -0.04 on 29 July 1994.

Maximum	7.8051	0.6300	0.6300	0.0000
Minimum	0.5145	-0.5900	0.0000	-0.5900
Std. Dev.	1.7944	0.2261	0.1251	0.1274
Obs	1549	1594	332	1262

Similar observations are found with China and Thai in the second sample period. On one fifth of the sample dates, the price of the Thai Alien shares was inconsistent with Bailey and Jagtiani's (1994) and Bailey *et al.*'s (1999) findings, i.e., instead of priced higher, they were priced lower, than shares traded on the Main Board. The premium in Thailand became more volatile than in China.

6.5 Determinants of the Premium/ Discount

Based on the widely accepted four factors to the premium/ discount discussed in Chapter 3, in this section, I will identify their contributions to the price premium/ discount in the sample countries respectively, to see whether the *same* set of factor(s) can explain both the local class shares premium in China and the foreign class shares premia in Singapore and Thailand. Cross-sectional regressions are used to capture variations in the premium across firms, due to data in time-dimension of certain variable, i.e., foreign ownership limits, are not available. The definition of the determinants will be introduced first, and then empirical results will be presented and discussed.

6.5.1 Definition of Explanatory Factors

Differential Risks Factor

The risk that certain investor group is exposed to is measured by the volatility following a modified range-type estimator (Garman and Klass, 1980):

$$\sigma_{j,i} = \frac{H_{j,i} - L_{j,i}}{0.5(H_{j,i} + L_{j,i})} \tag{6.1}$$

which utilizes high/ low prices and is considered to contain more information regarding volatility than do open/ close prices. Here, $\sigma_{j,i}$ is the standard deviation of the return on the *j*th type of shares for company *i*, $H(L)_{j,t}$ is the time averaged intraday high (low) price of the *j*th type of shares for company *i*.

As mentioned before, the risk differential hypothesis attributes the premium to the different risks foreign and local investors face: the group which face a higher risk requires a higher expected return, and so the corresponding class of shares is priced lower. I define the proxy for the risk attributor as:

$$RK_i = \frac{H_{F,i} - L_{F,i}}{0.5(H_{F,i} + L_{F,i})} / \frac{H_{L,i} - L_{L,i}}{0.5(H_{L,i} + L_{L,i})} \tag{6.2}$$

When the difference between the risks that different investor groups are exposed to increases, the gap of price between the corresponding classes should increase as well.

Differential Demands Factor

In China, the demand factor (*D*) is proxied by the relative number of the B-shares with respect to the total outstanding shares available on the local exchange. Measurement of the differential demands is different in Singapore[6]: the maximum

[6] Measurement of the demand factor in Thailand should be the same as in Singapore, however I could not obtain the updated data.

foreign ownership limitation governments imposed on individual firms is employed as a measure of the demand factor. As the differential demand hypothesis states, given the downward sloping demand curve, the more foreign class shares available to the foreign investors, the lower the price of the B-shares supposed to be. So the demand factor is expected to be positively related to the premium, in both sample countries.

Differential Liquidities Factor

To proxy the differential liquidities factor, I calculated the ratio of the time averaged trading volume of the foreign class shares to the total trading volume for each stock *i*. This is defined as the volume ratio:

$$L_i = \frac{V_{F,i}}{V_{L,i} + V_{F,i}} \tag{6.3}$$

where L_i is the volume ratio of foreign shares for company *i*, $V_{F,i}$ is the time averaged trading volume of foreign shares for company *i*, and $V_{L,i}$ is the time averaged trading volume of local shares for company *i*. Since illiquid stocks are priced lower to compensate for their less liquidity, higher foreign shares liquidity should be negatively correlated with the premium.

Asymmetric Information Factor

Market capitalization (*MV*) is used to measure the asymmetric information factor. Following the information asymmetry hypothesis, larger firms tend to be covered more by the media, so foreign investors may find it easier to have information about such firms and may like to invest in the equities which they are more familiar with.

Hence, larger firms tend to have relatively higher foreign class shares price, and a negative relationship is expected between the market capitalization and the premium.

6.5.2 Comparison of Chinese with Singapore and Thai (1994-1997)

The above introduced determinants are regressed on the premia in the three sample countries over the period from 3 January 1994 to 30 June 1997 respectively.

$$PRE_i = C + \beta X_i' + \varepsilon_i \tag{6.4}$$

where PRE_i is the price premium for firm i; X_i is a vector of explanatory variables including RK_i, D_i, L_i and MV_i; and ε_i is a white disturbance. OLS estimation with White's (1980) heteroskedasticity-consistent standard errors and covariance is employed. The results are presented in Tables 6.3-6.5.

Table 6.3: Determinants of the Chinese Premium (3 Jan 1994-30 Jun 1997)

	C	RK	D	L	MV	Adj. R^2
(1)	1.7686	-0.1718				0.0041
	(0.0000)***	(0.0005)***				
(2)	-1.2886		4.1441			0.2448
	(0.0083)***		(0.0000)***			
(3)	1.2922			1.0866		0.0036
	(0.0002)***			(0.1895)		
(4)	1.5919				4.18E-11	-0.0114
	(0.0000)***				(0.6163)	
(5)	-1.1206	-0.0887	4.3043	-0.6446	-4.26E-12	0.2195
	(0.0133)**	(0.0007)***	(0.0001)***	(0.4645)	(0.9563)	

Notes: The calculation of the market capitalization (MV) includes the non-tradable A-shares. Values in the parentheses are probability values. '**' indicates significant at the 5% level and '***' indicates significant at the 1% level.

The result indicates the deviation in the Chinese A-shares premium across firms is mainly driven by the relative differential demand factor and almost one quarter of the deviation can be explained by it. The more the B-shares are available to the foreign investors, the less is the gap between the A- and B-shares' prices. The differential risks local and foreign investors are exposed to also show statistical significance, however the explanatory power is low.

Table 6.4: Determinants of the Singapore Premium (3 Jan 1994-30 Jun 1997)

	C	RK	D	L	MV	Adj. R^2
(1)	0.2156	-0.3298				0.4369
	(0.1294)	(0.0097)***				
(2)	-0.0392		-0.0077			0.0799
	(0.7920)		(0.2385)			
(3)	-0.3201			0.0556		-0.0893
	(0.3707)			(0.9028)		
(4)	-0.1419				-4.64E-05	0.4092
	(0.0190)**				(0.0026)***	
(5)	-0.2691	-0.2857	-0.0003	0.7999	-3.47E-05	0.6868
	(0.1253)	(0.0168)**	(0.9117)	(0.0049)***	(0.0413)**	

Notes: Values in the parentheses are probability values. '**' indicates significant at the 5% level and '***' indicates significant at the 1% level.

The variation of the premium across firms can be better explained by the four factors in the Singapore market, suggested by a higher adjusted R-square value. Differential risks, liquidities and asymmetric information factors all together explain nearly 70% of the variation in the premium across firms. The risk factor plays a statistically significant role and it is suggested that it alone can explain nearly half of the cross-sectional premium variation, however the sign is unexpected. The negative sign

indicates either investors group in the Singapore market tend to be risk loving. The relative demand does not seem to influence the premium significantly as observed in the Chinese market. Instead, the market capitalization alone explains 40% of variations in the price premium across firms. As documented in the literature, the larger the firm, the less information asymmetry foreign investors face, and the higher price they would like to pay.

Table 6.5: Determinants of the Thai Premium (3 Jan 1994-30 Jun 1997)

	C	RK	L	MV	Adj. R^2
			Full Sample		
(1)	-0.1208	0.0868			0.0944
	(0.0000)***	(0.0071)***			
(2)	-0.0571		-0.0596		-0.0067
	(0.1895)		(0.5053)		
(3)	-0.0824			-1.71E-07	-0.0142
	(0.0042)***			(0.6295)	
(4)	-0.0815	0.0927	-0.0549	-7.28E-07	0.0958
	(0.2049)	(0.0054)***	(0.5473)	(0.1377)	
			Positive Premium		
(1)	0.0868	0.0762			-0.0462
	(0.0188)**	(0.2799)			
(2)	0.1713		-0.1331		-0.0348
	(0.0920)*		(0.4340)		
(3)	0.1546			-1.56E-06	-0.0193
	(0.0221)**			(0.1216)	
(4)	0.3259	0.0579	-0.4088	-4.08E-06	0.1139
	(0.0773)*	(0.4972)	(0.1769)	(0.1081)	
			Negative Premium		
(1)	-0.1804	0.0878			0.2871
	(0.0000)***	(0.0002)***			
(2)	-0.1314		-0.0175		-0.0193
	(0.0002)***		(0.8225)		
(3)	-0.1523			2.08E-07	-0.0142
	(0.0000)***			(0.5202)	
(4)	-0.1940	0.0955	0.0390	-1.73E-07	0.2747
	(0.0001)***	(0.0008)***	(0.5398)	(0.6780)	

Notes: The demand factor is excused from the regression since the updated data is not available. Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

Only the differential risks factor is suggested to be important in explaining the price premium variation across firms in Thailand. The sign of the factor is positive as the differential risks hypothesis expected: the less different of the local and foreign investors' required returns, the less the premium. In the full sample, nearly 10% of the variation in the premium cross firms can be explained by the factor, and the explanation power of the factor is even higher when exclude unusual positive premia. None of the examined factors is statistically significant associated with the abnormal positive premium sample.

Comparing the three markets, the deviation in the premia in both Singapore and Thailand, where foreign investors pay higher than their counterparts for the otherwise identical assets, is influenced by the differential risks local and foreign investors require, while only in China, where foreign investors instead pay less, the premium deviation is mainly explained by the demand factor: firms which have more B-shares outstanding tend to have higher premium. Besides the differential risk factor, the Singapore premium is also explained by the asymmetric information, which is not found in the other two countries. However, both the differential risks factor and the asymmetric information factor are suggested to contribute to the Singapore premium in an opposite way as the hypotheses expected.

6.5.3 Comparison of Chinese with Thai (1999-2005)

Since the separate listing system in Singapore market was abolished in August 1997, I compare the Chinese market with only the Thai market over the period of 1 January 1999 to 30 June 2005. The results are shown in Tables 6.6 and 6.7.

Table 6.6: Determinants of the Chinese Premium (1 Jan 1999-30 Jun 2005)

	C	RK	D	L	MV	Adj. R^2
(1)	1.3662	7.3467				-0.0096
	(0.0000)***	(0.6220)				
(2)	1.5680		-0.1132			-0.0108
	(0.0000)***		(0.7517)			
(3)	0.7268			1.6254		0.2339
	(0.0000)***			(0.0000)***		
(4)	1.3853				2.94E-11	0.0121
	(0.0000)***				(0.2602)	
(5)	-0.0423	17.2015	0.4928	1.7963	1.86E-11	0.2488
	(0.9172)	(0.4246)	(0.1587)	(0.0000)***	(0.4294)	

Notes: Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

Between 1999 and 2005, more than 20% of the cross-sectional Chinese A-shares premium deviation is suggested to be solely driven by the relative liquidity of the foreign and domestic shares. It is suggested by the theory that the higher relative liquidity of the B-shares, the higher their price is, and thus the lower of the premium. However the positive sign in my result seems puzzling.

Table 6.7: Determinants of the Thai Premium (1 Jan 1999-30 Jun 2005)

	C	RK	L	MV	Adj. R^2

			Full Sample		
(1)	0.0745	0.0638			0.0876
	(0.2024)	(0.0000)***			
(2)	0.0218		0.4401		0.0595
	(0.7673)		(0.0185)**		
(3)	0.18404			-1.71E-06	0.0002
	(0.0200)**			(0.0691)*	
(4)	-0.0213	0.0690	0.4353	-2.24E-06	0.2056
	(0.7890)	(0.0000)***	(0.0185)**	(0.0157)**	
			Positive Premium		
(1)	0.3279	0.0522			0.0952
	(0.0004)***	(0.0000)***			
(2)	0.4244		0.0380		-0.0393
	(0.0041)***		(0.8726)		
(3)	0.4965			-2.77E-06	0.0047
	(0.0001)***			(0.0113)**	
(4)	0.3476	0.0523	0.0783	-2.72E-06	0.0911
	(0.0165)**	(0.0000)***	(0.7419)	(0.0126)**	
			Negative Premium		
(1)	-0.1318	0.0061			-0.0426
	(0.0475)**	(0.9189)			
(2)	-0.1500		0.1049		-0.0062
	(0.0011)***		(0.3957)		
(3)	-0.1543			1.52E-07	-0.0387
	(0.0029)***			(0.7824)	
(4)	-0.1541	0.0151	0.13159	-4.76E-07	-0.0718
	(0.0532)*	(0.7989)	(0.3023)	(0.1685)	

Notes: The demand factor is excused from the analysis since the updated data is not available. Values in the parentheses are probability values. '*' indicates significant at the 10% level; '**' indicates significant at the 5% level; and '***' indicates significant at the 1% level.

In the full sample, the differential risks, liquidities and asymmetric information factors are all found statistically significant in explaining the cross-sectional variation of the premium. However, same as in the Chinese market, the liquidity factor also contributes positively to the premium. In the positive premium sub-sample, only the risk factor and the information asymmetry factor appear statistically significant at the 5% level, and the explanatory power is relatively low. In the negative premium sub-

sample, it is suggested some other factor(s) should be responsible for the premium since none of the prevailing determinate factor is suggested to be statistically significant at any conventional level in explaining the premium.

Comparing the Chinese and Thai premia, both of them can be explained by the relative liquidity of the foreign class shares to some extent, however the results suggest puzzling evidence that foreign investors in both markets would like to pay relatively more for illiquid stocks. In addition, there is no evidence to support that the Chinese lower foreign class shares price and the Thai lower foreign class shares price can be explained by same factors.

6.6 Why is China Unique?

6.6.1 Diversification Effect

It is widely documented in the literature that diversification across countries has an incremental value for one country's investors, because they can diversify some of their home country's systematic risk and thus can earn a superior risk-adjusted performance (see, e.g., Grubel, 1968; Levy and Sarnat, 1970; and Lessard, 1973). Therefore, investors are willing to offer a premium for the constrained ownership of securities abroad because the exclusion of foreign securities from their portfolio will result in a diversification loss. I propose foreign investors in both Singapore and Thai markets are willing to offer a premium because the absence of such investment would cause them a diversification loss; while the discount foreign investors enjoy in the Chinese market is a reflection that the Chinese B-shares do not provide such diversification benefit. For international diversification to be successful, it is

important that the returns of individual stock market exhibit a certain degree of independence.

Table 6.8 presents the correlation between the returns of the foreign class shares in the three sample countries and the returns of the worldwide markets measured by the MSCI World, S&P 500, FTSE 100, Hang Seng and Nikkei 500 Indexes.

Table 6.8: Correlations of the Foreign Class Shares' Returns and Worldwide Indexes' Returns

	MSCI	S&P 500	FTSE 100	HANG SENG	NIKKEI 500
Panel A: 3 Jan 1994-30 Jun 1997					
China	0.0465	0.0139	-0.0053	0.0257	0.0839
Singapore	0.0495	0.0274	0.1004	0.1192	0.0131
Thailand	0.0394	0.0001	0.0588	0.0498	0.0050
Panel B: 1 Jan 1999-30 Jun 2005					
China	0.0179	0.0127	-0.0041	0.1255	0.0539
Thailand (full sample)	0.0381	0.0284	0.0086	0.0352	0.0542
Thailand (positive premium)	-0.0694	-0.0552	-0.0052	-0.0925	-0.1260
Thailand (negative premium)	0.0688	0.0342	0.0872	0.0447	0.0223

In the first sample period, when measured by the MSCI and S&P 500 indexes, the Singapore foreign class shares are suggested most linked with the world market, and the Thai Alien Board shares are least linked. The conjecture that the Chinese A-shares premium is caused by the Chinese foreign class shares do not provide diversification benefit as the foreign class shares in other countries do, is not supported by this evidence. Using the FTSE 100 index as a proxy, the Chinese B-shares are seem to be negatively correlated with the worldwide market, and should provide more valuable diversification benefit than the foreign class shares in Singapore and Thailand, which are suggested to be positively correlated with the worldwide market. A negative return

from the UK's market can be compensated for by the positive return from the Chinese market. Among the three sample countries, the Chinese market is least correlated with the Hang Seng index, and this observation also suggests that the Chinese B-shares provide more diversification value than the Singapore and Thai foreign class shares. When the Nikkei 500 index is used to measure the worldwide market, the hypothesis that the Chinese B-shares do not provide as much diversification benefit as the foreign class shares in the other two markets is supported, as the Chinese B-shares is least correlated with the Nikkei 500 index.

In the second sub-period, except Hang Seng index, all other examined indexes have less correlation with the Chinese B-shares, suggesting China provides a better diversification option than Thailand. Suggested in Table 6.2, 20% of the Thai premium is positive in the second sub-period, which means same as the Chinese B-shares, the Thai Alien Board shares are also priced lower than their counterparts. If the diversification effect is truly the reason why China is different, then we should observe some similarity between the Chinese B-shares and the Thai Alien Board shares. However, the finding is not supportive.

Another measurement of the diversification value is the *beta* from the classic Capital Asset Pricing Model (CAPM) (Sharpe, 1964; Lintner, 1965), which measures the sensitivity of the foreign shares indexes in the sample countries to the worldwide market.

$$r_{it} - r_{ft} = c + \beta_i (r_{mt} - r_{ft}) + \varepsilon_{it} \qquad (6.5)$$

where r_{it} is the foreign class shares' returns in the ith country on day t; r_{mt} is the market returns, measured by different benchmark indexes' returns, on day t; r_{ft} is the corresponding risk-free rate on day t; c is a constant; and ε_{it} is a white disturbance. When MSCI and S&P 500 indexes are used as worldwide market benchmarks, returns of 3-month U. S. treasure bills are used as the risk-free rate; when the market returns are proxied by the returns of FTSE 100, Nikkei 500 and Hang Seng indexes, returns on 3-month U. K. treasure bills, Japan's basic discount and loan rate, and Hong Kong 3-month interbank interest rate are used respectively to proxy the risk-free rates. Estimated by OLS, *beta* values are reported in the following Table 6.9.

Table 6.9: Beta Measures of the Foreign Class Shares with Respect to Worldwide Indexes

	MSCI	S&P 500	FTSE 100	Nikkei 500	Hang Seng
Panel A: 3 Jan 1994-30 Jun 1997					
China	1.0006	1.0010	1.0007	0.9973	1.0001
Singapore	1.0013	1.0015	1.0025	0.9992	1.0032
Thailand	0.9994	0.9996	1.0006	0.9989	1.0015
Panel B: 1 Jan 1999-30 Jun 2005					
China	0.9992	0.9992	0.9987	0.9933	0.9993
Thailand	1.0003	1.0003	1.0000	1.0030	1.0004

Between January 1994 and June 1997, proxied by the MSCI index, worldwide stock market movements account for about 100.06% percent of the fluctuations in the Chinese B-shares returns, 100.13% percent of fluctuations in the Singapore foreign counter shares returns, and 99.94% percent of fluctuations in the Thai Alien Board shares returns. It suggests that the Thai Alien Board shares provide a relatively higher diversification value, and the Singapore foreign counter shares provide the least. Same

findings also can be observed when the S&P 500 and FTSE 100 indexes are employed to proxy the worldwide market. When the worldwide market is proxied by the Nikkei 500 and Hang Seng indexes, the Chinese B-shares suggest highest diversification value among the foreign class shares in the three sample countries. In the second sample period, between the Chinese and Thai foreign class shares, the Chinese foreign shares always suggest higher independence to the worldwide market, and so higher diversification value to overseas investors, whichever benchmark is used.

Both the correlation and beta measures approaches suggest we cannot attribute the opposite Chinese foreign class shares price premium to they do not provide enough diversification value to overseas investors.

6.6.2 Heavy Demand of Chinese A-Shares

The model of Stulz and Wasserfallen (1995) shows that the foreign demand curve for local equities may not be perfectly elastic, as assumed in traditional financial theories. There is an increasing body of evidence to support the existence of a downward slopping demand curve for equity shares. Their model suggests that if the demand for shares from domestic investors is more price elastic than the demand from foreign investors, the shares available to the foreign investors will trade at a premium relative to the shares available to the domestic investors. Based on their argument, I hypothesize that the discount in the Chinese foreign class shares is caused by the opposite situation in China: the demand for shares from domestic investors is less price elastic than the demand from foreign investors. Now the question is how to measure the demand elasticities. Bailey (1994) suggests that the lack of alternatives to low-yielding bank accounts drives much of domestic Chinese savings into stock

investments and pushes prices beyond what foreigners are willing to pay. Bailey *et al.* (1999) mentioned that "Chinese demand for any available investment vehicle is even greater than the foreign demand to invest in China" might be the reason that Chinese prohibits such a unique phenomenon. However, they did not go any further because of the availability of suitable data. In the industrial aspect, Jing Ulrich, the managing director and chairman of the JPMorgan's China equities and commodities business, once expressed her opinion of the puzzle in an interview with Financial Times that it is the heavy demand and limited supply of the A-shares cause the unique Chinese premium[7]. As I mentioned earlier in Chapter 4, bank saving is the main alternative to stock investment, I expect the Chinese premium is cointegrated with the inverse of the real savings rate, which might partially proxy for the domestic Chinese demand for equities. The real savings rate is measured by the difference between Chinese 6-month demand deposit rate and inflation rate. Lack of accurate economic relationship between the premium and interest rate, the cointegration test is a simple way to provide this insight.

Table 6.10: Cointegration Test of Inverse of Chinese Real Savings Rate with A-Shares Premium

	Trace Stat	Max-Eigen Stat
r=0	9.2283	7.6738
	(0.3447)	(0.4128)
r<=1	1.5544	1.5544
	(0.2125)	(0.2125)

Note: Values in the parentheses are the MacKinnon-Haug-Michelis (1999) probability values. Quarterly observations are obtained from Datastream. The test period is from Q1 1994 to Q2 2005.

[7] http://www.ftchinese.com/videosection.php

However, the hypothesized potential reason is not supported by the data. Table 6.9 presents the cointegration test result which suggests there does not exist any long-run equilibrium relationship between the premium and Chinese real savings rate.

6.6.3 Differential Liquidity

Amihud and Mendelson (1986) suggested that relatively illiquid stocks have a higher expected return and are thus priced lower to compensate investors for increased trading costs. Empirical evidence suggests that restricted assets, or assets showing illiquidity characteristics, are often valued at a large discount to comparable freely-traded assets. Bailey (1994) found that foreign investors in the Thai market offer relatively high prices for the relatively liquid Alien Board listed shares, with the result that those companies exhibit a relatively higher Alien Board price premium. I will examine whether the opposite price premium in the Chinese stock market is caused by the relative illiquidity of the B-shares. The following Table 6.10 shows the summary statistics of the relative foreign shares liquidity in the sample countries. In the first sub-period, as the smallest value appears in the Chinese market, there is supportive evidence that the opposite premium in China is caused by the illiquidity of the foreign shares. In the second sub-period, the Thai Alien Board shares are relatively more illiquid than the Chinese B-shares, however, foreign investors in the Thai market still would like to pay a premium for them. Besides, the positive premium group of Thailand actually is related with higher average relative liquidity value.

Table 6.11: Summary Statistics of Foreign Class Shares' Relative Liquidity

	Panel A: 3 Jan 1994-30 Jun 1997		
	China	Singapore	Thailand
Mean	0.3445	0.6688	0.3873
Median	0.3041	0.7104	0.3569
Maximum	0.7994	0.9079	0.9855
Minimum	0.0607	0.3974	0.0206
Std. Dev.	0.1563	0.1848	0.2624

	Panel B: 1 Jan 1999-30 Jun 2005			
	China	Thailand (full sample)	Thailand (positive premium)	Thailand (negative premium)
Mean	0.4729	0.3317	0.4384	0.2166
Median	0.5038	0.2742	0.3209	0.1230
Maximum	0.8210	0.9688	0.9688	0.5032
Minimum	0.1151	0.0006	0.0087	0.0006
Std. Dev.	0.1798	0.2853	0.3200	0.1880

6.6.4 Information Asymmetry

Chakravarty *et al.* (1998) extended the asset-pricing model based on Grossman and Stiglitz (1980) to incorporate asymmetric information and market segmentation in a noisy rational expectations framework. Their model predicts that whether cross-listing leads to a premium or a discount in trading of the foreign class shares depends on the relative magnitudes of the information asymmetry effect and the diversification effect. The former effect leads to discounts for the B-shares, while the latter effect implies a premium for the B-shares. Their theoretical argument provides a possible explanation to the puzzle and to why foreign shares trade at such large discounts in China but at premia in other markets: when there is no asymmetric information, their model predicts a premium for foreign shares, as in previous models of market segmentation; with severe asymmetric information, however, the B-shares may trade at a discount relative to the A-shares. Following their proposition, I will examine whether the

reason for China's opposite premium is that there is no asymmetric information in other countries; while in China, foreign investors are less informed.

Although the causality tests in Chapter 5 using time-series data does not support the information asymmetry before 2001, the panel causality test suggests local Chinese investors are better informed than their foreign counterparts. Chakravarty *et al.* (1998) argue that foreign investors find it more difficult to acquire and assess information about local Chinese firms, relative to domestic investors. These difficulties are due to language barriers, different accounting standards, and lack of reliable information about the local economy and firms. Many listed B-shares firms do not fully and promptly disclose all material changes in their business conditions, and published statements are not always prepared according to international accounting standards. While these problems face all investors, they are worse for foreign investors since local investors may be able to have access to informal local information sources that are unavailable to nonresident investors.

I tested the information asymmetry status between local and foreign investors in Singapore and Thailand between 3 January 1994 and 30 June 1997, using Toda-Yamamoto (1995) causality test introduced in Chapter 5. The results are reported in Table 6.12. It is suggested, same as the Chinese situation, the local Singapore investors are also better informed about domestic equities than foreign investors. However, they still would like to offer a premium over the local class shares. It seems the information asymmetry hypothesis cannot well explain the puzzle either.

Table 6.12: Information Asymmetry Between Local and Foreign Investors in Singapore and Thailand (3 Jan 1994-30 June 1997)

	Singapore			Thailand		
	lag	chi-sq	Prob.	lag	chi-sq	Prob.
Foreign class shares return does not Granger Cause local shares return	6+1	5.8961	0.4349	8+1	17.9344	0.0217**
Local class shares return does not Granger Cause foreign shares return		13.6662	0.0336**		6.9648	0.5404

Note: '**' indicates significant at the 5% level.

6.7 Summary and Discussion

Although the unique opposite premium of China has been mentioned a lot, no work so far has provided a completely satisfactory explanation. This chapter firstly compared and contrasted the institutional settings of China, Singapore and Thailand, which all have separate listing system, and secondly examined whether the cross-sectional deviations in the premium/ discount of the foreign class shares in the sample countries can be explained by same factor(s). Thirdly, four potential reasons for the opposite Chinese premium are proposed and examined, and preliminary evidence is provided. The results suggest the dual-listed shares price premia in China, Singapore and Thailand cannot be explained by same factors. Cross-sectional deviations in the Chinese A-shares premium can mainly be explained by the differential demand of the B-shares before June 1997 and by the differential liquidity of the B-shares after June 1997; while in the other two countries, Singapore and Thailand, a common significant driven factor is the differential risk between local and foreign investors. The results from the further examination of the four potential reasons, i.e. the Chinese B-shares do not provide attractive diversification value to foreign investors; the price of the

Chinese A-shares is pushed up by their heavy demand from Chinese local investors; Chinese B-shares are relatively illiquid; foreign investors in the Chinese stock market face severe information asymmetry, for the opposite Chinese premium suggest none of them can explain the puzzle. In addition, I found the premium in Thailand is not always as negative as documented with earlier data, but sometimes the local Thai investors also pay a higher price than their foreign counterparts for identical assets. This makes the Chinese lower foreign class shares price not unique anymore. However, I did not find the lower foreign class shares prices in China and Thailand are caused by same forces.

The literature in segmented markets besides China is extremely limited, especially in recent years when the market segmentation policies were abolished in most of the countries as a result of market liberalization. This chapter, with more up-to-date data, is the first cross-country research after Bailey *et al.* (1999). The research of this chapter faced a lot of difficulties, such as there are only a few countries that continue to retain the dual-listing system; there is not enough essential literature on sample countries; data quality is poor in some countries, e.g., Mexico, due to liquidity reasons and the already limited sample of countries with dual-listed stocks has to be further reduced; updated datasets are not fully available, e.g., the differential demand factor in Thailand. Nevertheless, this chapter took a first step forward in trying to considering the Chinese puzzle.

CHAPTER 7

CONCLUSION

The topic of the Chinese A-shares premium puzzle has remained unresolved for over a decade since it was raised by Bailey in 1994. Major research efforts across many disciplines, including economics, financial economics, finance, behavioural finance, corporate finance and management, have looked into the premium puzzle. All these works have mainly tried to uncover an explanation for two aspects of the puzzle: the factors that caused the premium, and the segmentation/ integration of the Chinese stock markets. Although many efforts have been put into revealing the puzzle, there is so far still no leading paper or clear answer to it, but rather, all the works involved contribute their own parts to the problem. This thesis has not attempted completely to resolve the puzzle, but has revisited it from new perspectives, in an attempt to provide a more up-to-date and insightful picture.

Compared with the A-shares market, the Chinese B-shares market has suffered from thin transactions and poor liquidity, which in turn seriously affects investors' enthusiasm in investing in the B-shares. The B-shares market has been increasingly marginalized as many overseas investors have fled it, especially after domestic investors entered the market in 2001. Many practitioners have claimed the B-shares market has lost its basic function as a capital allocator and should be abolished at some time point. As China has made public regulations that allow overseas strategic investors to buy shares on the A-shares market, there are probably fewer reasons now

for the B-shares market to remain. The eventual cessation of the B-shares has been put on the agenda. Mr. Qibin Ren, the Head of Research Center of the China Securities Regulatory Commission, confirmed that the CSRC has been discussing possible solutions, with the options of keeping the development of the B-shares market and making it the place for foreign firms listing stocks in China, or abolishing the market by either repurchasing the B-shares or merging it with the A-shares market or even the H-shares market. Whatever solutions are adopted eventually, it is necessary to get a clearer and more updated understanding of the nature of the Chinese segmented markets and pricing features therein. This thesis has tried to look at a puzzle that today is important and shed light on the puzzle in three separate but related investigations.

7.1 Main Findings of the Thesis

The organization of this thesis had been based on attempts to answer the three sets of research questions which were posed in Chapter 1. Thus, the key findings are presented in the form of answers to these research questions.

Question 1: Why there is large variation in the premium across firms? Are local Chinese investors really liquidity driven and care less about intrinsic value? Is the QFII programme successful in importing value investing preference to the local market?

The findings in Chapter 4 indicate that the local Chinese investors and foreign investors do have different valuation preferences over certain firm fundamentals. Before 2001 when the Chinese individual investors were allowed to participate in the

B-shares market, the foreign investors value firms which are more efficient in generating profit from shareholders' equities and firms which would like to return profit to shareholders. Unlike what has generally been believed in terms of local investors being short-run speculators, I found evidence that they do value firms' future performance. The relationship between such fundamentals and the price premium disappeared after the reform of 2001, indicating the preference difference diminished as the two markets became integrated. This could be the result of local and foreign investors 'learning' from their counterparts. However, the influence of the floating factor exists through the entire sample period, from 1994 to 2004. Foreign investors would like to pay more for firms with fewer shares kept in government's hands. The consistent decreasing coefficient of the floating ratio in the Shanghai market suggests the deregulations were effective; however in the Shenzhen market, the QFII programme may not has been so successful.

The decline of the premium around the 2001 open market reform is found to be concentrated in firms with lower financial risk, suggesting local investors prefer firms with such a feature. Besides, a larger decline is also found to be associated with a lower return on equity and floating ratio for the Shenzhen-listed firms. Decline in the premium around the launch of the QFII programme is suggested to be concentrated in Shanghai-listed firms with lower financial risk, higher expected sales growth and lower relative liquidity of their A- and B-shares.

Question 2: Are local Chinese investors really better informed than foreign investors as the information asymmetry hypothesis about the determinants of the price premium

argues? Has the linkage between the A- and B-shares markets strengthened as deregulations, which aim to remove the market segmentation, were introduced?

The information asymmetry hypothesis of the Chinese A-shares premium is based on the foundation that Chinese local investors are better informed than foreign investor, thus foreign investors would only like to offer a lower price considering their information disadvantage about local assets. However, the argument that local Chinese investors are better informed than foreign investors about local assets itself is worthy of careful examination. The extensive previous literature has generated different results. I raised this question again by using a more appropriate and up-to-date dataset, which includes only firms with dual-listed shares instead of commonly used official price index which includes all firms, and more appropriate econometric techniques, including the Toda-Yamamoto causality test, and a panel data approach.

Pure time-series analyses suggest the Chinese stock markets are perfectly segmented under strict segmentation restrictions, and there is no information flow suggested between local and foreign investors. Since the restriction was partially removed, the two markets became more linked and an information flow between local and foreign investors was found: foreign investors in the Shanghai market were found to be have an information advantage over their foreign counterpart, as suggested by both a traditional Granger causality test and the Toda-Yamamoto type causality test; in the Shenzhen market, a traditional Granger causality test indicates there is double way feedback between local and foreign investors, while the Toda-Yamamoto causality test suggests the information flow is one way: from local investors to foreign investors. My study also covered data after the QFII programme introduced, and thus provided

evidence of how effective the programme was in removing segmentation between Chinese A- and B-shares markets. However the finding is surprising, as it suggests no information flow between the A- and B-shares investors at all in the Shenzhen market by either methodology; in the Shanghai market, foreign investors are found still to take the leading position. Following the above findings, it seems the foundation of the information asymmetry argument does not even exist.

More advanced and more powerful panel data analyses, which take into account of information in both time-series and cross-sectional dimensions, suggest the linkage between the A- and B-shares does strengthen after the QFII programme was introduced. The panel causality test confirms local investors are better informed than foreign investors before 2001, which is supportive of the information asymmetry hypothesis. After 2001, information is found to flow bi-directionally. Since the A-shares premium, although it has continued to diminish, still persists after deregulations, and no certain group of investors are found significantly to have superior information, there may be other factors that cause the premium.

Question 3: Why China is unique in foreign investors enjoying a price discount rather than the commonly observed premium in other segmented markets with similar market settings?

This question has been mentioned a lot in earlier studies but has never been resolved satisfactorily so far. Facing a lot of empirical difficulties, e.g. limited literature, available sample countries and good quality data, I tried to provide some preliminary evidence to the puzzle by comparing China and Singapore and Thailand. This is the first cross-country comparison after Bailey *et al.* (1999). A surprising finding is that

the opposite Chinese premium should not be considered 'unique' as documented for decade, but the premium in Thailand is also positive sometimes, i.e., foreign investors pay less than local investors for identical assets, especially during 2001 and 2003. I did not find the positive premium in China and in Thailand is caused by same proposed factors. Among the four prevailing factors, i.e., differential risks, differential demands, differential liquidities and asymmetric information, the demand factor and liquidity factor are found to be attributable to the cross-sectional deviation of the premium in China, while risk and asymmetric information factors are found significant in Thailand, before June 1997 and after 1999 respectively. As for the reason of the opposite premium in China, I tried to trace the source from four aspects, i.e. the Chinese B-shares do not provide enough diversification value to attract investors from overseas, heavy demand of the A-shares from Chinese local investors; the Chinese B-shares are relatively illiquid, and foreign investors in the Chinese market are information disadvantaged, however none of these is found to be supported by the data.

7.2 Limitations and Suggestions for Future Research

As mentioned in the former section, the research has not been set out to attempt to be the definitive work on the topic of Chinese stock market segmentation and the A-shares premium, but rather to provide a more multi-angled insight. It is constrained by the following limitations and future research could be done to complete them:

(i) In order to take account of possible effects the policy changes on the premium, I split the sample into sub-samples based on the date when the policies went into

effect, however, no formal econometric techniques regarding structural break were involved. Literature in structural breaks of panel data is still limited and there is not a widely accepted, established panel data structural breaks test so far. Further research could therefore be done in this area when a proper econometric treatment becomes available.

(ii) Due to the change of the Chinese exchange rate regime in July 2005, the dataset used in the research only covers two years after the QFII programme was introduced. Especially in Chapter 4 when annual data is used, the number of the observations is relatively limited. Since the Chinese B-shares are traded in foreign currency, the premium after July 2005 incorporates the fluctuation in the exchange rate. Further research could be done in taking into account of the influence of the exchange rate changes.

(iii) Although the Chinese A-shares premium has been decreasing, it still exists. The 2001 deregulation, which removed the restrictions of local Chinese individuals in investing in the B-shares market, made the premium drop dramatically. This might suggest the premium is largely caused by the segmented market structure. When foreign institutional investors are allowed to trade the A-shares through the QFII programme, the segmentation is further removed. According to the result in Chapter 4, that local and foreign investors do have their own investment valuation preference, the premium would continue to persist even if 'hard' segmentation due to policy restrictions imposed by the government is removed, as it would be affected by the 'soft' segmentation caused by differential valuation preference. Further research could be done to confirm whether the 'soft' segmentation indeed

exists. In addition, the valuation preference of different investors groups suggested in Chapter 4 is not stable, and further research could also be done to verify whether the preferences do indeed vary through time.

(iv) The cross-country comparison conducted in Chapter 6 has some limitations, including the market segmentation and dual-listing system had be abolished in lots of countries when the new Chinese stock markets founded; literature and especially recent literature in such countries is extremely limited; sample countries are restricted due to data availability and quality. More accurate research could be undertaken in the future when necessary source and material is available. For example, the empirical results suggest the local class shares premium in China and the foreign class shares premium in other countries cannot be well explained by the same set of factors, suggesting there are other factors that contribute to these premia. The differential valuation preferences hypothesis could be a promising first hypothesis here when necessary firm fundamentals data in other countries are available.

(v) Although there is no fundamental difference between the Shanghai market and the Shenzhen market, and the two markets were subject to same regulations, I found the premia of firms listed in the two markets have certain different features, and I treated the two markets separately in my examinations. It would also worthy to carry out investigations in the future to find out where the differences between the exchanges come from.

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Appendix A:

Notice on Issues related to Individual Domestic Residents Investing in Foreign Currency Stocks Listed on the Domestic Stock Markets (B-Shares Market)

No. 22[2001] CSRC

This notice is addressed to the following institutions: all the Securities Regulatory Offices, Sub-Offices, Representative Offices; all the branches, Beijing and Chongqing Departments of State Administration of Foreign Exchange ("SAFE"); Shanghai and Shenzhen Stock Exchanges; all the commercial banks, securities companies and investment trust companies concerned.

To facilitate the sound development of foreign currency stocks listed on the domestic stock markets ("B shares"), maintain the stability of both the B share and foreign exchange markets, protect investors' rights, and regulate the conduct of all organizations and individuals in the stock market, the China Securities Regulatory Commission ("CSRC") has made this notice with regard to the following issues:

1. In accordance with Clause 4 of the Regulations of the State Council on Foreign Currency Stocks Listed on the Domestic Stock Market Issued by Limited Companies [the State Council Decree No. 189, 1995] and the Decision of CSRC on Domestic Residents May Invest in the B Share Market Issued on February 19, 2001, individual domestic residents may, in accordance with this notice, invest in B shares.

2. Before June 1, 2001, domestic residents who want to invest in the B shares, can only use the foreign currency which had been deposited in domestic commercial banks, either in the foreign exchange account or foreign currency account, prior to February 19, 2001 (February 19 is inclusive and similarly hereinafter). However, those foreign currencies either in cash or transacted from any other sources other than from the foreign currency deposit accounts as stated above will not be allowed to invest in the B shares. The foreign currency that had been deposited before February 19, 2001 in the domestic commercial banks and re-deposited after this date due to the expirations can be invested in the B shares. Domestic residents are allowed, after June 1, 2001, to invest in the B shares with foreign currencies which are deposited after February 19, 2001 or transferred from abroad to the Chinese domestic commercial banks. Foreign currency in cash can still not be used for investment in the B share market.

3. Securities companies and investment trust companies which have been authorized by the CRSC to manage B shares business and authorized by SAFE to handle foreign currencies may bring the certificates issued by the CSRC for operating the B shares and the licenses authorized by State Bureau of Foreign Exchange Control for managing foreign currencies, and set up B share guarantee accounts at all the domestic commercial banks and their branches which have been authorized to manage foreign currencies in the same city. The branches of the above-mentioned securities companies and investment trust companies may set up the guarantee accounts for the same purpose by providing copies of the abovementioned certificates and licenses issued to their parent companies, on which the branches should put their own seals. Only one B share guarantee account is allowed for each securities company or investment trust company or their branches ("securities operating institutions") with one domestic commercial bank within the same operating area and under no circumstances should more than one B share guarantee account under one securities or investment trust company be allowed to set up in one domestic commercial bank within the same area. Securities operating institutions should, within three working days, submit

files to SAFE or its local branches (“Foreign Exchange Bureau”) about the banks holding their guarantee accounts and release the information about their guarantee accounts to the public via media.

4. Domestic residents who wish to open B share accounts should follow the procedures below:

1) Transferring their foreign currencies:

Individuals may transfer their foreign currencies from their deposit accounts into the B share guarantee accounts set up by the securities operating institutions. Personal IDs are required for such transactions. For the time being, such transactions are restricted to the same banks and the same areas. Domestic commercial banks should provide bank statements to individuals for their money being transferred, and should also send the same statement to the securities operating institutions for them to verify.

2) Setting up B share capital accounts with securities operating companies:

Individuals then may open B share capital accounts with securities operating institutions. Personal IDs and bank statement of the transferred foreign currencies are required. The minimum B share account opening balance is 1,000.00 US dollars or its equivalent.

3) Setting up B share securities accounts: After setting up the B share capital accounts, individuals may open their B share securities accounts with securities operating companies.

5. Domestic commercial banks should strictly obey the rules in this notice and check the dates when domestic residents transfer foreign currency from their CD (certified deposit), the foreign currency should be deposited before February 19, 2001. When transferring foreign currency from the saving accounts, the amount being transferred should not be more than the balance of the accounts as of February 19, 2001. And when making the transactions, domestic residents should convert the foreign currency into the same currency as the B share guarantee account held by the securities operating institutions.

6. The inflow to the B share capital accounts for domestic residents should be the foreign currency being transferred from foreign exchange accounts or foreign currency accounts, and the profit from B share trading. The outflow can only be used to buy B share stocks or transferred back to domestic commercial banks. However, foreign currency in B share capital accounts is not allowed to be transferred to foreign countries. All the foreign currencies transferred from B share capital accounts to their deposit accounts within domestic commercial banks shall be regarded as foreign currency within the country and be subjected to The Temporary Rules on Foreign Currency Regulations of Individual Domestic Residents and other rules whichever are applicable. Domestic residents shall not withdraw foreign currency cash from their B share capital accounts at any time.

7. The inflow to the B share accounts for non-residents shall be foreign currency being transferred from abroad, foreign currency lawfully deposited with domestic commercial banks and profit from the B share trading. The outflow should be the foreign currency being transferred abroad, or being deposited in their legal accounts within domestic commercial banks and/or deducted for B share trading. Non-residents shall not withdraw foreign currency cash from their B share accounts.

8. Transference of B shares between domestic residents and non-residents is forbidden. Domestic residents shall not put their B share holdings under trusteeship operated outside mainland China.

9. All domestic commercial banks which have set up B share guarantee accounts for the securities operating institutions are allowed to manage foreign currency payment and settlement associated with B share trading between securities operating companies and securities registration and settlement companies.

10. All securities operating institutions, domestic commercial banks, domestic residents, non-residents shall strictly obey the rules laid out within this notice and any other rules and regulations made by the CSRC and the SAFE with regard to B share trading, in order to avoid transferring of foreign exchange abroad and illegal trading of foreign currencies. Those who are in breach of the rules and regulations shall be penalized by the CSRC and SAFE under the rules and regulations applied.

This notice shall come into force on the date of its public release. Securities operating institutions may open B share guarantee accounts with domestic commercial banks from the date of this notice. However, domestic residents shall not transfer foreign currency for the purpose of opening B share capital accounts until February 26, 2001. The Notice on Issues related to Strict Control of Opening B Share Accounts No. 75 (1996) by CSRC and The Notice of Clearing up B Share Accounts No. 1 (1996) CSRC shall be annulled at the same time as this notice comes into force.

Appendix B:

Provisional Measures on Administration of Domestic Securities Investments of Qualified Foreign Institutional Investors (QFII)

China Securities Regulatory Commission
People's Bank of China

Decree No. 12

The "Provisional Measures on Administration of Domestic Securities Investments of Qualified Foreign Institutional Investors (QFII)", which will come into effect from 1 December 2002, is hereby promulgated.

CSRC Chairman: Zhou Xiaochuan
PBOC Governor: Dai Xianglong

Chapter 1. General Provisions

Article 1. Based upon China's relevant laws and administrative regulations, this Regulation was promulgated for the purpose of governing Qualified Foreign Institutional Investors' investments in China's securities market and promoting developments of China's securities market.

Article 2. Qualified Foreign Institutional Investors (hereinafter referred to as "QFII" which can be a single or a plural, as the case may be) are defined in this Regulation as overseas fund management institutions, insurance companies, securities companies and other assets management institutions which have been approved by China Securities Regulatory Commission (hereinafter referred to as "CSRC") to invest in China's securities market and granted investment quota by State Administration of Foreign Exchange (hereinafter referred to as "SAFE").

Article 3. QFII should mandate domestic commercial banks as custodians and domestic securities companies as brokers for their domestic securities trading.

Article 4. QFII should comply with laws, regulations and other relevant rules in China.

Article 5. CSRC and SAFE shall, in accordance with the laws, supervise and govern the securities investing activities undertaken by QFII within the jurisdiction of China.

Chapter 2. Qualifications, Criteria and Approval Procedures

Article 6. A QFII applicant should fall within the following criteria:

(1) The applicant should be in sound financial and credit status, should meet the requirements set by CSRC on assets size and other factors; and its risk control indicators should meet the requirements set by laws and securities authorities under its home jurisdiction;

(2) Employees of the applicant should meet the requirements on professional qualifications set by its home country/region;

(3) The applicant should have sound management structure and internal control system, should conduct business in accordance with the relevant regulations and should not have received any substantial penalties by regulators in its home country/region over the last three years prior to application;

(4) The home country/region of the applicant should have sound legal and regulatory system, and its securities regulator has signed Memorandum of Understanding with CSRC and has maintained an efficient regulatory and co-operative relationship;

(5) Other criteria as stipulated by CSRC based on prudent regulatory principles.

Article 7. The criteria of assets scale and other factors as referred to in the aforesaid article are:

For fund management institutions: Having operated fund business for over 5 years with the most recent accounting year managing assets of not less than US$10 billion;

For insurance companies: Having operated insurance business for over 30 years with paid-in capital of not less than US$1 billion and managing securities assets of not less than US$10 billion in the most recent accounting year;

For securities companies: Having operated securities business for over 30 years with paid-in capital of not less than US$1 billion and managing securities assets of not less than US$10 billion in the most recent accounting year;

For commercial banks: Ranking among the top 100 of the world in the total assets for the most recent accounting year and managing securities assets of not less than US$10 billion.

CSRC may adjust the aforesaid requirements subject to the developments of securities market.

Article 8. To apply for QFII qualification and investment quota, an applicant should submit the following documents to CSRC and SAFE respectively through its custodian:

(1) Application Forms (including basic information on the applicant, investment quota applied for and investment plan, etc.);

(2) Documents to verify that the applicant meets requirements set in Article 6;

(3) Draft Custody Agreement signed with its expected custodian;

(4) Audited financial reports for the most recent 3 years;

(5) Statement on sources of the funds, and Letter of Undertaking promising not to withdraw funds during the approved period;

(6) Letter of authorisation by the applicant;

(7) Other documents as required by CSRC and SAFE.

All the aforesaid documents, if written in languages other than Chinese, must be accompanied by their Chinese translations or Chinese extracts.

Article 9. The CSRC shall, within 15 working days from the date the full set of application documents are received, determine whether to grant approval or not. Securities Investment Licences will be issued to those applicants whose applications have been approved whereas written notices will be given to those applicants whose applications have been rejected.

Article 10. Applicants shall apply to the SAFE through their custodians for investment quotas after obtaining the Securities Investment Licences.

SAFE shall, within 15 working days from the date full set of application documents are received, determine whether to grant approval or not. Applicants whose applications have been approved will be notified in writing

their permitted investment quotas and Foreign Exchange Registration Certificates will be issued. Written notices will be given to those applicants whose applications have been rejected.

The Securities Investment Licence will automatically become void if an applicant is unable to obtain the Foreign Exchange Registration Certificate within one year after the Securities Investment Licence is granted.

Article 11. In order to encourage medium and long-term investments, preference will be given to the institutions managing closed-end Chinese funds subject to the requirements of Article 6 or pension funds, insurance funds and mutual funds with good investment records in other markets.

Chapter 3. Custody, Registration and Settlement

Article 12. A custodian should meet the following requirements:

(1) Has a specific fund custody department;

(2) With paid-in capital of no less than RMB 8 billion;

(3) Has sufficient professionals who are familiar with custody business;

(4) Can manage the entire assets of the fund safely;

(5) Has qualifications to conduct foreign exchange and RMB business;

(6) No material breach of foreign exchange regulations for the recent three years.

Domestic branches of foreign-invested commercial banks with more than three years of continual operation are eligible to apply for the custodian qualification. Their paid-in capital eligibility shall be based on their overseas headquarters' capital.

Article 13. Approvals from CSRC, People's Bank of China (hereinafter referred to as "PBOC") and SAFE are required for custodian status.

Article 14. Domestic commercial banks should submit the following documents to CSRC, PBOC and SAFE to apply for custodian status:

(1) Application Forms;

(2) Copy of its financial business licence;

(3) Management system in relation to its custody business;

(4) Documents verifying that it has efficient information and technology system;

(5) Other documents as required by CSRC, PBOC and SAFE.

CSRC, together with PBOC and SAFE, will review application documents and decide whether to approve the applications or not.

Article 15. A custodian shall perform the following duties:

(1) Safekeeping all the assets that QFII put under its custody;

(2) Conducting all QFII related foreign exchange settlement, sales, receipt, payment and RMB settlement businesses;

(3) Supervising investment activities of QFII, and reporting to CSRC and SAFE in case QFII investment orders are found to have violated laws or regulations;

(4) Reporting to SAFE about foreign exchange remittance and repatriation of QFII, in two working days after QFII remits/repatriates its principal/proceeds ;

(5) Reporting to CSRC and SAFE about the status of QFII's RMB special account, in five working days after the end of each month;

(6) Compiling an annual financial report on QFII's domestic securities investment activities in the previous year and sending it to CSRC and SAFE in three months after the end of each accounting year;

(7) Keep the records and other related materials on QFII's fund remittance, repatriation, conversion, receipt and payment for no less than 15 years;

(8) Other responsibilities as defined by CSRC, PBOC and SAFE based on prudent supervision principles.

Article 16. A custodian should strictly separate its own assets from those under its custody.

A custodian should set up different accounts for different QFII, and manage those accounts separately.

Each QFII can only mandate one custodian.

Article 17. QFII should mandate its custodian to apply for a securities account on its behalf with securities registration and settlement institution. When applying for a securities account on behalf of the QFII, a custodian should bring the QFII' mandate and its Securities Investment Licence and other valid documents, and file with CSRC the relevant situation within five working days after opening a securities account.

QFII should mandate its custodian to open a RMB settlement account on its behalf with securities registration and settlement institution. The custodian shall be responsible for the settlement of QFII's domestic securities investment, and shall file with CSRC and SAFE the relevant situation within five working days after opening a RMB settlement account.

Chapter 4 Investment Operations

Article 18. Subject to the approved investment quota, QFII can invest on the following RMB financial instruments:

(1) Shares listed in China's stock exchanges (excluding B shares);

(2) Treasuries listed in China's stock exchanges;

(3) Convertible bonds and enterprise bonds listed in China's stock exchanges;

(4) Other financial instruments as approved by CSRC.

Article 19. QFII may mandate domestically registered securities companies to manage their domestic securities investments.

Each QFII can only mandate one investment institution.

Article 20. For domestic securities investments, QFII should observe the following requirements:

(1) Shares held by each QFII in one listed company should not exceed 10% of total outstanding shares of the company;

(2) Total shares held by all QFII in one listed company should not exceed 20% of total outstanding shares of the company.

CSRC may adjust the above percentages based on the developments of securities market.

Article 21. QFII's domestic securities investment activities should comply with the requirements as set out in the Guidance for Foreign Investments in Various Industries.

Article 22. Securities firms should preserve the trading and transaction records of QFII for at least 15 years.

Chapter 5 Fund Management

Article 23. Upon the approval of SAFE, a QFII should open a RMB special account with its custodian.

Within five working days after the opening of the RMB special account, the custodian should report to CSRC and SAFE for filing.

Article 24. Revenue articles in the RMB special account shall include: settlement of funds (foreign exchange funds from overseas, and accumulated settlement of foreign exchange should not exceed the approved investment quota), proceeds from the disposal of securities, cash dividends, interests from current deposits and bonds. Expense articles in the RMB special account shall include: cost of purchasing securities (including stamp tax and commission charges), domestic custodian fee and management fee, and payment for purchasing foreign exchange (to be used to repatriate principals and proceeds).

The capital of special RMB account shall not be used for money lending or guarantee.

Article 25. Within three months after receiving Securities Investment Licence from CSRC, QFII should remit principals from outside into China and directly transfer them into RMB special accounts after full settlement of foreign exchange. The currency of the principals from QFII should be exchangeable currency approved by SAFE and the amount of the principal should not exceed the approved quota.

If QFII has not fully remitted the principals within three months after receiving Foreign Exchange Registration Certificate, the actual amount remitted will be deemed as the approved quota; thereafter the difference between approved quota and the actual amount shall not be remitted inward prior to the obtaining of a newly approved investment quota.

Article 26. In the case that a QFII is a closed-end Chinese fund management company, it can mandate its custodian, with the submission of required documents to SAFE to apply for purchase of foreign exchange for the repatriation of principals by stages and by batches three years after its remittance of the principals. The amount of each batch of principal repatriation should not exceed 20% of the total principals, and the interval between two repatriations should not be shorter than one month.

Other types of QFII can mandate their custodians, with the submission of required documents, to apply to SAFE to repatriate the principals by stages and by batches one years after their remittance of the principals. The amount of each batch of principal repatriation should not exceed 20% of the total principals, and the interval between two repatriations should not be shorter than three months.

The overseas receivers of the above-mentioned repatriation should be the QFII themselves.

Article 27. QFII whose principal of approved investment quota is remitted to China for less than one year but over three months, after the submission of transfer application form & transfer contract and upon approval of CSRC and

SAFE, may transfer the approved investment quota to other QFII or other applicants who have fulfilled the requirements of Article 6.

After getting Securities Investment Licence from CSRC and investment quota from SAFE, the transferee can remit the difference as its principals if the value of the transferred assets is lower than the investment quota approved by SAFE.

Article 28. If QFII intends to remit principals inwards again after it partially or fully repatriates its principals, it should re-apply for investment quota.

Article 29. If QFII needs to purchase foreign exchange to repatriate their post-tax profits of the previous accounting year which have been audited by Chinese CPA, the QFII should mandate its custodian to apply to SAFE fifteen days prior to repatriation, together with the following documents:

(1) Repatriation Application Form;

(2) Financial reports of the accounting year in which the profits are generated;

(3) Auditor's report issued by Chinese CPA;

(4) Profits distribution resolutions or other effective legal documents;

(5) Tax payment certificates;

(6) Other documents as required by SAFE.

The overseas receivers of the above-mentioned repatriation should be the QFII themselves.

Article 30. SAFE may adjust the timeframe required for QFII to repatriate its principal and proceeds, subject to the needs of China's foreign exchange balance.

Chapter 6 Regulatory Issues

Article 31. CSRC and SAFE should annually review QFII's Securities Investment Licence and Foreign Exchange Registration Certificate.

Article 32. CSRC, PBOC and SAFE may require QFII, custodians, securities companies, stock exchanges, and securities registration and settlement institutions to provide information on QFII's domestic investment activities, and may conduct on-site inspections if necessary.

Article 33. Stock exchanges and securities registration and settlement institutions may enact new operation rules or revise previous operation rules on QFII's domestic securities investments, the implementation of which will be effective upon approval of the CSRC.

Article 34. In the event of any of the followings, QFII should file with CSRC, PBOC and SAFE in five working days:

(1) Change of custodians;

(2) Change of legal representatives;

(3) Change of controlling shareholders;

(4) Adjustment of registered capital;

(5) Litigations and other material events;

(6) Being imposed substantial penalties overseas;

(7) Other circumstances as stipulated by CSRC and SAFE.

Article 35. In the event of any of the followings, QFII should re-apply for its Securities Investment Licence:

(1) Change of business name;

(2) Acquired by or merged with other institution(s);

(3) Other circumstances as stipulated by CSRC and SAFE.

Article 36. In the event of any of the followings, QFII should surrender its Securities Investment Licence and Foreign Exchange Registration Certificate to CSRC and SAFE respectively:

(1) Having repatriated all its principals;

(2) Having transferred its investment quota;

(3) Dispersion of authorised entities, entering into bankruptcy procedures, or assets being taken over by receivers;

(4) Other circumstances as stipulated by CSRC and SAFE.

If QFII fail to pass the annual review on Securities Investment Licences and Foreign Exchange Registration Certificates, as mentioned in Article 31, the Licences/Certificates will automatically be invalid. And the QFII should return these Licences/Certificates as required by the aforesaid Article.

Article 37. In accordance with their respective authorities, CSRC, PBOC and SAFE will give warnings or penalties to QFII, custodians and securities companies, etc. who violate this Regulation. The same breach, however, should not be subject to two administrative penalties or more.

Chapter 7 Supplementary Provisions

Article 38. This Regulation is also applicable to institutional investors from Hong Kong Special Administrative Region, Macao Special Administrative Region and Taiwan Region, who conduct securities investment businesses in Mainland China.

Article 39. This Regulation will come into effect from 1 December 2002.

Appendix C:

Licensed QFIIs (As of 31 December 2007)

	Name	Quota (Hundred million US$)
1	UBS Warburg Ltd.	8
2	CitiGroup Global Markets Ltd.	5.5
3	CSFB	5
4	Fortis Bank	5
5	Nikko Asset Management	4.5
6	Morgan Stanley	4
7	HSBC Securities	4
8	Deutsche Bank	4
9	Nomura Securities	3.5
10	ING Bank	3.5
11	Goldman Sachs Group Inc.	3
12	Merrill Lynch	3
13	INVESCO	2.5
14	Lehman Brother	2
15	BNP Paribas	2
16	Goldman Sachs Asset Management International	2
17	AMP	2
18	Morgan Stanley Investment Management	2
19	Prudential Asset Management (HK)	2
20	Schroder Investment Management	2
21	GE Asset Management	2
22	UBS Global Asset Management	2
23	HSBC Investment (HK) Ltd.	2
2	Sumitomo Mitsui Asset Management Co.	2
25	ABN AMRO	1.75
26	JPMorgan Chase Bank	1.5
27	JF Asset Management	1.5
28	Scotia Bank	1.5
29	Martin Currie Investment Management	1.2
30	Hengseng	1
31	Bill&Melinda Gates Foundation	1
32	GIC Co.	1
33	Temasek Fullerton Fund Management	1
34	The Dai-Ichi Mutual Life Insurance Company	1
35	DBS	1
36	KBC	1
37	LCF Edmond de Rothschild Banque	1

38	Standard Chartered Bank (HK Br.)	0.75
39	Barclays Bank	0.75
40	Dresdner	0.75
41	Calyon S. A.	0.75
42	Dawa	0.5
43	Societe Generale	0.5
44	Power Corporation of Canada	0.5
45	AIG Global Investment Corp.	0.5
46	Yale University	0.5
47	Stanford University	0.5
48	United Overseas Bank	0.5
49	Shinko Securities Co., Ltd.	0.5

Source: SAFE.

Appendix D:

Companies Issuing Both A- and B-Shares on the Shanghai Stock Exchange

(As of End of 2006)

A Code	B Code	Company
600602	900901	SVA ELECTRON
600604	900902	SHAI ERFANGJI
600611	900903	DAZHONG TRANSPORTION
600613	900904	SHAI WINGSUNG DATA TECHNOLOGY
600612	900905	CHINA FIRST PENCIL
600610	900906	CHINA TEXTILE MACHINERY
600614	900907	SHAI SANJIU TECHNOLOGY DEVELOPMENT
600618	900908	SHAI CHLOR-ALKALI CHEMICAL
600623	900909	SHAI TYRE&RUBBER
600619	900910	SHAI HIGHLY GROUP
600639	900911	SHAI JINQIAO EXPORT PROCESSING ZONE DEVELOPMENT
600648	900912	SHAI WAI GAOQIAO FREE TRADE ZONE DEVELOPMENT
600617	900913	SHAI LIAN HUA FIBRE COPORATION
600650	900914	SHAI JIN JIANG TOWER
600818	900915	SHAI FOREVER
600679	900916	PHOENIX CO.
600851	900917	SHAI HAIXIN GROUP
600819	900918	SHAI YAOHUA PILKINGTON GLASS
600695	900919	SHAI DAJIANG (GROUP) STOCK
600841	900920	SHAI DIESEL ENGINE
600844	900921	DAYING MODERN AGRICULTURE
600689	900922	SHAI SANMAO TEXTILE
600827	900923	SHAI FRIENDSHIP GROUP
600843	900924	SHANGGONG.CO.,LTD.
600835	900925	SHAI SHANGLING ELECTRIC APPLIANCES
600845	900926	SHAI BAOSIGHT SOFTWARE
600822	900927	SHAI MATERIAL TRADING CENTRE
600848	900928	SHAI AUTOMATION INSTRUMENTATION
600680	900930	SHAI POSTS&TELECOMMUNICATIONS EQUIPMENT
600663	900932	SHAI LUJIAZUI FINANCE&TRADE ZONE DEVELOPMENT

600801	900933	HUAXIN CEMENT
600754	900934	SHAI NEW ASIA GROUP
600295	900936	INNER MONGALIA EERDUOSI CASHMERE PRODUCTS
600726	900937	HEILONGJIANG ELECTRIC POWER
600751	900938	TIANJIN MARINE SHIPPING
600094	900940	SHAI WORLDBEST
600776	900941	EASTERN COMMUNICATIONS
600054	900942	HUANGSHAN TOURISM DEVELOPMENT
600272	900943	SHAI KAIKAI INDUSTRY
600221	900945	HAINAN AIRLINES
600698	900946	JINAN QINGQI MOTORCYCLE
600320	900947	SHAI ZHENHUA PORT MACHINERY
600190	900952	JINZHOU PORT
600555	900955	SHAI MATSUOKA

Appendix E:

Companies Issuing Both A- and B-Shares on the Shenzhen Stock Exchange

(As of End of 2006)

A Code	B Code	Company
000002	200002	CHINA VANKE
000011	200011	SHN PROPERTIES&RESOURCES DEVELOPMENT
000012	200012	CSG TECHNOLOGY
000016	200016	KONKA GROUP
000017	200017	SHN CHINA BICYCLE
000018	200018	SHN VICTOR ONWARD TEXTILE INDUSTRIAL
000019	200019	SHN SHENBAO INDUSTRIAL
000020	200020	SHN HUAFA ELECTRONICS
000022	200022	SHN CHIWAN WHARF
000024	200024	CHINA MERCHANTS SHEKOU HOLDINGS
000025	200025	SHN TELLUS HOLDING
000026	200026	SHN FIYTA HOLDINGS LTD.
000028	200028	SHN ACCORD PHARMACEUTICAL
000029	200029	SHN SPECIAL ECONOMIC ZONE REAL ESTATE&PROPERTIES
000030	200030	GUANGDONG SUNRISE HOLDINGS
000037	200037	SHENZHEN NANSHAN POWER STATION
000039	200039	CHINA INTERNATIONAL MARINE CONTAINERS
000045	200045	SHN TEXTILE (HOLDINGS)
000055	200055	CHINA FANGDA GROUP
000056	200056	SHN INTERNATIONAL ENTERPRISE
000058	200058	SHN SEG CO., LTD.
000413	200413	SHIJIAZHUANG BAOSHI ELECTRONIC GLASS
000418	200418	WUXI LITTLE SWAN COMPANY LTD.
000429	200429	GUANGDONG PROVINCIAL EXPRESSWAY DEVELOPMENT
000488	200488	SHANDONG CHENMING PAPER
000505	200505	HAINAN PEARL RIVER
000513	200513	LIVZON PHARMACEUTICAL GROUP INC.
000521	200521	HEFEI MEILING
000530	200530	DALIAN REFRIGERATION
000539	200539	GUANGDONG ELECTRIC POWER DEVELOPMENT

000541	200541	FOSHAN ELECTRICAL AND LIGHTING
000550	200550	JIANGLING MOTORS
000553	200553	HUBEI SANONDA
000570	200570	CHANGCHAI CO.,LTD.
000581	200581	WEIFU HIGH-TECHNOLOGY CO., LTD.
000596	200596	ANHUI GUJING DISTILLERY
000613	200613	HAINAN DADONGHAI TOURISM CENTRE(HOLDINGS)
000625	200625	CHONGQING CHANGAN AUTOMOBILE COMPANY
000725	200725	BOE TECHNOLOGY GROUP
000726	200726	LU THAI TEXTILE
000761	200761	BENGANG STEEL PLATES
000869	200869	YANTAI CHANGYU PIONEER WINE

Appendix F:

Companies on the Stock Exchange of Singapore Imposed Restrictions on Foreign Share Ownership and Reached the Limit (As of 30 June 1995)

	Firm	Limit on Foreign Share Ownership (%)	Date of Separate Listing	Industry
1	ST AEROSPACE	15	16 Nov. 1990	Aerospace & Defense
2	SINGAPORE AIRLINES	27.51	3 May 1988	Travel & Leisure
3	ST AUTOMOTIVE	25	22 Sept. 1993	Travel & Leisure
4	ST COMPUTER SYSTEMS	25	20 Apr. 1993	Software & Computer Services
5	ST ELECTRONIC & ENGINEERING	15	27 Aug. 1991	Industrial Engineering
6	SINGAPORE PETROLEUM CO.	49	25 Oct. 1990	Oil & Gas Producers
7	SINGAPORE PRESS HOLDINGS	49	3 May 1988	Media
8	SHIPBLDG. ENGR. LTD.	15	19 Nov. 1990	Industrial Engineering
9	OVERSEAS UNION BANK	40	24 Jul. 1992	Banks
10	KAY HIAN HOLDINGS	49	31 Oct. 1990	Financial Services
11	UNITED OVERSEAS BANK	40	31 Jul. 1989	Banks
12	OVERSEAS UNION TRUST	20	10 Oct. 1994	Financial Services
13	OVERSEAS CHINESE BANKING CORP.	40	31 Jul. 1989	Banks

Source: Bailey *et al*., 2007.

Appendix G:

Companies on the Stock Exchange of Thailand Imposed Restrictions on Foreign Share Ownership and Reached the Limit

	Company	Industry
1	Asia Fiber	Personal Goods
2	AYUDHYA CMG LF. ASR.	Nonlife Insurance
3	BANGKOK BANK	Banks
4	BANGKOK INSURANCE	Nonlife Insurance
5	BANGKOK RUBBER	Personal Goods
6	BANK OF AYUDHYA	Banks
7	CHAROONG THAI WIRE CAB.	Electronic & Electrical Equipment
8	CHAROEN POKPHAND FOODS	Food Producers
9	CMIC FINANCE AND SECS.	Financial Services (Sector)
10	DHANA SIAM FIN.& SECS.	Financial Services (Sector)
11	DUSIT THANI	Travel & Leisure
12	ICC INTERNATIONAL	Support Services
13	THANACHART CAPITAL	Banks
14	OHTL	Travel & Leisure
15	PADAENG INDUSTRY	Industrial Metals & Mining
16	PAN ASIA FOOTWEAR	Personal Goods
17	REGIONAL CONTAINERS LIN.	Industrial Transportation
18	SAHA PATH.INTER-HOLDING	Financial Services (Sector)
19	SAHA-UNION	Personal Goods
20	SANYO UNIVERSAL	Household Goods & Home Constructions
21	SIAM CEMENT	Construction & Materials
22	SIAM CITY CEMENT	Construction & Materials
23	SIAM COMMERCIAL BANK	Banks
24	SMC MOTORS	General Retailers
25	KASIKORNBANK	Banks
26	THAI PLASTIC CHM.	Chemicals
27	UNIVERSAL STARCH	Food Producers
28	ADVANCED INFO SER.	Mobile Telecommunications
29	BANGKOK LAND	Real Estate Investment & Service
30	FINANCE ONE	Financial Services (Sector)
31	LAND AND HOUSES	Household Goods & Home Constructions
32	MDX	Real Estate Investment & Service
33	PHATRA THANAKIT	Financial Services (Sector)

34	SIAM CITY BANK	Banks
35	TMB BANK	Banks
36	BANPU PUBLIC	Mining
37	QUALITY HOUSES	Real Estate Investment & Service
38	MATICHON	Media
39	SAHA PATHANAPIBUL	Personal Goods
40	UNION ASIA FINANCE	Financial Services (Sector)
41	AMER.STD.STYWR	Construction & Materials
42	HANA MICROELECTRONICS	Electronic & Electrical Equipment
43	INTERNATIONAL ENGR.	Technology Hardware & Equipment
44	KRUNG THAI BANK	Banks
45	LOXLEY	Fixed Line Telecommunications
46	NATION MULTIMEDIA GP.	Media
47	POST PUBLISHING	Media
48	PRECIOUS SHIPPING	Industrial Transportation
49	PROPERTY PERFECT	Real Estate Investment & Service
50	ROBINSON DEPT.STORE	General Retailers
51	SHIN	Technology Hardware & Equipment
52	SIAM MAKRO	General Retailers
53	SIAM PULP PAPER	Forestry & Paper
54	SYNTEC CONSTRUCTION	Construction & Materials
55	SOMPRASONG LAND	Real Estate Investment & Service
56	SRITHAI SUPERWARE	Chemicals
57	TRUE CORPORATION	Mobile Telecommunications
58	THAI GLASS INDUSTRY	Leisure Goods
59	THAI PRESIDENT FOODS	Food Producers
60	UNITED COMMUNICATIONS	Mobile Telecommunications
61	ELECTRICITY GENERATING	Electricity
62	PTT EXPLORATION & PRDN.	Oil & Gas Producers
63	MINOR FOOD GROUP	Food & Drug Retailers
64	THAI INDUSTRIAL GAS	Gas, Water & Multi-utilities