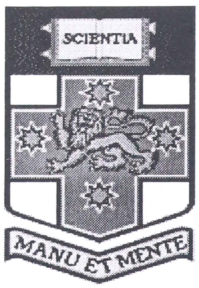

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A SEGMENTED CHINESE EQUITY MARKET

Zhian Chen

A dissertation submitted in fulfilment of the requirements for the degree of Doctor of Philosophy at the University of New South Wales

August 2005

DEDICATION

To Li and Zebin, who in various ways contributed to this outcome.

CANDIDATE'S STATEMENT

Certificate of Originality

I hereby declare that this submission is my own work to the best of my knowledge it contains no material previously published or written by anther person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

Zhian Chen

1st August 2005

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ABSTRACT

This dissertation consists of three self-contained studies on the segmented Chinese equity market. In particular, it focuses on the impact of market segmentation on asset pricing, market microstructure, and return volatility. Each study examines one distinct and specific challenge for this market and its participants.

The first study examined by this dissertation concerns the share price differences between Chinese domestic A-shares and foreign B-shares. The foreign B-share in China is traded at a price much lower than its corresponding A-share, which is different from other segmented markets. A liquidity asset pricing model is used to explain this price difference. It contributes to the literature by considering liquidity as one of the main explanatory variables for asset pricing. The results are generally consistent with the liquidity asset pricing model used here.

The next study focuses on investigating the components of the bid-ask spreads of A-shares, B-shares, and H-shares in China. The bid-ask spread is one of the important portions of the total transaction costs. A time-series and cross-sectional comparison is undertaken on the spread and its components, after controlling for other factors which may determine them. The results suggest a higher transaction cost in the foreign-owned share markets, which reflects the difficulties of foreign investors in acquiring and assessing information regarding local Chinese firms relative to domestic investors, and the likelihood of higher information asymmetry. It also indicates the effect of economies of scale and scope on transaction costs and trading activities.

The third topic examines the impact of ownership structure, especially the different types of foreign ownership, on the domestic return volatility in China. Previous research has concentrated on investigating the relationship between ownership structure and firm performance in China. This work analyzes the impact of foreign

ownership on domestic A-share return volatility. This study extends the literature on ownership by estimating the relationship between three forms of ownership, government ownership, legal-entity ownership and foreign ownership, and return volatility. After controlling for the other share characteristics, such as firm size, industry and financial leverage, the results suggest that foreign ownership increases local market volatility, and possibly makes the local market more integrated with the world market. The results thus question the effectiveness of market segmentation in eliminating the domestic market volatility caused by foreign markets.

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CHAPTER 1

Introduction

International capital moves more freely and swiftly than ever before across national borders. Countries, especially the developing countries, welcome international investment as it is one of the key determinants of a prosperous economy. On the other hand, international capital is seen as a creator of instability and uncertainty. In order to promote national interest, many restrictions are imposed on international capital flows to emerging markets. Market segmentation is the result of those barriers to international investment (Jorion and Schwartz, 1986), and it is quite common to find that emerging or developing markets are segmented from international financial markets.

China has just experienced one of the largest transitions in its history, and the whole economy has switched from a centrally-planned socialist one to a market-oriented one. Corresponding to the changing economic and business environment, remarkable progress has been made in the Chinese capital market. Although the Chinese equity market has a relatively short history in comparison with other developed markets in the world, due to its high rate of growth and enormous potential economic power, its equity market is a rapidly growing field of research, and has attracted more and more interest from both industry administrations and research academics not only in China but also internationally.

Like most of the other emerging markets, the Chinese equity market has unique characteristics. Several different kinds of shares are issued, and the market is segmented between domestic and foreign investors. However, in contrast to other markets, the domestic shares are traded at a much higher price in comparison with the corresponding foreign shares. The aim of this dissertation is to provide some new

insight into this area, utilizing the unique structure put in place by the Chinese government. The topics elaborated include analysis of a new asset pricing model, market microstructure, and corporate governance relating to this segmented market. The purpose of this dissertation is to investigate and understand the impact of market segmentation in China on asset pricing, transaction costs (bid-ask spread), and return volatility.

This dissertation consists of three self-contained studies on the segmented Chinese equity market, which can be read independently. Accordingly, each study contains an introduction and conclusion. Here, I provide an overview of the dissertation and also demonstrate how the different areas of the dissertation are linked.

In order to provide a background to understand and evaluate this dissertation, the history and development of China's stock market and its prospects are addressed in Chapter 2, where some basic market characteristics and government regulations are also described. Chapter 3 introduces the market microstructure and the institutional details relating to China's stock market. It details the operation of the trading system, the settlement process, and the regulations related to listed companies, investors, and exchange members.

The lower price of foreign Chinese B-shares in comparison with the corresponding domestic A-shares is always puzzling. Previous academic literature has used several different ways of explaining this phenomenon. The first issue examined by this dissertation in Chapter 4 contributes to the research by attempting to explain the price differences between A-shares and B-shares using Swan's (2005) liquidity asset pricing model. In this new asset pricing model, transaction costs are the most important determinant of equity premium, and the transaction is treated as endogenous. The empirical results of the chapter are consistent with the implications of the model. Compared with other alternative asset pricing factors, such as firm size, book-to-market ratio, and informativeness, the liquidity asset pricing specification has the

highest explanatory power to explain the observed equity premium on both A-share and B-share markets. The liquidity asset pricing model also explains well changes in the price ratio of the two types of shares.

Bid-ask spread which is inversely related to liquidity is an important portion of the entire transaction cost faced by investors in a financial market. The bid-ask spreads on the A-share, B-share and H-share markets are substantially different. Chapter 5 decomposes the bid-ask spreads of A-shares, B-shares, and H-shares into order processing and adverse-selection components, and the components of these different shares are compared in both time-series and cross-sectional approaches, after controlling for all the factors which may determine them. The results of this chapter suggest that the variables that determine the entire bid-ask spread also determine its components. The domestic Chinese A-share market is more informationally efficient than either the B-share or the H-share market. It is found that both spread components (the adverse selection component and the order processing component) as a percentage of share price decrease after the opening of the B-share market as a result of a large investor base and possibly a lower proportion of informed investors. This chapter also extends the market microstructure literature on one of the world's largest order-driven markets.

Previous research on the ownership structure in China has mainly concentrated on examining the relationship between ownership structure and firm performance. The final topic covered in this dissertation in Chapter 6 examines the impact of ownership structure, especially the existence of foreign ownership, on Chinese domestic return volatility. The results indicate that there is a positive relationship between domestic return volatility and foreign ownership, especially foreign ownership on tradable shares, even after controlling for share characteristics, such as industry, firm size and trading activity. After decomposing the domestic return volatility into systematic risk and idiosyncratic risk, the results suggest that higher risk is mainly due to higher systematic risk, or higher exposure to international market risk. Although the domestic equity market in China is segmented from international capital flows as

intended by the government regulations, the domestic market can still be affected by world market risk with information diffusion amongst the markets.

Finally, Chapter 7 provides conclusions and discusses implications for future policy and research. A related research paper is provided in the Appendix. This paper examines the intra-industry effects of the privatization of the Bank of China Hong Kong (BOCHK). The purpose of this paper is to discuss and apply some of the key issues and lessons learnt from similar privatization in other parts of the world towards a better understanding of the consequences of the partial privatization of the Bank of China Hong Kong (BOCHK).

CHAPTER 2

China's Stock Market – Its History, Development and Prospects

Since the economic reform, China's economic growth and development has been one of the greatest success stories, and its average annual GDP growth rate has been close to ten percent over the last two decades. China has transformed its economic structure from a centrally-planned socialist one to a market-oriented one, and the whole economy in China will eventually be integrated with the global economy. Although the equity market in China has only been partially opened to international investors, its size and prospects have attracted more and more interest from both academics and investors.

The aim of this chapter is to provide a preliminary analysis of the evolution and development of the Chinese equity market[1]. It details the history and the development of the Chinese equity market, and its prospects. The purpose is to identify the stimuli for the market's development and also the impediments to it by reviewing its characteristics.

2.1. History of the Chinese Stock Market

2.1.1 Post-independence

The first stock market in China was established in Shanghai in the 1890s, towards the end of the Qing Dynasty (George, 1991). Another stock exchange was set up later in Hong Kong. However, both exchanges were established by foreign interests, and

[1] Bonds and some other financial securities should not be totally ignored in an integrated financial market. In this chapter, as well as the rest of this dissertation, the term 'securities market' or 'China's securities market' refers to stocks, bonds and other financial securities. If only considering stocks, 'stock market' or 'China's stock market' are used in order to avoid ambiguity between the concepts.

most of the shares traded on these two exchanges were British and US shares. During the Republican period (1911-1949), an active government bond market was established in Beijing (George, 1991). It was not until 1940 that a group of Shanghai banks and trust companies formed the 'Chinese Stock Promotion Committee', and initiated local interest in an informal trading system. At its peak the shares of 76 companies were admitted for trading – twenty-two of which were banks (Skully, 1982). During the final period of the Nationalist government, following the civil war (1945-1949), the Shanghai Securities Exchange was very active, and foreign shares, local shares, and government bonds were all traded. However, by 1948, hyperinflation resulted in the suspension of the exchange even before the Communists took power on 1 October 1949 (George, 1991).

2.1.2 Pre-Reform Period

After the Communist victory and the establishment of the People's Republic of China in 1949, a highly centralized and planned economic system modelled on that of the former Soviet Union was established. All the companies, especially the larger ones in important fields of industry, were nationalized. The whole non-agricultural sector was dominated by state-owned enterprises (SOEs), and these were almost completely financed by the state budget with few debts (Zhang, 1999). Securities investment was suspended, and all the securities exchanges were closed as well.

2.1.3 Economic and Financial Reform

Since 1978, the Chinese government has tacitly admitted that the centrally-planned economy and the system of state ownership has failed to deliver the goods (George, 1991). Economic reform and a free-market system was first introduced in the rural areas in 1979, and the reform was then extended to the cities and industrial sectors. The major objectives of the economic reform were to reduce the inefficiency and the distortions inherent in a purely centrally-planned economy and to expedite economic development by improving allocative efficiency, relying on market forces and material incentives to motivate the desired economic behaviour (Brayshaw and Teng, 1995).

This ambitious economic reform dramatically changed the attitude towards the free market system. The organisational structure of economic activities and resource allocation were changed significantly as well. During the reform of state-owned enterprises (SOEs), it has been a continuous process of shifting decision rights and residual claims from the nation, to the province, then to the cities / counties, then to the enterprises themselves (Zhang, 1997). Since reforms started, the share of the state sector has gradually diminished and the share of the private sector has grown in terms of both output and employment. Although SOEs are still tightly controlled by the government at various levels, debt finance from state banks has replaced state budget finance and has gradually become the major financial instrument of SOEs (Zhang, 1999).

In order to fund state expenditure, the first state treasury bonds were issued to public enterprises in 1981, but were not allowed to be circulated or to be transferred between individuals. Later, financial institutions were allowed to issue enterprise bonds. In 1986, in order to increase the liquidity and attractiveness of enterprise bonds, bond transactions between individuals were made possible in Shenyang (Ayling and Jiang, 1995). Later, secondary transactions in enterprise bonds were allowed by the government in more Chinese cities. Not until 1988 were state treasury bonds allowed to be traded on an experimental basis in Shanghai, Shenyang, Shenzhen and four other Chinese cities. Later in the same year, this spread to the other 61 cities. Although these markets were initially very small in size and trade infrequently, they represented the outcome of a new ideology of building up a more diversified financial system (Xu, 1998). At the same time the concepts of 'financial market' and 'security investment' were introduced to more and more individuals in China.

As economic reforms in urban areas continued, the problem of how to define the property rights of SOEs emerged as a difficult task for the Chinese government. At first, the stocks in the state-owned sector were issued as an experiment, and this was actively advocated by some economists as a better way to define property rights (Yi, 1994). The main purpose of experimenting with the shareholding enterprises was

initially more related to reforming the business administration system than to raising funds from the public. A group of shareholding corporations thus emerged. All shares of these early shareholding companies were initially issued to internal employees only. It was intended that adoption of the shareholding system would serve as a means of raising productivity since the performance of a shareholding company was tied to the personal interests of employees or staff through the participating shares and dividend scheme (Lin, Yang and Wang, 1998). The majority share ownership was still controlled by the Government, and the issued shares were more like a hybrid of preferred shares and bonds. Most of these shares had a predetermined fixed dividend yield and a maturity date, at which time the shareholders had their principal back, and there was little risk involved since the yield and redemption were guaranteed by the Government. Some of the shares even allowed their holders to redeem the principal before maturity (Yi, 1994). However, the benefit of raising capital from outside (through issuing shares or bonds) was gradually recognized by some shareholding companies seeking to finance their expansion. The profound significance of this development lies in the fact that it ended a situation in which the banking system was the only source of capital (Yi, 1994). In September 1984 the first shareholding company, Beijing Tianchiao Department Store, was formed and it issued redeemable shares with a three-year maturity. In December of the same year, Shanghai Feilo Acoustics Inc. issued non-redeemable shares to the public for the first time. The emergence and popularity of non-redeemable shares (common stock) brought the Chinese capital market one step closer to international standards.

During the mid-1980s, a growing economy, the rapid extension of domestic lending, and injudicious use of national foreign exchange reserves all created a situation which prompted tough new restrictions on bank lending in China. The tightening of credit was an important incentive to corporations and enterprises to raise funds through the share issuance (Brayshaw and Teng, 1995). As the other sources of investment (such as government revenues and taxes) had dried up, selling shares to the public was viewed as a useful way to raise money to boost the economy and to lift the massive state industries out of the doldrums (Ayling and Jiang, 1995). Between 1986 and 1988, the concept of a capital market was gradually disseminated amongst large and

medium-sized enterprises. The Bank of Communications, in particular, was instrumental in popularising different securities, and was responsible for the lion's shares of new issues, which by mid-1988 amounted to some RMB1.7 billion (George 1991). However, most of the issued shares were still in small amounts, and not freely traded. Without a secondary market, the returns of bondholders or shareholders were only from interest or dividend payments. Apart from the maturity, there was no clear difference between bonds and shares at that time. An illegal black-market eventually emerged in order to fulfil investors' liquidity requirements.

A primary market cannot be fully functional without a secondary market, and this led to the establishment of securities trading centres to facilitate public issuing and trading of securities in a few major business centres in China. In contrast to securities markets in developed countries, these securities trading centres were organized and administered directly by the government authority in charge at that time, the People's Bank of China (PBC, the central bank in China). In addition, securities trading in these centres was rather limited, and tight geographical and transferability restrictions were imposed on the securities listed at these securities trading centres (Lin, Yang, and Wang, 1998). Share trading in China started on an over-the-counter (OTC) market in 1986, and the Investment and Trust Company of Shanghai Industrial and Commercial Bank was the first to provide share trading services. The first publicly traded shares were those issued by the Shanghai local companies, Yangzhoang and Feilo. Both companies commenced public trading over the counters of securities companies on 9 September 1986. The State Council then promulgated regulations allowing share trading in Shanghai and Shenzhen only (Yi, 1994).

Between mid-1988 and late 1990, the securities markets developed rapidly, and trading between individuals in government and enterprise securities became commonplace. There were four over-the-counter (OTC) securities trading houses in Shanghai – Shanghai International, Haitong, Bank of China Securities, and Zhengxing. By early 1989, the Shanghai Municipal Government had issued and standardised rules for trading in securities, and it had become normal for enterprises to appoint securities

houses to represent them in new issues, rather than seeking to gain approval by themselves. Bonds were the most popular instruments at that time, with tenures of three to five years for government or corporate bonds, and some corporations also issued short-term papers with a six to nine-month maturity (George, 1991).

Given the large amounts of private savings in China, and the financial funding needed to support economic growth, the Chinese government eventually accepted the need for a shareholding system. Free transferability became crucial to the further development of the capital market, and the Shanghai Stock Exchange (SHSE), the first securities exchange, was approved by the People's Bank of China (PBC) on 26 November 1990. The Shanghai Stock Exchange was inaugurated on 19 December 1990, whilst the Shenzhen Stock Exchange (SZSE) started provisional trading on 3 April 1991 and formally opened on 4 July 1991. The establishment of these two stock exchanges confirmed the Government's attitudes towards a market-oriented economy and its support for the further development of its capital market.

2.2. Development

Since the establishment of the two stock exchanges in China, these securities markets have grown rapidly. Various securities are available on the two exchanges, which include equity shares (A-shares and B-shares), securities investment funds, treasury bonds (for both spot and repo trading)[2], corporate bonds[3], and corporate convertible bonds. As shown in Table 2-1, for the period between 1992 and 2002, the number of companies listed on the two stock exchanges in Shanghai and Shenzhen increased from 53 to 1224. The corresponding market capitalisation[4] increased from RMB104.8 billion to RMB3,8329.1 billion over the same period. Some details of the market are addressed in this section.

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[2] In China, Treasury bonds are also traded on the Chinese national interbank bond market based in Shanghai.

[3] The corporate bond repo contracts were launched on the two stock exchanges in China in early 2003.

[4] The prices of tradable A-shares are used to calculate the value of non-tradable shares.

Table 2-1: Overview of the Chinese stock market

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Number of Listed Companies (A, B share)	53	183	291	323	530	745	851	949	1,088	1,160	1,224
Number of Listed Companies (B share)	18	41	58	70	85	101	106	108	114	112	111
Number of Listed Companies (H share)		6	15	18	25	42	43	46	52	60	75
Number of Securities Investment Funds							6	22	34	51	71
Total Issued Capital (1,000,000,000)	6.9	38.8	68.5	84.8	122.0	194.3	252.7	308.9	379.2	521.8	587.5
Negotiable Shares (1,000,000,000)	2.1	10.8	22.6	30.1	43.0	67.1	86.2	108.0	135.4	181.3	203.7
Total Market Capitalization (RMB 1,000,000,000)	104.8	353.1	369.1	347.4	984.2	1,752.9	1,950.6	2,647.1	4,809.1	4,352.2	3,832.9
Negotiable Market Cap. (RMB 1,000,000,000)		86.2	96.9	93.8	286.7	520.4	574.6	821.4	1,608.8	1,446.3	1,248.5
Trading Volume (1,000,000,000)	3.8	23.4	201.3	70.5	253.3	256.1	215.4	293.2	475.8	315.2	301.6
Trading Value (RMB 1,000,000,000)	68.1	366.7	812.8	403.6	2,133.2	3,072.2	2,354.4	3,132.0	6,082.7	3,830.5	2,799.0
PE Ratio											
Shanghai Stock Exchange		42.5	23.5	15.7	31.3	39.9	34.4	38.1	58.2	37.7	34.4
Shenzhen Stock Exchange		42.7	10.3	9.5	35.4	41.2	32.3	37.6	56.0	39.8	37.0
Turnover Ratio (%)											
Shanghai Stock Exchange			1,135	529	913	702	454	471	493	269	214
Shenzhen Stock Exchange			584	255	1,350	817	407	425	509	228	199

Sources: China Securities and Futures Statistical Yearbook

2.2.1. Characteristics

The Chinese securities market emerged and has been growing as a hybrid with planned and market-oriented components, and consequently its features differ significantly from those of the developed markets. In the following section, some specific characteristics of the Chinese market are addressed.

Segmented Stock Market

With increasing economic reforms, the open-door policy and political and social stability, there have been increasing foreign direct investment (FDI) inflows into China since the late 1980s (Kawai, 1999). FDI inflows have been the vehicle of China's economic transformation, of upgrading its trade patterns and indeed of its entire industrial structure. The willingness to attract foreign capital was thought to be an essential factor in China's economic development (Kawai, 1999). As a result, in order to attract foreign investment to the equity market, the Chinese government allowed a few companies to issue stocks to foreign investors.

On 30 November 1991, Shanghai Vacuum Electronics Inc. issued the first B-shares in China. This event indicated that China had begun opening up its securities market to international investors. Since then there have been two types of shares traded on two domestic Chinese stock exchanges. This has created a legal channel for foreign investors to invest directly in China's equity market. At the end of 2002 it was calculated that 10.476 billion B-shares had been issued by 111 companies, raising a total capital of RMB32.511 billion. The B-Share Market has attracted a large number of foreign investors, and it provides an additional channel for foreign capital, thereby enhancing the continuing evolvement of Chinese securities market.

On 9 October 1992, the shares of Chinese Brilliance Automotive (CBA), a Shenyang mini-vans producer, started to trade on the New York Stock Exchange (NYSE). It was the first Chinese firm to directly issue shares on the international stock market. This move demonstrated the willingness of the Chinese government to improve the

international image of Chinese corporations. CBA also had to meet strict US disclosure rules in order to provide international investors with adequate information about its activities. This issuance was viewed as a role model for other Chinese firms wishing to raise funds from mature international capital markets. Shortly after, some other state-owned enterprises were approved by the China State Council to issue shares in Hong Kong. On 29 June 1993, Tsingtao Brewery listed its H-shares on the Stock Exchange of Hong Kong, and became the first Mainland China incorporated state-owned enterprise to list in Hong Kong. At the end of 2002, there were 75 H-share companies with a combined market capitalization of US$11.8 billion.

In contrast to H-share companies, which are incorporated in Mainland China, some Chinese firms used backdoor listing methods in Hong Kong by either acquiring companies already listed on the Hong Kong Exchange, or issuing shares via their overseas incorporated subsidiaries. These firms are referred to as 'red chips'. Normally, the Hong Kong entity exists as a 'shell' corporation which purchases Chinese assets at a discount from the Mainland, with the general criterion being that a 35 percent shareholding is still held by Mainland entities. In July 1992, the first red-chip IPO – Haihong Holdings under the China Merchant Group – made its debut in Hong Kong. Later, the overwhelming response to Beijing Enterprises' IPO in May 1997 drew a record subscription rate of 1,276x. Before the listing of China Mobile in October 1997, red chips were mostly conglomerates spun-off from their Mainland Chinese window companies. After the listing of China Mobile and China Unicom, telecom stocks continued to dominate the red chips' fund raising landscape in terms of dollar amount. The inclusion of these telecom companies and other industry-focused companies such as CNOOC, China Insurance and SIIC MedTech had widened the concept of red-chips (diversified companies and industry-specific companies). From the perspective of market capitalization of the Hong Kong stock market, red chip companies accounted for 4.5% in 1993, but 23.6% in 2001. Since 1992, red chip companies have raised a total of US$68 billion through equity / equity-linked issues, among them, US$13 billion from IPOs, US$19 billion from secondary placement, and US$36 billion from rights issue, convertible bond and others. The red chips have made Hong Kong one of China's equity markets.

To date, there are also several Chinese firms listed in Australia, Singapore and Britain. Overseas listing serves the purpose of absorbing international investment funds, but also of gaining international experience for local capital market participants in China. Entering global capital markets has been a beneficial and instructive experience for these listed companies; they are usually more advanced in management and financial status than their domestic counterparts. However, foreign firms are prohibited from listing on either the Shanghai Stock Exchange or the Shenzhen Stock Exchange, and so far, local investors in China have also been prohibited from investing overseas.

Currently, on the two domestic stock exchanges in China, the Shanghai and Shenzhen stock exchanges, two types of shares are traded, namely, A-shares that are available only to Chinese citizens, and B-shares or special Renminbi denominated shares, which are designated for foreign investors[5]. In all other respects, A-shares and B-shares are identical, and they provide investors with equal voting rights and the same monetary distributions. However, all trading of B-shares, including the payment of dividends, is in foreign currency. Shanghai B-shares are traded in US dollars, while Shenzhen B-shares are traded in Hong Kong dollars[6]. No individual investor may hold more than 25% of a firm's B-shares and firms are not allowed to issue more than 49% of their total shares in B-shares. This maintains domestic control of listed companies. The trading mechanisms for both A-shares and B-shares are similar. Local brokers deal with A-share orders, while either local or foreign brokers can handle B-share orders. A-shares dominate share trading on both the Shanghai and Shenzhen stock exchanges. The A-share and B-share markets are distinct, segmented capital markets targeted for domestic and foreign investors respectively. For all companies, A-shares are priced higher than the corresponding B-shares and this has been the case in all periods since their listing. The arbitrage opportunities implied by the large

[5] From the end of February 2001, domestic investors with foreign currency were also allowed to trade B-shares. During the month of March 2001, the B-shares index in Shanghai and Shenzhen surged 80% and 110% respectively.

[6] The B-shares on the Shenzhen Stock Exchange were denominated in RMB before 22 March 1993, in US dollars between 23 March 1993 and 28 June 1993, and in Hong Kong dollars after 29 June 1993.

discrepancies in A-share and B-share prices are severely limited and thus the markets are effectively segmented.

The sheer size and growth potential of the Chinese market spells opportunities for international investors and financial institutions. Listing enterprises abroad would encourage China's integration into international capital markets. Although openness to foreign capital was considered vital to China's economic development, the Chinese government approaches capital flow liberalisation, financial market deregulation and opening, and relaxation of foreign exchange control with some caution. As long as the Chinese government still maintains tight restrictions on capital inflows, foreign entry into domestic financial services and foreign exchange transactions, it is hard for the A-share and B-share markets to be amalgamated.

Classification of Shares in Ownership

In contrast to other former socialist East European countries and the former Soviet Union, the economic reform in China did not adopt a radical full privatization programme. A gradual and incremental market approach is used in China. The proponents of a market approach believe that if the markets for products, production factors, and corporate control are created and function well, even without dramatic changes in ownership at the early stage of reform, the efficiency of SOEs can still be improved (Xu and Wang, 1999). As the Chinese stock market was emerging as a product of economic reform, the Chinese government treated the stock market as an experimental reform with a trial-and-error strategy at the beginning. The majority of shares are issued by state-owned enterprises, and the ownership of most listed companies is quite complex compared to firms in mature markets. With respect to ownership, the shares can be briefly classified as state-owned shares, legal-entity shares, social public shares, and employee shares. Among them, only the social public shares are tradable on the stock exchanges:

(1) State-owned shares are those shares which are held by the government through designated government agencies (either various industrial ministries in the central government or local provincial or municipal governments). These shares are created in the process of converting the original assets owned by the state into government ownership of the shareholding companies when the SOEs undertook shareholding reform. The state-owned shares make up the largest component of the overall shares in comparison with other classes, though this has gradually declined in recent years. This incremental reduction resulted from the public release of state-owned shares, reducing the dominance of these shares from 51% in 1991 to 47.2% in 2001. In addition, owing to the lack of funds, the state (or legal-entities) normally gives up exercising rights issues, which further dilutes its ownership.

(2) Legal-entity shares are those which are held by legal entities (i.e. enterprises and/or other economic entities, but not individuals). Legal-entity shares are converted from the assets of institutions or enterprises which joined the shareholding companies before they were listed. These are the second largest component of the overall shares in the Shanghai and Shenzhen markets, accounting for 17.32% of the total market in 2002. Before listing on the stock exchange, an existing entity normally takes responsibility for the firm as a sponsor or founder, and it receives sponsor/founder shares (one kind of legal-entity shares) in return for its intellectual property and its contribution to the company. Furthermore, some institutions and enterprises holding legal-entity shares are state agents, so these shares have a similar status to state-owned shares. Also, some legal-entity shares are owned by overseas institutions. Both the state-owned and legal-entity shares are issued when the shareholding company is formed, and both are non-tradable[7]. As a result of these special regulations the government is able to maintain control over most listed companies.

[7] Legal entity shares cannot be traded on the SHSE and the SZSE although some limited buying and selling can be made through the Securities Trading Automated Quotation System (STAQS) or the National Electronic Trading System (NETS), which are automated electronic quotation systems located in Beijing and which started in July 1992. So far, very few companies have listed their legal entity shares on STAQS or NETS. Furthermore, the STAQS and the NETS were closed by the Chinese government in 2000 due to irregularity.

(3) Social public shares are shares traded on stock exchanges. These social public shares are also called 'tradable' shares. Based on their investor base and trading locations, the social public shares can be categorized as A-shares, B-shares, and H-shares (or N-shares).

(4) Employee shares are shares owned by the staff of listed companies. Like any other A-shares, employee shares require a certain waiting period, normally six to twelve months, after the company has been listed before being freely traded on the domestic stock exchanges. Most listed companies do not have employee shares, and they only account for a very small fraction of total shares outstanding, even when they exist. Moreover, the issuance of new employee shares was abolished in 1999.

Table 2-2 shows the ownership structure of the Chinese stock market to the end of 2002. State-owned shares were still the largest group in both markets, accounting for about 47.20% of the total number issued at the end of 2002. By the end of 2002, listed companies had a total non-tradable equity of 383.854 billion shares, amounting to 65.33% of the total equity of listed companies. The shares were allocated in the following way: (1) 277.343 billion shares owned by the state; (2) 101.747 billion shares owned by legal entities; and (3) 1.562 billion shares owned by employees and others. At the same time there were 203.690 billion tradable shares, amounting to 34.67% of the total equity of the listed companies. These were broken down in the following way: (1) 150.922 billion A-shares; (2) 16.761 billion B-shares; and (3) 36.007 billion H-shares (see Table 2-2, and Figure 2-1). While retaining a state dominated shareholding position in most of the listed companies, the directors and senior management of these firms are appointed by the government. Due to a lack of market supervision, this ownership structure causes severe agency problems in China. This also makes it difficult for listed companies to re-adjust their industrial structure through stock market mechanisms such as mergers and acquisitions. In the near future, an important task will be to optimize the ownership structure of listed companies in China, and clearly define the administrative duties and operation managing duties of these firms.

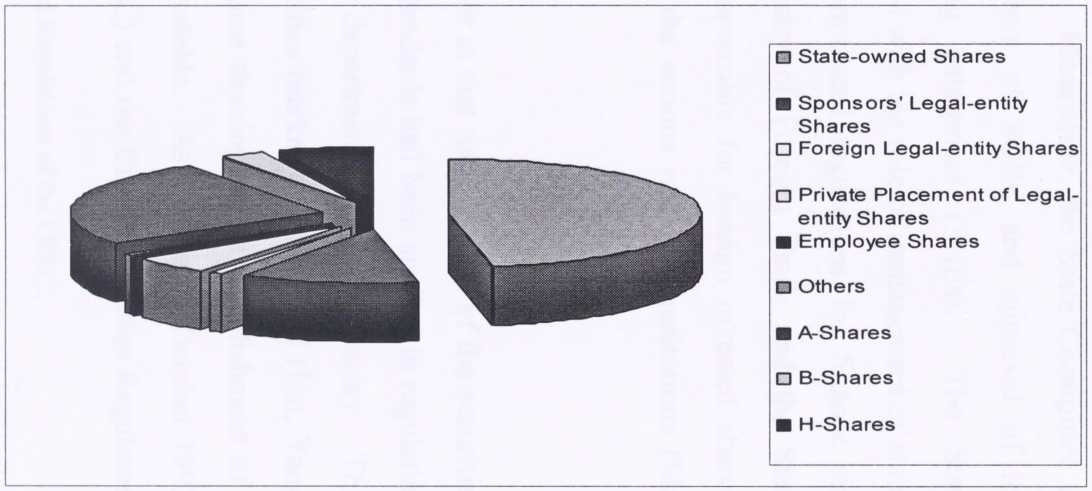
Table 2-2: Capital structure of listed companies

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
State-owned Shares	2,850	19,022	29,647	32,867	43,201	61,228	86,551	111,607	147,513	241,061	277,343
Sponsors' Legal-entity Shares	905	3,497	7,387	13,518	22,463	43,991	52,806	59,051	64,254	66,317	66,451
Foreign Legal-entity Shares	280	409	752	1,184	1,499	2,607	3,577	4,051	4,620	4,580	5,326
Private Placement of Legal-entity Shares	649	4,106	7,282	6,193	9,182	13,048	15,234	19,010	21,420	24,525	29,970
Employee Shares	85	932	672	307	1,464	3,962	5,170	3,671	2,429	2,375	1,562
Others	0	19	110	627	1,160	2,287	3,147	3,320	3,507	1,628	3,202
A-Shares	1,093	6,134	14,376	17,994	26,732	44,268	60,803	81,318	107,816	131,813	150,922
B-Shares	1,025	2,470	4,146	5,652	7,865	11,731	13,396	14,192	15,156	16,310	16,761
H-Shares	0	2,184	4,082	6,500	8,388	11,145	11,995	12,454	12,454	33,194	36,007
Total Shares	6,887	38,773	68,454	84,842	121,954	194,267	252,679	308,674	379,169	521,803	587,544

Unit: 1,000,000,000

Sources: Shanghai and Shenzhen stock exchanges

Figure 2-1: Capital structure of listed companies at the end of 2002



2.2.2. Regulatory Bodies[8]

Owing to the importance of the securities market, its failure could have a severe negative impact on the whole economic reform process in China. Therefore, the Chinese government still maintains fairly stringent control over its securities market.

Historical Background

The Chinese security market originated from the treasury bonds circulation and the SOEs reforms, with a number of top government institutions involved in its establishment. In March 1987, the People's Bank of China (PBC, the central bank) was appointed by the Chinese State Council as the primary administrator of China's securities market. Its major tasks were to approve the issuing of securities, to assess the qualification of securities, to authorise the establishment of securities institutions and to supervise securities-related businesses. Meanwhile, the State Committee of Structural Reforms took charge of the reform of SOEs, and approval of the transformation from SOEs to share-holding enterprises (SHEs). The State Administration of National Assets was entrusted with the role of management of state-owned shares. The Ministry of Finance formulated regulations for finance and accounting for listed companies. The Ministry of Foreign Trade and the State Administration of Exchange Control were responsible for foreign invested shares. The State Planning Commission coordinated the actions of these institutions (Ma, 2001).

Although the PBC was the primary administrator at that time, control of the securities market was still widely diffused, and various standards had been applied in regulating the securities market by different administrative departments across the country. This reduced the effectiveness with which the securities market was managed (Lin, Yang, Wang, 1998). As the securities market in China developed, the establishment of a centralized market regulatory body became inevitable. As a result, in October 1992, the State Council Securities Commission (SCSC) and the China Securities Regulatory

[8] This section is written based on the Bylaws of Rules and Regulations of the CSRC.

Commission (CSRC) were organized as a specific regulatory body dealing with the securities market. The responsibility of the SCSC is to exercise centralised market regulation and to make principal provisions for development of the market. The role of the CSRC, as the SCSC's executive branch, was to supervise and regulate the securities market according to the legislation.

As the securities market grew, it saw an increase in the authority of the SCSC and CSRC. In August 1997 the decision was taken by the State Council to give control of the two stock exchanges in Shanghai and Shenzhen to the CSRC. Accordingly, CSRC offices were established in two municipalities. When the central government began reform and re-organisation of the national securities regulatory system in April 1998, the SCSC was absorbed into the CSRC, forming one ministry rank department responsible directly to the State Council. This then became the official governing body of the Chinese securities and futures markets. In November 1998 the local securities regulatory departments came to be under the direct supervision of the CSRC. The purpose of this was to improve supervisory functions and reduce the influence of local governments. As a result, the CSRC gained centralised supervision of those organisations engaged in securities which had been formerly supervised by the People's Bank of China (PBC). This reform strengthened the powers and functions of the CSRC and saw the establishment of a centralised securities supervisory mechanism[9].

China's securities markets are regulated by the Securities Law, which was passed in December 1998 and became effective on 1 July 1999. Implementation of the Securities Law fully sets out a legislative background for governing securities activity

[9] Although a number of government ministries were still involved in the administration of the securities market, their impact was gradually declining. The PBC continues to approve the establishment of securities institutions other than entities of the stock exchange and to regulate their business activities. The State Development and Reform Commission (a new government agency replacing the State Development Planning Corporation and incorporating the functions of the State Economic and Trade Commission and the State Economic Restructuring Commission, based on the recommendations of the SCSPC), is responsible for approving the number of new share issues every year. The Ministry of Finance regulates accounting firms, but their applications for taking part in the securities business must be examined and approved by the CSRC. The State Commission for Restructuring the Economy formulates rules on converting SOEs into joint-stock companies and companies limited by shares.

in China. The law comprises 214 clauses in twelve chapters and sets out standard practices for the issuing and trading of shares, codes of behaviour and penalties for violations for China's listed companies, financial intermediaries, stock exchanges, registration and settlement companies, self-regulatory financial associations, and government regulatory bodies. The law mostly codifies existing practices to protect investors against unethical practices, such as insider trading, market manipulation and fraud. The Securities Law also forbids brokerages from using clients' funds for trading on their own account. Furthermore, there are penalties of varying degrees for unauthorised stock trading. Insider trading is to be 'punished severely'. There are fines for a range of other irregularities, including the publishing of wrong or misleading information. However, the law remains rather vague as to what constitutes stock speculation and does not mention whether SOEs can own shares at all.

Major Responsibilities

The CSRC is the executive body of the State Council Securities Policy Committee (SCSPC), and has one chairman, four vice-chairmen, one secretary-general, and two deputy secretary-generals. There are thirteen functional departments or offices, three subordinate centers, and one special committee. It also has ten regional offices established in major cities around China. In addition, there is an outreach office in every province, every autonomous region, all cities directly under the jurisdiction of the State Council, and cities with provincial-level status in the State Economic Plan.

The CSRC's responsibilities include setting up regulatory rules; supervising securities and futures markets; approving stock listings or bond offerings; overseeing the behaviour of listed companies and their shareholders; inspecting the activities of securities firms; supervising businesses engaged in storing, clearing, transferring and registering securities; and investigating breaches of the securities laws and imposing penalties on violators. CSRC also has the authority to approve overseas listing for companies with significant operations in China, regardless of where the firms are incorporated.

2.2.3. Listed Companies, Intermediaries and Investors

China's securities market originated from a group of local independent securities houses. As the operational mechanisms and regulatory system of the securities market became more effective, the Shanghai and Shenzhen Stock Exchanges, two separate domestic exchanges, became a marketplace for the whole of China. By the end of 2002, China's stock exchange trading system had 2,412 retail brokerage branches nationwide, spread across all large and medium-sized cities. Investors are now being offered an increasing number of financial products and there is a growing increase in the trading of securities. At the end of 2002, the total market capitalization was RMB3,832.9 billion, equivalent to 37.43% of the GDP; the outstanding capitalization was RMB1,248.5 billion, 12.19% of the GDP; and the annual turnover was RMB2,799.0 billion (see Table 2-1, Table 2-3).

Table 2-3: Stock market and national economy

	GDP	Market Cap.	Over GDP (%)	Negotiable Market Cap.	Over GDP (%)	Investment in Fixed Assets	Domestic Raised Capital	Over Investment in Fixed Assets (%)
1992	2,663.8	104.8	3.93			808.0	5.0	0.62
1993	3,463.4	353.1	10.20			1,307.2	27.6	2.11
1994	4,675.9	369.1	7.89	96.5	2.06	1,704.2	10.0	0.59
1995	5,847.8	347.4	5.94	93.8	1.60	2,001.9	8.6	0.43
1996	6,788.5	984.2	14.50	286.7	4.22	2,291.4	29.4	1.28
1997	7,477.2	1,752.9	23.44	520.4	6.96	2,494.1	85.6	3.43
1998	7,955.3	1,950.6	24.52	574.6	7.22	2,840.6	77.8	2.74
1999	8,205.4	2,647.1	31.82	821.4	9.87	2,947.5	89.7	3.04
2000	8,940.4	4,809.1	53.79	1,608.8	17.99	3,291.8	154.1	4.68
2001	9,593.3	4,352.2	45.37	1,446.3	15.08	2,782.7	118.2	4.25
2002	10,239.8	3,832.9	37.43	1,248.5	12.19	3,294.2	78.0	2.37

Unit: RMB1,000,000,000

Sources: The National Bureau of Statistics of China (NBSC) and the China Securities Regulatory Commission (CSRC)

Listed Companies

The first block of listed companies on the Shanghai Stock Exchange (SHSE) was selected from the Shanghai local shareholding enterprises that were previously transferred from state-owned enterprises. From 1994, the number of non-Shanghai-located listed companies surpassed that of local companies in the market. In the first

year of the opening of the Shenzhen Stock Exchange (SZSE), there were only six local Shenzhen stocks, and market capitalization was RMB3.53 billion. The size of the Shanghai market was intended (and is still intended) by the Government to be larger than that of the Shenzhen market. The average size of listed companies in Shanghai has always been larger than in Shenzhen. The SZSE was intended to be eventually transformed into a second-board market for small and high-tech stocks, similar to the NASDAQ in the US.

Table 2-4: Industrial distribution of listed companies in 2002

Industries	Total		Shanghai Stock Exchange		Shenzhen Stock Exchange	
	No. of Listed Companies	(%)	No. of Listed Companies	(%)	No. of Listed Companies	(%)
Agriculture, Forestry and Fishing	30	2.5	18	2.5	12	2.4
Mining	17	1.4	7	1.0	10	2.0
Food, Beverage	57	4.7	33	4.6	24	4.7
Textile, Apparel, Leather	59	4.8	33	4.6	26	5.1
Wood Product	2	0.2	1	0.1	1	0.2
Paper, Printing	24	2.0	15	2.1	9	1.8
Petroleum, Chemical Products, Plastics	131	10.7	69	9.7	62	12.2
Electrical Equipment	38	3.1	21	2.9	17	3.3
Metal, Nonmetallic Mineral Products	115	9.4	66	9.2	49	9.6
Machinery, Equipment	195	15.9	110	15.4	85	16.7
Medicine, Biological Products	68	5.6	44	6.2	24	4.7
Other Manufacturing	18	1.5	13	1.8	5	1.0
Electricity, Gas, Water Supply	49	4.0	30	4.2	19	3.7
Construction	21	1.7	13	1.8	8	1.6
Transport, Storage	50	4.1	33	4.6	17	3.3
Information, Technology	67	5.5	38	5.3	29	5.7
Wholesale and Retail Trade	99	8.1	64	9.0	35	6.9
Finance, Insurance	8	0.7	5	0.7	3	0.6
Real Estate	42	3.4	25	3.5	17	3.3
Social Services	41	3.4	21	2.9	20	3.9
Transmission, Culture	12	1.0	9	1.3	3	0.6
Conglomerates	81	6.6	47	6.6	34	6.7
Total	1,224	100	715	100	509	100

Sources: Shanghai and Shenzhen stock exchanges

The listed companies on the two stock exchanges are distributed over wide industry sectors[10], including communications and transport, energy, telecommunications, public

[10] The industry classification is based on the proportion of business involved of the listed firms according to the CSRC guidance. A listed company is not able to change its industry sector status unilaterally without the CSRC's approval.

utilities, finance, electronics, metallurgy, food, drinks, textiles, commerce and comprehensive services (see Table 2-4). By December 2002, 1,224 companies from all 31 provinces autonomous regions and municipalities nationwide listed their shares on the SHSE and the SZSE. The companies can be broken down as follows: 1,050 public companies listed A-shares only; 24 companies issued B-shares only; 86 companies listed both A-Shares and B-shares; 27 companies had dual listings both in China and Hong Kong; several companies listed A-shares in China and ADRs in New York and GDRs in London (see Table 2-1). By the end of 2002, altogether 587.5 billion shares had been issued in the markets by China's listed companies and this had raised RMB684 billion domestically alone.

Investors

By the end of 2002, the number of investors with accounts at the Shanghai Stock Exchange was 35,666,100, which included 34,701,900 A-share investors and 964,200 B-share investors. There were 190,600 institutional investor account holders, and the number of A-share accounts and B-share accounts were 181,000 and 9,600 respectively. There were 33,151,500 investors with accounts at the Shenzhen Stock Exchange, including 32,573,100 A-share investors and 578,400 B-share investors. The number of institutional investors at the SZSE was 172,200, of which 164,200 were A-share investors. The proportion of institutional investors' accounts to total investor accounts increased from 0.48% at the end of 2001 to 0.51%. By the end of 2002, 67.275 million investment accounts had been opened. Institutional investors accounted for 345,200 of these, while individual investors accounted for 66,929,800 (see Table 2-5, Table 2-6).

Table 2-5: Expansion of investors

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total										
Investors	7,777	10,590	12,425	23,068	33,333	39,111	44,820	58,011	66,504	68,818
New Ones	5,610	2,813	1,835	10,643	10,265	5,778	5,708	13,192	8,401	2,314
Shanghai										
Investors	4,235	5,749	6,852	12,079	17,133	19,994	22,811	29,578	34,296	35,666
New Ones	3,123	1,514	1,103	5,227	5,054	2,861	2,817	6,767	4,626	1,370
Shenzhen										
Investors	3,542	4,841	5,573	10,989	16,200	19,117	22,009	28,433	32,208	33,152
New Ones	2,487	1,299	732	5,417	5,211	2,917	2,891	6,424	3,775	943

Unit: 1,000

Sources: Shanghai and Shenzhen stock exchanges, and China Securities Depository and Clearing Corporation Limited

Table 2-6: Structure of investors at the end of 2002

	A-shares			B-shares		
	Total	SHSE	SZSE	Total	SHSE	SZSE
Total Investors	67,275.0	34,701.9	32,573.1	1,542.6	964.2	578.4
Legal	345.2	181.0	164.2	17.6	9.6	8.0
- Domestic				0.2	0.0	0.2
- Foreign				17.4	9.6	7.8
Personal	66,929.8	34,520.9	32,408.9	1,524.9	954.6	570.3
- Domestic				1,269.6	789.1	480.5
- Foreign				255.3	165.5	89.8
New Investors	2,264.6	1,334.9	929.7	61.0	35.1	25.9
Legal	33.9	22.3	11.6	0.8	0.4	0.4
- Domestic				0.0	0.0	0.0
- Foreign				0.8	0.4	0.4
Personal	2,230.7	1,312.6	918.1	60.2	34.7	25.5
- Domestic				59.0	34.0	25.0
- Foreign				1.2	0.7	0.5

Unit: 1,000

Sources: Shanghai and Shenzhen stock exchanges, and China Securities Depository and Clearing Corporation Limited

Intermediaries

Securities intermediaries are those entities that are engaged in securities businesses, such as securities companies, accounting firms, law firms, asset appraisal firms, investment advisory firms, etc. According to the Securities Law, securities firms are categorised into two groups based on their strength and business scope. Comprehensive securities firms, with registered capital of RMB500 million (US$60 million) or above, have authority to engage in brokerage in addition to underwriting and trading on their own accounts. In the case of securities firms with registered

capital of RMB50 million (US$6 million) or above authorisation is granted to engage only in brokerage. By the end of 2002, there were 127 securities companies, 2936 securities houses, and 179 futures brokerages in China (see Table 2-7). Together with other relevant authorities, the CSRC is entitled to grant the qualifications of all intermediaries engaged in or related to securities activities. The CSRC is also supporting the development of local Chinese securities companies, and encouraging integration among them. However, the majority of securities companies cannot access the interbank lending market, and banks do not normally provide stock collateral loans to securities firms. The most important way of financing is the repurchase of government bonds. However, owing to some illegal repurchase incidents, the CSRC has tightened the regulations on repurchase, and made it even harder for the securities houses to obtain capital from the financial market. The brokerage must segregate clients' money from their own accounts, even though misuse of clients' funds is still common.

Table 2-7: Intermediaries

	1994	1995	1996	1997	1998	1999	2000	2001	2002
SHSE									
- Number of Members	550	553	524	467	330	310	305	263	200
- Non-local Members	501	504	478	424	318	299	293	253	186
SZSE									
- Number of Members	496	532	542	373	329	318	326	284	237
- Non-local Members	466	498	508	349	314	304	310	268	220
Securities Companies	91	97	94	90	90	90	100	109	127
Securities Houses	2262	NA	2420	2412	2412	2412	2680	2700	2936
Futures Exchanges	14	14	14	14	3	3	3	3	3
Futures Brokerages	NA	NA	329	294	278	213	178	200	179

Sources: The China Securities Regulatory Commission (CSRC)

2.3. Prospects

The development of the securities market and SOE reform with a shareholding system have played a positive role in economic reform in China. The number of listed firms in China has increased dramatically with a corresponding increase in market capitalization. The Chinese stock market has raised a considerable amount of capital since 1991. However, despite this dramatic expansion to date, the capital markets in China still remain underdeveloped when taking into consideration China's economic

scale and world standards. At the end of 2002, the ratio of stock market capitalization to Gross Domestic Product (GDP) was 37.43%. After the exclusion of non-tradable shares, the ratio of floating capitalization to GDP was around 12.19%. In terms of its value relative to the overall GDP of the national economy, the equity market is less important in China than in the developed economies, or even some other emerging markets. Although banks dominate financial systems throughout Asia, the corporations in China rely more heavily on banking finance and on internally generated funds than the other regions owing to China's underdeveloped capital markets. Under weak government regulations and direct lending, a large number of non-performing loans have built up (Harvie and Naughton, 2000).

China is embarking on a new economic cycle characterized by more openness and economic restructuring. The capital market is expected to play a more important role in the future in facilitating the mobilization and rational allocation of financial resources. There will be a sufficient supply of listed companies in China, and on the demand side, huge domestic savings are looking for more diversified investments. Further development of the equity market in China will convert domestic savings into equity investment. The main effects of China's stock market on the economy are not only to generate capital through the listing, but also to improve the operating efficiency of corporations, corporate governance, and financial reporting mechanisms. The Chinese government considers shareholding to be a key solution to the reform of SOEs, and the stock market is expected to play a major role in corporate finance in the near future. According to a report released by a noted Beijing research institute, the market value of China's stock markets will hit RMB13 trillion and account for 50 percent of the nation's GDP by 2010. The influence of private-owned enterprises on the overall economy will gradually increase.

China's accession to the World Trade Organization (WTO) in 2001 poses tremendous challenges and opportunities to the Chinese securities market, and it will gradually lead to further improvement in the efficiency, transparency and liquidity of Chinese securities markets. The WTO's General Agreement of Trade in Services (GATS) has

given China a mandate to liberalize competition in its financial markets, boost the number of financial intermediaries, and foster the development of its stock markets (Burke, 1999). The Chinese government is required to dismantle protectionist regulations on its securities markets, and the domestic Chinese financial institutions are required to face directly any competition from their more advanced foreign counterparts[11]. In the near future, capital investment in most fields will be open to international investors, and it is likely the Chinese stock market will become an important part of the global capital market.

The Chinese government is further encouraging the development of institutional investors, and insurance companies and pension funds are allowed to invest in the stock market as, with the lifting of restrictions, more mutual funds are set up. The Chinese government hopes this can stabilize the market and increase the professionalism of the investors. Starting from September 2001, open-ended funds have been approved in China, and at the beginning of 2003, several open-ended funds were listed on the two domestic exchanges in China. Even though the number of funds in China has grown dramatically during the last five years, the total amount of money under management is still only a small fraction compared to other developed markets. From 2002, in order to further liberalize the A-share market, to introduce more foreign expertise to increase the convertibility of Chinese local currency, foreign institutions have been allowed to invest directly in the A-share market via joint-venture investment funds[12] with local Chinese securities firms. Effective from 1 December 2002, the Qualified Financial Institutional Investor (QFII) scheme allows some qualified foreign institutions to invest in A-share markets along with Treasury and corporate bonds listed on the two domestic exchanges in China, through special accounts which are governed by the State Administration of Foreign Exchange. However, no single QFII is allowed to hold more than 10% in a listed company, and the total QFII ownership of a listed company cannot exceed 20%. Since the same

[11] Three years after WTO accession, Sino-foreign securities firms will be allowed, with foreign interest up to one-third of the gross stake. These joint-venture securities firms will be eligible to conduct the underwriting of A-shares, and the underwriting and broking in B-shares, H-shares and bonds.

[12] Foreign firms are not allowed to have majority share ownership over joint-venture funds.

time, a Qualified Domestic Institutional Investor (QDII) mechanism has also been under discussion to allow domestic institutional investors to invest in overseas markets. The scope of insurance companies to invest has broadened in order to bring more long-term investors to the market.

To support the development of the private sector, a NASDAQ-style market was set up on the Shenzhen stock exchange on 1 August 2004, after nearly a four-year halt (since November 2000) to Shenzhen's main board IPOs. This is similar to the Growth Enterprise Market (GEM), established in Hong Kong at the end of 1999. It will allow small and medium-sized private firms in high-tech or the high growth-potential sector to access the capital market. Altogether there are around 50 private companies listed on the main board in Shanghai and Shenzhen. The two stock exchanges in China are directed mainly at the privatization of SEOs. The private firms represent China's fastest growing sector, and the establishment of a second board for these firms is a major step forward in terms of financing China's economic development. After launching the second board in Shenzhen, the main board at Shenzhen will eventually merge with the main board in Shanghai. However, the current listing requirement for the Shenzhen GEM is still similar to that on the SHSE, and companies need three consecutive years of profitability prior to listing, which makes a large number of venture firms ineligible.

Further development of bond markets, especially the corporate bond market, would also be an important contribution to economic development. Historically, there has been too much reliance on bank financing. However, development of the corporate bond market will require the establishment of efficient trading and settlement technology, increasing the credibility of domestic rating agencies, and establishing risk-free yield curve benchmarks and a stable regulatory environment. To the end of 2003, there were 20 corporate bonds listed on the SHSE, and five on the SZSE. The total size of issuance is just a small fraction relative to Treasury bonds in China. A company wanting to issue corporate bonds requires approval from the National Development Reform Commission, China's top planning body, while the People's

Bank of China must approve the coupon. Although there are some rights and warrants traded on the two stock exchanges, these instruments tend to be relatively illiquid. A new proposal for a financial derivative market may provide benefits, particularly for risk management. It is imperative that this market is well regulated and is highly liquid. The existence of a derivatives market, especially a financial derivatives market, will be vital to the stability of the financial markets[13]. Mergers and acquisitions, debt-equity swaps and private equity placement are all areas which are underdeveloped and underutilised. However, with market liberalisation, activities in these areas will further expand (Kawai, 1999). The Chinese government will even allow foreign-funded firms to float shares on the A-share market.

2.4. Conclusion

This chapter reviews the history and the development of the Chinese equity market. A well developed equity market is crucial to economic reform in China, as it allows enterprises to access the capital market. However, the development of a securities market is only part of the overall economic reform process in China. The performance of listed firms, especially in the case of those firms with politically appointed managers, will not necessarily improve without corresponding improvement in corporate governance practices and the legal system. The Chinese securities market is still in the process of standardizing securities transactions and increasing the transparency of the market to be on a par with prevailing practice in the rest of the world. However, a number of problems still exist.

In order to ensure investor confidence and the long-term sustainable growth of the securities markets, continuous regulatory and legislative improvements as well as enforcing bans on insider dealing and price manipulation, are the important tasks faced by Chinese regulators. Protecting investors, especially the smaller ones, should be of top priority for the regulators in China. It is also important for the regulators to curb

[13] There are three futures exchanges in Mainland China, the Shanghai Futures Exchange, the Dalian and the Zhengzhou Commodity Exchanges. In May 1995, the bond futures market in China was shut down by the government owing to market irregularities.

speculation, cool the frenzy of the stock market, and improve the quality of listed companies.

The state still retains significant ownership and ultimate control over most of the listed companies in China, with the listing of enterprises on the stock market providing them with equity funds for restructuring and expansion. However, while there is a legal framework to govern the issuing and trading of stocks, there are no standardized asset valuation and accounting practices, and this is especially so for companies with a majority of state-ownership (or even in case where the state is the largest minority shareholder). Whether true operational efficiency and capital allocation efficiency can be achieved still remains in question. Furthermore, the Chinese government faces considerable challenges in allowing circulation of non-tradable shares on the two exchanges. In 2002, a government proposal for the sale of state holdings in listed firms had to be withdrawn owing to negative market reaction. The continued majority ownership by the state makes it difficult to introduce professional management into listed companies, and as a source of discipline it has also seriously constrained the market.

Although China's securities market is still an emerging marketplace, it has the greatest potential in the Asia-Pacific region, and it plays a significant role in China's continued economic growth and reform process. With further development, it will naturally lead to full deregulation in the financial industry, and the current segmentations among banking, securities, insurance, and trust will eventually disappear.

CHAPTER 3

Market Microstructure and Institutional Details

This chapter provides an overview of the equity market microstructure and the institutional framework of the Chinese equity market[14]. It documents the trading facility of the two stock exchanges in China, explains the exchange regulations, and discusses information dissemination.

3.1. Trading Facility

There are two exchanges in China: the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE)[15]. The structure and transaction rules of these two stock exchanges are almost identical. They are both non-profit membership institutions directly governed by the China Securities Regulatory Commission (CSRC). Both exchanges employ a computerized automated order matching trading system, and have their own independent systems for trusteeship, clearance and settlement. No company can be cross-listed on both markets.

Both stock exchanges are open five days a week except for public holidays. The official trading hours are between 9:30 a.m. and 3:00 p.m. with a lunch break from 11:30 a.m. to 1:00 p.m. Therefore, there are a total of four hours of continuous trading (consecutive bidding) each day. In addition, both markets enter a pre-trading session from 9:15 a.m. to 9:25 a.m. each day, which subsequently generates the morning opening prices, via an opening algorithm (auction).

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[14] This chapter is based on the China Securities and Futures Statistical Year Book (2001, 2002, 2003), the Shanghai Stock Exchange Fact Book (2001, 2002, 2003), and the Shenzhen Stock Exchange Fact Book (1998, 1999, 2000, 2001, 2002, 2003).

[15] The over-the-counter (OTC) market was set up in July 2001 to accommodate companies expelled from the main board equities market, and some others which were previously listed on the now-defunct Securities Trading Automated Quotations System (STAQS) network and the National Electronic Trading System (NETS).

During normal trading hours, all orders have to be entered into the computerized trading system[16]. Orders can be sent to the SHSE's trading system through more than 5,000 trading terminals either on the trading floor or in member firms. The SHSE has an enormous trading floor measuring 3600 square meters, the largest in the Asia-Pacific rim. The SHSE is also able to disseminate the real-time quote and transaction information throughout the country and abroad through its own domestic satellite and optical communication network. After a few upgrades, the computer system of the SHSE has the daily capability of executing 29 million orders and settling 60 million transactions at a speed of 8,000 transactions per second, via automatically matching the closest bid and ask orders. On the SZSE, Tandem computers are used for trading and IBM AS400 for the settlement. The daily capacity of the system is twenty million transactions, while the historical daily peak is 4.5 million trades. The SHSE has established a nation-wide satellite telecommunication network with more than 3,000 one-way satellite substations and 1,800 two-way substations. Market information can be updated ten times every minute, and the data of each quote and transaction can be transmitted to investors even when the daily trading volume reaches RMB200 billion. The SZSE trading network also has national coverage, linked with over 3,000 member trading terminals. The electronic and order-driven system largely ensures the fairness of trading and the instant dissemination of market information across the country. This real-time system gives investors nationwide equal access to the market. As the majority of equity investors in China are retail investors, the trading systems of the two exchanges are designed to withstand a large number of small transactions, unlike other more developed markets.

Two trading methods are used by the order matching system: a periodic consolidated auction and a continuous discriminating auction. The periodic consolidated auction is

[16] The SHSE and SZSE introduced off-market block trading for A-shares, B-shares (on the SHSE only), mutual funds, and bonds in order to improve the trading services provided to institutional investors, in September and February 2002 respectively. The off-market block trades are conducted after markets close between 3 p.m. and 3:30 p.m. The trading results have no effect on stock closing price or market indices on that day. The minimum transaction size is 500,000 shares or RMB 3 million for RMB denominated securities, and 500,000 shares or US$ 300,000 for B-shares. The trading price of the block trade is also limited between the intraday high and low.

used once a day in order to generate the morning opening prices. In this type of auction, all orders submitted during the morning pre-trading session are batched for execution at a single equilibrium price. The opening price of a stock is based on a mathematical algorithm which enables the largest volume to be executed at this price. After the opening, the unmatched orders form the basis of regular trading. A continuous, discriminating auction is used during regular trading hours in accordance with a price and time priority scheme for matching transactions. Bid orders are placed in price priority from highest to lowest while ask orders are placed from lowest to highest. Since it is impossible to put a buy (sell) order above (below) the currently existing lowest ask (highest bid) price, the 'best' price is the only one that can be executed at any given time. Thus, matching can only occur at one price level each time. In this type of auction, buy and sell orders are submitted to the system. Matched orders are executed and then dispatched from the system, whereas unmatched orders remain in the system until they are executed or cancelled. The transaction prices of a particular auction are generated contingent upon the bid (ask) prices and the time of order submissions. Despite the lunch break, the afternoon session is a continuation of the morning session without an opening algorithm. During the lunch break, the order book remains unchanged as orders may not be amended or withdrawn until the market reopens for the afternoon session. The automated order matching system can instantaneously execute orders that have accumulated during the lunch break. This operation is different from the Tokyo Stock Exchange, where the periodic auction is used twice a day (Lehmann, and Modest, 1994). The mechanism adopted also possesses different characteristics when compared to the Hong Kong market, where both the morning and the afternoon sessions are opened with a continuous market (Brockman and Chung, 1999). In China, all orders expire at the end of each trading day, although it is also possible to enter orders which are valid only for one trading session. Market orders and limit orders are the only two types of orders allowed. The smallest trading unit is 100 shares[17]. Floor trading among member brokers and short selling are strictly prohibited. There is no mandated market maker to stabilize the stock price by trading for his own account as in the US. The tick size

[17] Odds lots can be sold but not purchased.

(minimum quote price) in both stock markets is RMB1 cent for A-shares[18], while the tick size of B-shares is US0.1 cent on the SHSE and HK1 cent on the SZSE.

As of May 1998, the trading systems on both the Shanghai and Shenzhen stock exchanges require investors to trade through only one securities house. The exchange's automatic quotation system will reject transaction orders from investors who have not appointed an exclusive brokerage to act on their behalf. This single brokerage system is intended to strengthen market supervision.

3.1.1. Price Limit

During most of the time the stock market has existed in China, a daily price limit has been in operation on both exchanges. Before 20 May 1992, a daily price limit of ± 5% was set up on the Shanghai Stock Exchange, which was reduced to ± 1% later. During the same time period, the Shenzhen Stock Exchange applied ± 10%, ± 5%, and even an asymmetric +1% to –5% price limit during different periods. In the middle of 1992, both exchanges lifted the price limit, and allowed share prices to move freely. On 16 December 1996, the CSRC requested both exchanges to implement a daily 10% limit[19] on both price rise and fall for shares and funds trading. This price cap has been imposed until now. All bid and ask orders exceeding the limits are null and void and brokerages are banned from accepting invalid orders. The purpose of the price limit is to maintain market stability and try to prevent fluctuations in share prices, but its benefit requires further analysis in the future.

3.1.2. Trading Suspension in Securities

From June 1998, shares that hit their limit up or limit down levels (± 10%) for three consecutive days or shares that rise or fall over 7% within each day for five

[18] The tick size for investment funds was changed from RMB1 cent to RMB0.1 cent, effective from 3 March 2003.

[19] The Price limit for ST (special treatment) stocks (companies that have made two consecutive years, or net asset per share has fallen below the par value.) and PT (particular transfer) stocks (companies that have made three consecutive years) is ± 5%, and trading of those shares only takes place on Friday.

consecutive days must be temporarily suspended from trading for the morning session. The suspended listed companies are required to disclose information to explain the fall or rise, and any price sensitive information. This regulation aims to improve companies' disclosure and limit speculation.

3.1.3. Market Surveillance

The market surveillance system comprises several sub-systems, making possible real-time surveillance over various market activities. The surveillance system integrates the trading and settlement system and the different surveillance measures create automatic alerts. The role of the system is to detect, deter and report as well as to be involved in tracking and analyzing suspicious probable violations. The system is able to track each end investor. All this helps to reduce any potential risks in trading and settlement.

3.1.4. Transaction Fees

Transaction costs in China are substantially higher than for comparable developing markets, and they differ between A-shares and B-shares. From 1 July 1990, the Shenzhen Stock Exchange (SZSE) started to impose a 0.6% stamp duty on the selling side. In October of the same year, the Shanghai Stock Exchange (SHSE) started to charge a stamp duty of 0.3% for both sides, making 0.6% in total. On 30 November 1990, the stamp duty in Shenzhen was increased on both sides of the transaction to 0.6% for both sides (or 1.2% in total for a round trip). In order to compete with the SHSE, the stamp duty in Shenzhen was decreased to 0.3% for both sides on 1 June 1991. In June 1992, the National Taxation Office and National Reform Committee officially set the stamp duty for both sides at 0.3%. Stamp duty was increased to 0.5% for both sides on 10 May 1997, and it was decreased to 0.4% for both sides on 12 June 1998. On 1 June 1999, stamp duty for B-shares was decreased further for both sides by 0.1% to 0.3%. Stamp duty for A-shares and B-shares was further decreased for both sides to 0.2% on 16 November 2001. However, the stamp duty in China is still one of the highest in the world. The brokerage charge in China is mandated by

the two stock exchanges, which is for both sides 0.35% for A-stocks (10 Yuan at least), 0.6% for B-stocks, 0.25% for funds (5 Yuan at least), and 0.2% for bonds (5 Yuan at least). For the trading of B-stocks, investors have to either trade with a broker who has operating licences for trading B-stocks, or entrust a Mainland broker to make the transactions. Obviously, in such cases it takes a longer time to execute the trade. From 1 January 2001, the brokerage fees on trading B-shares were further cut to 0.43% for both sides. Beginning 1 May 2002, the brokerage commission is allowed to float between 0.3% and the minimum fixed charge. A minimum fee for a single transaction was set at RMB5 for trading A-shares, US$1 for trading B-shares on the SHSE, and HK$5 for trading B-shares on the SZSE. There is also a clearing charge of 0.05% for both sides for Shenzhen listed stocks or US$4 for Shanghai listed stocks, and a stock exchange charge ranging for both sides from 0.03% to 0.0346%. Until now, no tax has been imposed on capital gain income.

3.2. Settlement

Prior to 24 November 1992, the Shanghai Stock Exchange (SHSE) used a T+1 settlement method on all A-shares transactions, which means investors who bought A-shares could not sell them until the next day. Between 25 December 1992 and 31 December 1994, investors were able to sell their A-shares on the same day they bought them (T+0). Prior to 1 November 1993, investors could not sell B-shares until three days after purchasing (T+3). From 2 November 1993 to 31 December 1994, B-shares were traded on the T+0 rule. On the Shenzhen Stock Exchange (SZSE), from 15 June to 31 December 1993, A-shares were traded on a T+1 rule and B-shares were traded on a T+3 rule. During the period between 1 January 1994 and 31 December 1995, the trading of A-shares and B-shares were on the T+0 and T+1 rules respectively. Since 1 January 1995, the CSRC unified the settlement methods of the two exchanges. The settlement takes place on the same day (T+0) of a trade among members of the exchange and on the next day (T+1) between a broker and his clients for A-shares, while it takes three days for B-shares trading to be settled (T+3).

Both exchanges implement electronic, book-entry delivery systems, and the clearing systems retain the records of both brokers and end investors. During the settlement, each clearing member settles the securities between the clearing corporation and all its trading seats first on a net basis, and then internally with its clients. Prior to March 2001, both stock exchanges in China had their own clearing and settlement companies: the Shanghai Securities Central Clearing & Registration Co. (SSCCRC) and the Shenzhen Securities Clearing Co. (SSCC). In March 2001, the China Securities Depository & Clearing Co., Ltd (CSDCC) was formed. This is responsible for establishing and managing securities accounts; clearing accounts; securities depository and securities trust; transferring ownership; clearing and payments of securities and capital; and other agent services such as allocation of equity for the issuer. This centralized system is able to provide investors with unified, safe and efficient services. The two depository and clearing companies of the SHSE and the SZSE became its subsidiaries, and the CSDCC processes its operations on two separate platforms using its Shanghai and Shenzhen branches. For the settlement procedure, the electronic system used in Shanghai is referred to as PROP, and the system in Shenzhen is known as B-Com.

3.3. Requirements for Listing and Delisting

Under a delegation of authority from the CSRC, the stock exchanges have the power to establish detailed rules to govern issuing and trading activities in the exchanges (Lin, Yang and Wang, 1998). Although the exchange listing rules set out the criteria for listing and delisting, and set out listing fees, reporting obligations and sanctions for failure to comply with the rules, currently the China Securities Regulatory Commission (CSRC) is responsible for the examination of the eligibility of IPO applicants. After obtaining approval from the CSRC, firms should apply for listing to a stock exchange (the SHSE or the SZSE) before their shares can be publicly traded. According to Company Law in China, Enterprises are required to meet the following criteria in order to be listed:

- the IPO should be approved by the State Council Securities Management;

- the company's capital stock must be RMB50 million or above;
- the company must have a minimum of three years operating history and have positive earnings over the last three consecutive years;
- the number of shareholders with holdings of at least 1,000 outstanding shares must not be less than 1,000;
- at least 25% of the company's total share capital should be publicly offered. 15% of public offering applies to the company whose share capital exceeds RMB400 million; and
- the company must not have a history of serious misconduct or fraudulent schemes during the previous three years.

Companies may also be delisted by the request of the issuer or by a decision made by the exchange. Delisting at the request of the company can only occur if it is agreed to by the General Shareholders' Meeting and if the company concerned has settled all of its obligations to the stock exchange. The exchange may delist a stock if any of the following conditions occur: changes to a firm's equity holdings; failure to meet disclosure rules; creating false accounts; and conducting illegal activities. Despite these regulations, the exchange exercises discretion over when companies are delisted. The Company Law provides for the delisting of any firm that posts an annual loss for three consecutive years or more[20]. The exchanges in China are now confronted with a difficult problem. They are clearly unwilling and unable to delist all of the companies which fail to meet the listing requirements but the failure to do so means that the quality and reputation of the exchange is adversely affected[21].

[20] The companies reporting losses for three years or more are placed in a category named 'particular transfer stocks' (PT). They are suspended from normal trading, but can be transferred once a week.

[21] In April 2001, the Shanghai Narcissus Electrical Appliances Co. listed on the Shanghai Stock Exchange with both A-shares and B-shares issued, became the first firm to be delisted. No listed firms in China have been delisted due to irregularities, despite the fact that several firms have been discovered reporting false accounting results.

Mode of Stock Issuance

Article 28 of the Securities Law states that "In the event that premium issuance is adopted for a stock issuance, the issuing price shall be negotiated and determined between the issuer and the underwriter, subject to the verification of the securities regulatory agency under the State Council." In fact, the CSRC has set a rigid formula for the issuing price, and normally it is based on a certain PE ratio, which makes the IPO prices bear little or no relation to the fundamentals of the company. From 22 February 2000, investors' subscription rights to the initial public offerings (IPO) are based on their holdings in other listed firms in the secondary market. The new rule also limits the investors' purchase of IPO up to 0.01% of the share offering.

3.4. Reporting Requirements

Modern stock markets require effective disclosure. Information and disclosure released by companies will help investors make accurate decisions and protect the interests of investors, as well as promote smooth economic growth in a society. Disclosure of public listed companies is crucial to the normal functioning of securities markets. Therefore the practice of information disclosure is regulated worldwide, and China is no exception. Since the early 1990s, government authorities in charge of securities markets have made great efforts to draw up regulations or rules governing information disclosure of publicly listed companies. The listing rules of stock exchanges set out specific reporting requirements, and these rules impose an obligation to provide the following reports to the exchanges: an audited annual statement within 120 days of year end; a semi-annual report within 60 days of half-year end; in addition, all important and relevant information that possibly may affect the value of the company's securities or investment decisions of investors (such as merger and acquisition, senior management turnover, change of controlling stake or investing in big projects, must also be disclosed on a timely basis). However, the rules of the Exchanges do not specify the time period within which this must be reported and the mechanism for such reporting. Shareholders having more than five percent ownership must publicly disclose, within three trading days, any transaction involving

more than five percent of the listed firm's total shares. This particular shareholder is not allowed to trade the listed firm's shares during a three-day period.

During the third quarter of 2000, the CSRC issued rules requiring companies to disclose whether the assets they owned in Mainland firms were in fact genuine. In addition, reports had to include an opinion on the legitimacy of ownership claims in companies outside China by Mainland-based institutions and individuals. They also had to include a statement as to whether these companies' activities were within the bounds of Chinese law, and general information regarding share issues, the listed assets, the underwriters, how the proceeds from the issue would be spent, and the exchange on which the shares would be listed.

Since 2001, all listed companies have been required to issue quarterly financial statements. Companies failing to disclose within the required period are suspended from trading until they have met the requirements. When a company releases information, trade on that company's stock is suspended for one hour. Annual reports are required to be audited by certified public accountants. The companies which issue B-shares must have their annual reports audited by both Chinese and international accounting firms, and the gap resulting from the differences between the local and international accounting standards must be clarified. The CSRC also encourages listed companies to be audited by foreign accounting firms[22] under international accounting standards, in addition to domestic accountants. Each company is required to provide an earnings forecast on a quarterly basis, and a pre-announcement warning should be given if a loss or 50% change in earnings is expected. Both exchanges check corporate disclosures on a post-event basis. Disciplinary actions, such as trade suspension, public censure or fine, are taken against incompliance or corporate fraud, and the managers, directors and controlling shareholders are liable in information disclosure. If considered necessary, there must be supplementary reports.

[22] The big five authorized foreign accounting firms are KPMG, PricewaterhouseCoopers, Arthur Andersen, Deloitte Touche Tohmatsu and Ernst & Young, and later PricewaterhouseCoopers and Arthur Andersen merged their China and Hong Kong operations.

3.5. Exchange Members

Both exchanges in China are non-profit membership institutions and legal entities. The Exchange Membership Rules outline the requirements to become a member and the rights and obligations of the members. These rules tend to relate to the members' relationship with the Exchange. As a result of mergers and takeovers among the brokerages, the membership on the Shanghai Securities Exchange declined from 553 in 1995 to 200 in 2002. Similarly, the membership on the Shenzhen Securities Exchange declined from 542 in 1996 to 237 in 2000[23]. There are approximately 175 active members in the SHSE and the SZSE. A small group of brokers tend to dominate trading, and the top ten brokers account for thirty percent of trading activity. Currently, all the Exchange members are domestic, and overseas market participants are offered special seats to trade in B-shares only.

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[23] Most of the securities companies are dual members of the Shanghai and Shenzhen stock exchanges, and each brokerage house services the securities trading on both the Shanghai and Shenzhen exchanges simultaneously. Majority investors have two accounts in the Shanghai and Shenzhen markets respectively.

CHAPTER 4

Liquidity Asset Pricing Model in a Segmented Equity Market

4.1. Introduction

The capital asset pricing model (CAPM), derived by Sharpe (1964), Lintner (1965) and Mossin (1966) and its zero-beta version by Black (1972), has a history of more than thirty years. While the CAPM received early empirical support, it has subsequently been challenged. Based on CAPM, the expected return on different capital classes varies. After taking inflation into account, the expected return on cash is zero or less, and the expected return on stocks is higher than that on bonds because of the higher risk associated with investment in stocks. Traditionally, the price differences between segmented equity markets are explained either by ICAPM (international CAPM) (For details, see, e.g., Solnik, 1974, Black, 1974, Stulz, 1981), or by the differences in risk aversion between the different investor groups, or by a diversification effect. Liquidity or marketability would also be expected to affect the expected return of capital. As investors who are risk-averse require higher expected returns to compensate for greater risk which they undertake, one would expect these investors to prefer more liquid investments, as these can be traded quickly and at low cost. Assuming this to be so, investments with lower liquidity must offer higher expected returns if they are to attract investors.

The finance literature on market segmentation has documented that, with foreign ownership restrictions, a class of shares open to foreigners tends to command higher prices than those shares open to domestic investors (see, e.g. Hietala, 1989; Bailey and Jagtiani, 1994; Stulz and Wasserfallen, 1995; and Domowitz, Glen and Madhavan, 1997). Hietala (1989) reports a substantial premium on the foreign-owned unrestricted shares in the Finnish stock market over the period 1984–1985. He develops an equilibrium return model applicable when domestic investors are allowed

to hold only domestic stocks (restricted Finnish and unrestricted Finnish stocks) and foreign investors are allowed to hold all stocks (foreign stocks and unrestricted Finnish stocks). He shows that in this market setting domestic investors are willing to pay less than foreign investors for domestic stocks due to the lack of diversification benefit. Bailey and Jagtiani (1994) study the effects of capital controls using data from Thailand, which restricts foreign investors from trading in securities which have reached foreign ownership limits. They find that an average 19% premium on the Alien Board of the Stock Exchange of Thailand and the cross-sectional price differences between domestic and foreign shares are correlated with proxies for the severity of foreign ownership limits, liquidity and information availability. Stulz and Wasserfallen (1995) find that for a sample of 19 firms listed in Switzerland, foreign investors pay higher prices than local investors. Domowitz, Glen and Madhavan (1997) document a significant stock price premium for B series shares in Mexico, which are not restricted to a particular investor group, and examine the relationship between stock prices and market segmentation caused by foreign ownership restrictions.

Bailey (1994) analyzes eight Chinese B-shares for the period of March 1992 through to March 1993. He finds a significant discount in B-share prices relative to the corresponding A-share prices of these eight stocks. This price discount has continued to exist, and during my sample period, the price discount is even larger than in Bailey's (1994) study. For reasons which have not so far been elucidated in the literature, the Chinese stock market is the only segmented equity market in which foreign investors pay lower prices for the shares. At the same time, there is a large liquidity difference between the two segmented markets in China in terms of both transaction costs and turnover rate. Given these substantial price differences and liquidity differences between the two classes of shares in China, the following research question is addressed here: is it possible to use Swan's (2005) liquidity asset pricing model to explain these price differences in the Chinese equity market since the liquidity in two markets is totally different with much greater trading interest in the domestic A-share market?

The detailed evidence here illustrates the effect of the liquidity on asset prices, and it has a number of policy implications concerning the design and operation of emerging capital markets, the flotation of newly privatised companies, and the evaluation of direct and portfolio investments in developing countries. In addition, a rational explanation is offered for price discounts on B-shares in the Chinese equity market.

The remainder of the chapter is organized as follows. Section 4.2 presents some earlier literature in the area of asset pricing and market segmentation. Section 4.3 describes the data, and presents some descriptive statistics on the prices, turnover rates, and trading costs of A-shares and B-shares on both Shanghai and Shenzhen stock exchanges. Section 4.4 introduces the methodology, which is based on Swan's (2005) liquidity asset pricing model. The model is used to explain why B-shares are traded at discount, and the empirical test results are also summarised here. Section 4.5 concludes the chapter and provides some suggestions for future research.

4.2. Literature Review[24]

The capital asset pricing model (CAPM) has a history of more than thirty years, and it obtained initial empirical support until the 1980s. After arbitrage pricing theory (APT) had been developed, a number of empirical tests were carried out, and the market portfolio and betas of the CAPM have sometimes been replaced by proxies for APT factors and factor loadings. Fama and French were able to provide evidence in their papers that the pricing paradigm continues to be valid, and they show that the cross-sectional variation in expected returns associated with these non-CAPM beta risk features is characterised by both the firm size and its book-to-market ratio. Fama and French (1993) develop a three-factor pricing model, in which the three factors are the returns on the market portfolio, and returns on two zero net-investment portfolios. One of the zero net-investment portfolios is long in small firms and short in large firms

[24] This section is based mainly on Swan (2005). See Swan (2005) for details.

(SMB), whereas the other is long in high book-to-market and short in low book-to-market securities (HML).

The role of liquidity or marketability in asset pricing was pioneered by Amihud and Mendelson (1986a). In this paper, the authors present and test the hypothesis that investors require returns on securities measured net of transaction costs. Therefore, stocks with higher bid-ask spreads require higher expected returns in order to compensate for higher transaction costs. Through their empirical tests on NYSE stocks over the 1961 to 1980 period, they find a significant positive relationship between stock returns and spreads, and the returns of high-spread stocks are less spread-sensitive than the returns of low-spread stocks.

Amihud and Mendelson (1986b) further analyze the effect of bid-ask spread on asset pricing. In their equilibrium model, they posit a marginal investor who is equally content to trade bonds or equity in the same quantity. A return net of transaction costs that is the same as the yield on transaction cost-free bonds is required by the investor. Therefore, the total equity yield must equal the product of the marginal investor's trading level or turnover rate and the equity transaction cost, known as the 'amortized spread'. Furthermore, in the model, the resulting testable hypothesis is that the market-observed expected return is an increasing and concave function of the spread. Jacoby, Fowler and Gottesman (2000) derive a CAPM-based model based on net (after bid-ask spread) returns, and they find a positive and convex relationship between the expected return and the future spread cost. Other empirical studies of the relationship between stock returns and bid-ask spreads have different findings. Eleswarapu and Reinganum (1993) only find a significant relationship in January, and Chen and Kan (1996) find an insignificant relationship.

Furthermore, Amihud and Mendelson (1989) show that after including the relative bid-ask spread as an explanatory variable, three of four factors which are significantly related to risk-adjusted returns in Merton (1987) are no longer significant. Only

CAPM beta remains significant. They conclude that expected asset returns are positively related to CAPM betas and relative bid-ask spreads. Further empirical evidence of the importance of liquidity is provided by Datar, Naik and Radcliffe (1998) who, using data from CRSP for US stocks, show that trading volume provides a better explanation than the size of the firm. Their conclusion is that firm size is simply one of a number of possible proxies for liquidity, and the relationship between firm size and return found in the Fama and French series of papers is just a reflection of the liquidity-return relationship.

Brennan and Subrahmanyam (1996) also examine whether transaction costs caused by adverse selection result in higher expected returns. Instead of using bid-ask spread as a liquidity proxy, they use estimated variable and fixed, proportional transaction costs. After adjusting risk by using Fama and French's (1993) three-factor model, they find a concave relationship between equity premiums and variable costs of transaction and a convex relationship between premiums and fixed costs of transaction. Brennan, Chordia and Subrahmanyam (1998) investigate whether expected returns are explained by a number of firm characteristics including market liquidity, measured by trading volume. They find a negative and significant relationship between returns and trading volume for both NYSE and NASDAQ stocks. They argue that since trading volume is significant using risk adjustment method, support is provided for the hypothesis that there is an actual relationship between expected returns and liquidity, and incomplete risk adjustment is not a factor. Amihud and Mendelson (1991) summarize their own earlier findings relating to liquidity and asset prices and discuss the implications for financial policy. The model indicates that an individual's required return on a stock will equal his required return in the absence of bid-ask spread, plus the percentage bid-ask spread amortized over the individual's expected holding period. Chalmers and Kadlec (1998) also find strong empirical evidence that the amortized spreads are priced better than bid-ask spreads for common stocks of US domiciled companies traded on AMEX and NYSE from 1983 to 1992.

All the above papers emphasize the importance of liquidity in explaining the asset price, but the trading activities have been taken as fixed and immutable or exogenous. Mehra and Prescott (1985) are only able to explain the high historical equity premium implausibly by assuming a high degree of risk aversion. Fisher (1994) finds that the implied transaction costs are between 9.4% and 13.6% to explain the observed premium on NYSE between 1900 and 1985. In Marquering and Verbeek (1999), transaction costs are incorporated in intertemporal asset pricing models, and the implied bid-ask spread of approximately 10% is required in order to explain the cross-sectional expected returns in US for 1959–1993, while adopting a consumer habit persistence approach at the same time. The reason that turnover is treated as exogenous in these models, is that Amihud and Mendelson (1986a, b) assume that each investor treats his investment horizon, and hence stock turnover rate, as given. Barber and Odean (2000) suggest that investors are irrational, and they pay transaction costs as a penalty for active trading due to 'overconfidence'.

Based on Merton's (1973) intertemporal consumption and investment model, Constantinides (1986) uses numerical simulations to calculate the liquidity premium of a single representative investor with constant relative risk aversion (CRRA) preferences. In his model, the increment on the expected rate of return for an asset with transaction costs makes that asset as attractive to an investor as an identical asset without transaction costs. Accommodating increases in proportional transaction costs, investors drastically reduce the frequency and volume of trade. In his single period model, Constantinides (1986) shows that the liquidity premium and the one-way transaction cost are identical. The infinite-horizon model shows that the required compensation to cover the transaction costs approximates a mere 0.15 of the one-way transaction cost. However, owing to the transaction costs, the investor lacks the motivation to adjust his portfolio. This means that one cannot calibrate the model to the stylised facts relating to trading. Pagano (1989) examines issues of trade concentration and market fragmentation, and show that each trader accesses market liquidity according to conjectures about entry decisions by other potential participants. In his model, investors rebalance their portfolio due to differences in endowments, but he does not consider the size of the transaction costs.

Vayanos (1998) assumes an overlapping generation economy and his model treats turnover as endogenous. It is surprising that in his framework asset prices can rise when transaction costs increase. Both Vayanos (1998) and Constantinides (1986) find that transaction costs have a negligible effect on asset prices, and Vayanos (1998) attributes his finding to the inability of life-cycle considerations to generate more than a very small stock turnover.

Pagano (1989) introduces an endowment difference while Vayanos (1999) introduces an age differential counterparties. Apart from Pagano (1989) and Vayanos (1999), all the above-mentioned papers model a single representative investor making consumption and portfolio choices, but an individual representative investor could not trade optimally with any identical counterparties. No transaction cost and trading model without trading between investors can be meaningful. In Swan's (2005) model, except for endowments, the representative agents (or investors) are identical in all aspects. They are equally content to trade equity shares or bonds with both high and negligible transaction costs, and they have the same constant absolute risk aversion (CARA) coefficient, and utility function, with identical preferences and identical beliefs. The heterogeneity in endowments motivates trade between investors. Although it could place less reliance on endowment heterogeneity by relaxing any of these assumptions, Swan (2005) suggests that none of them is actually required to explain observed equity premium and trading patterns. All that is required, according to Swan (2005), is a downward sloping security transaction demand function, which is consistent with observed negative relationships between trading turnover and transaction costs. The implied 'consumer surplus' loss arising from transaction costs, which equals to the implied illiquidity (equity) premium loss, is the area under the implied security demand functions over the range of transaction costs from zero to its observed value, and the equity premium makes investors equally content to trade security bearing transaction costs or an equivalent asset without transaction costs.

Swan (2005) focuses on not only the observed transaction costs as in the other asset pricing literature, but also an invisible cost, namely the cost of forgone trades. He finds that only a slight transaction cost will induce investors to carry out a very small fraction of the trades relative to the optimal case under zero transaction cost, and this is the dead-weight utility loss relative to the zero transaction cost ideal. In Swan's (2005) simulation, the cost of forgone trading is over 15 times higher than the observed transaction outlay, and the high cost of equity capital demonstrates this invisible cost. The key to understand Swan's liquidity asset pricing model is the endogeneity of trading in securities markets. In this model, investors' decisions to trade are utility enhancing and hence voluntary, not an exogenous event as in earlier models (except Constantinides, 1986; Pagano, 1989 and Vayanos, 1998). Swan (2005) summarises his findings as follows: under the assumptions of CARA preferences, low risk aversion ($b=1$), moderate risk ($\sigma^2=3.24\%$) and 1% round-trip transaction cost, a 7.15 percent annual equity premium due to transaction costs and an average equity turnover rate of 38 percent are generated in its numerical simulation. This simulated equity premium is further decomposed into 0.37 percent due to actual transaction costs and 6.78 percent due to costs of forgone transaction. The simulation also yields an 880 percent annual turnover rate for bonds. He also finds empirical support for a bond turnover rate approximately 26 times higher than the equity turnover rate.

In Swan's (2005) model, the stock turnover is a linear function of the dollar transaction cost. From the perspective of empirical estimation, he finds that a more plausible linear in logarithms function can be used:

$$\tau(\varphi)=\alpha\varphi^{\beta}, \qquad (4.1)^{25}$$

and its inverse equation is as follows:

$$\varphi=\tau(\varphi)^{-1}=\left(\frac{\tau}{\alpha}\right)^{-\left(\frac{1}{\beta}\right)}, \beta\neq 1, \qquad (4.2)^{26}$$

[25] Swan (2005) Equation 42 on p. 22

[26] Swan (2005) Equation 43 on p. 23

where τ is turnover; $\varphi \triangleq \frac{Ra}{p^{mp}}$ is the actual relative transaction cost in opportunity cost terms; α is is the 'intrinsic' liquidity parameter and β is the absolute value of the (constant) elasticity of demand for turnover with respect to transaction costs.

By integrating the turnover demand function from a very small transaction cost, ε, to the relative transaction cost φ, the illiquidity premium, expressed in terms of both opportunity costs and stock turnover, is as follows:

$$c(\varphi) \cong \int_{\varepsilon}^{\varphi} \alpha x^{-\beta} dx, \text{ as } \varepsilon \to 0, \cong \frac{\alpha \varphi^{1-\beta}}{1-\beta} = \frac{\tau \varphi}{1-\beta}, \beta \neq 1, \qquad (4.3)^{27}$$

$$c(\tau) \triangleq c[\varphi(\tau)] = \frac{\alpha}{1-\beta}\left(\frac{\tau}{\alpha}\right)^{-\frac{1-\beta}{\beta}}, \quad \beta \neq 1, \qquad (4.4)^{28}$$

where φ is the relative transaction cost in opportunity cost terms; α is the 'intrinsic' liquidity parameter; and β is the absolute value of the (constant) elasticity of demand for turnover with respect to transaction costs.

Therefore, the equity premium can be addressed as the illiquidity premium between equity shares and bonds, which is as follows:

$$\begin{aligned} ep &\equiv [1/(1-\beta)](\tau_e c_e - \tau_b c_b) \\ &\equiv \alpha[1/(1-\beta)](c_e^{1-\beta} - c_b^{1-\beta}) \\ &\equiv \alpha^{1/\beta}[1/(1-1/\beta)](\tau_e^{1-1/\beta} - \tau_b^{1-1/\beta}), \end{aligned} \qquad (4.5)^{29}$$

where ep is the equity premium over treasury bills; τ_e and τ_b are security turnover for equity and treasury bills respectively. τ_e and τ_b depend generally on transaction costs of the two respective securities, c_e and c_b:

$$\tau_e = \alpha c_e^{-\beta}, \qquad (4.6)$$

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[27] Swan (2005) Equation 44 on p. 23

[28] Swan (2005) Equation 45 on p. 23

and

$$\tau_b = \alpha c_b^{-\beta}, \tag{4.7}$$

with the 'intrinsic' liquidity parameter, α, and the absolute value of the transaction cost elasticity[30], β, treated as a constant.

When the limiting elasticity is equal to unity, as β approaches 1,

$$ep \equiv -[i(\tau_e) - \tau_e c_e] \equiv \alpha \ln(c_e / c_b) \equiv -\alpha \ln(\tau_e / \tau_b). \tag{4.8}$$

When the limiting elasticity is not equal to unity ($\beta \neq 1$), the asset price can be expressed as:

$$P_e^a = D/(r_f + ep) = D/\{r_f + \alpha[1/(1-\beta)](\tau_e c_e - \tau_b c_b)\}. \tag{4.9}$$

Several papers have tried to analyze the price differences between Chinese A-shares and B-shares, but most have concentrated on the differences in risk aversion between domestic and foreign investors. Liquidity is only treated as a minor effect. Ma (1996) includes the liquidity proxy ($\frac{\text{Turnover of A - stock}}{\text{Turnover of B - stock}}$) in his cross-sectional regression, but its t-value is insignificant. Poon, Firth, and Fung (1998) use the liquidity theory of Amihud and Mendelson (1986b) to explain the negative abnormal returns on A-share companies that also offer B-shares, with their proxy of liquidity factor being the change in trading volume. However, the parameter of the liquidity variable is not statistically significant. Chen, Lee and Rui (1999) use both the relative volume (the ratio of trading volume in B-shares to total trading volume) and turnover ratio (the ratio of turnover in B-shares to turnover in A-shares) as proxies of the liquidity, and they find a significant negative relationship between the B-share price

[29] Swan (2005) Equation 47 on p. 29

[30] The transaction cost elasticity measures the sensitivity in turnover rate to changes in transaction costs.

discount and the relative liquidity factors. However, all of these papers fail to provide a theoretical reason for using these liquidity proxies.

4.3. Data

Those companies listed on the two domestic stock exchanges in China, which issue both A-shares and B-shares, are selected in the sample. The data covers the period between 1 March 2000 and 28 February 2001. The intraday data, including bid, ask, and transaction prices, are obtained by SIRCA from the Reuters information system. The final sample includes 39 companies listed on the Shanghai Stock Exchange and 41 companies listed on the Shenzhen Stock Exchange. The B-share prices in Shanghai are denominated in US dollars, while the B-share prices in Shenzhen are denominated in Hong Kong dollars. All the B-share prices are converted back to RMB (local Chinese currency) by using the daily US and Hong Kong dollar exchange rates[31]. The number of shares outstanding, the trading volume and market capitalization for both A-shares and B-shares, and the daily index data of both exchanges during the sample period are also collected. Due to the lack of a developed bond market in China, the one-year bank deposit rate in China is used as the risk-free rate for the domestic Chinese market, and the one-year Treasury bond rate in U.S. is chosen as the risk-free rate for foreign investors.

Table 4-1 lists the 80 companies which issue both A-shares and B-shares on the Shanghai and Shenzhen stock exchanges. It shows the companies' names, the A-shares and B-shares' stock code, and the average price ratios (P_A / P_B) between A-Shares and B-Shares during the sample period. Table 4-1 also shows that the prices of A-shares are normally five to six times higher than the corresponding B-share prices, and these price differences between A-shares and B-shares are even larger than in Bailey's (1994) period. During the data period, the price ratios are relatively stable.

[31] Both exchange rates are collected from Sequence, the Financial Times database.

Table 4-1: A-share and B-share price ratio on the stock exchanges of China
Panel A: Shanghai Stock Exchange

A-share Code	B-share Code	Company Name	No. Obs	Mean	Std	Med
600602	900901	SHANGHAI VACUUM ELECTRON DEVICE	230	3.86	0.68	3.74
600604	900902	SHANGHAI ERFANGJI	231	6.12	1.74	5.45
600611	900903	SHANGHAI DAZHONG	232	3.99	0.81	3.77
600613	900904	SHANGHAI WINGSUNG	218	6.95	2.38	5.73
600612	900905	CHINA FIRST PENCIL	231	6.78	1.55	6.68
600610	900906	CHINA TEXTILE MACHINERY STOCK	220	6.77	1.86	6.00
600614	900907	SHANGHAI RUBBER BELT	214	7.16	2.70	6.00
600618	900908	SHANGHAI CHLOR ALKALI CHEMICAL	228	7.04	2.26	5.88
600623	900909	SHANGHAI TYRE&RUBB	229	6.90	1.97	5.93
600619	900910	SHANGHAI REFRIGERATOR COMPRESSOR	230	6.70	2.22	5.71
600639	900911	SHANGHAI JINQIAO EXPORT ZONE	229	4.91	1.19	4.50
600648	900912	SHANGHAI WAIGAOQIAO FREE TRADE ZONE	232	6.00	0.99	5.68
600617	900913	SHANGHAI LIAN HUA FIBRE CORPN	224	7.39	2.87	6.22
600650	900914	SHANGHAI JIN JIANG TOWER	232	5.91	1.37	5.47
600818	900915	SHANGHAI FOREVER	209	8.26	2.50	7.11
600679	900916	PHOENIX	229	8.71	2.88	7.76
600851	900917	SHANGHAI HAIXIN GROUP	225	4.12	0.90	3.90
600819	900918	SHANGHAI YAOHUA PILKINGTON GLASS	226	6.06	2.79	4.70
600695	900919	SHANGHAI DAJIANG, GROUP STOCK	230	7.04	2.56	6.04
600841	900920	SHANGHAI DIESEL ENGINE	232	6.10	1.29	5.65
600844	900921	SHANGHAI HERO	227	6.15	1.22	5.91
600689	900922	SHANGHAI SANMAO TEXTILE	224	4.62	1.34	4.04
600827	900923	SHANGHAI FRIENDSHIP & OVERSEAS CHINESE	230	6.04	1.32	5.90
600843	900924	SHANGHAI INDUSTRIAL SEWING MACHINE	229	7.43	1.90	7.10
600835	900925	SHANGHAI SHANGLING ELECTRIC APPLIANCES	231	3.54	0.37	3.53
600845	900926	SHANGHAI STEEL TUBES	218	8.65	2.79	7.33
600822	900927	SHANGHAI MATERIAL TRADING CENTRE	230	6.93	1.51	6.62
600848	900928	SHANGHAI AUTOMATION INSTRUMENTATION	231	6.41	1.64	6.17
600680	900930	SHANGHAI POSTS & TELE EQUIPMENT	230	5.68	0.57	5.53
600625	900931	SHANGHAI NARCISSUS ELECTRIC APPLIANCES	41	10.60	0.90	10.36
600663	900932	SHANGHAI LUJIAZUI FINANCE & TRADE ZONE	230	4.74	0.83	4.63
600801	900933	HUAXIN CEMENT	228	5.36	1.40	4.79
600754	900934	SHANGHAI NEW ASIA, GROUP	226	5.11	1.16	4.77
600726	900937	HEILONGJIANG ELECTRIC POWER	225	4.56	0.70	4.58
600751	900938	TIENTSIN MARINE SHIPPING	231	4.99	1.05	4.86
600094	900940	SHANGHAI WORLDBEST	231	4.86	1.55	4.39
600776	900941	EASTERN COMMUNICATIONS	227	3.42	0.21	3.42
600054	900942	HUANGSHAN TOURISM DEVELOPMENT	232	3.65	0.46	3.48
600698	900946	JINAN QINGQI MOTORCYCLES	229	3.63	0.80	3.46
		Average		**5.98**	**1.52**	**5.46**

Panel B: Shenzhen Stock Exchange

A-share Code	B-share Code	Company Name	No. Obs	Mean	Std	Med
000002	200002	CHINA VANKE	223	3.26	0.26	3.21
000003	200003	GINTIAN INDUSTRY, GROUP	216	5.34	0.40	5.38
000011	200011	SHENZHEN PROPERTIES & RESOURCES	214	5.75	0.56	5.82
000012	200012	CHINA SOUTHERN GLASS HOLDING LO.,LTD.	223	8.20	1.37	8.01
000013	200013	SHENZHEN PETROCHEMICAL, HOLDINGS	220	4.94	0.49	4.94
000015	200015	SHENZHEN ZHONGHAO, GROUP	39	7.91	1.00	8.17
000016	200016	KONKA GROUP	221	2.76	0.20	2.74
000017	200017	SHENZHEN CHINA BICYCLES CO, HOLDINGS LTD	206	7.98	1.16	8.09
000018	200018	VICTOR ONWARD TEXTILE INDUSTRIAL	219	6.04	0.73	5.90
000019	200019	SHENZHEN SHENBAO INDUSTRIAL	218	5.12	1.33	4.60
000020	200020	SHENZHEN HUAFA ELECTRONICS	219	6.85	1.03	7.10
000022	200022	SHENZHEN CHIWAN WHARF HOLDINGS LTD	224	4.22	0.31	4.22
000024	200024	CHINA MERCHANTS SHEKOU PORT SERVICE	220	3.39	0.16	3.38
000025	200025	SHENZHEN TELLUS, HOLDINGS	206	6.42	0.67	6.43
000026	200026	SHENZHEN FIYTA HOLDINGS LTD	221	5.11	0.47	5.08
000028	200028	SHENZHEN HEALTH MINERAL WATER	218	7.72	1.16	7.88
000029	200029	SHENZHEN SPECIAL ECONOMIC ZONE PROPERTIES	223	5.33	0.86	5.00
000030	200030	SHENZHEN LIONDA HOLDINGS	211	7.04	1.04	6.70
000037	200037	SHENZHEN NANSHAN POWER STATION	220	4.81	0.47	4.75
000039	200039	CHINA INTERNATIONAL MARINE CONTAINERS	223	3.99	0.34	3.89
000045	200045	SHENZHEN TEXTILE, HOLDINGS	217	5.40	0.82	5.05
000055	200055	SHENZHEN FANGDA INDUSTRY	224	5.07	0.47	4.95
000056	200056	SHENZHEN INTERNATIONAL ENTERPRISE	218	5.36	0.48	5.35
000058	200058	SHENZHEN SEG	221	5.41	1.01	5.17
000413	200413	SHIJIAZHUANG BAOSHI ELECTRONIC GLASS	222	6.02	0.96	5.78
000418	200418	WUXI LITTLE SWAN COMPANY LIMITED	224	3.80	0.23	3.79
000429	200429	GUANGDONG PROVINCIAL EXPRESSWAY	221	4.67	0.77	4.43
000505	200505	HAINAN PEARL RIVER ENTERPRISES HOLDINGS	222	5.07	0.52	4.91
000513	200513	LIVZON PHARMACEUTICAL GROUP INC	225	4.33	0.30	4.35
000521	200521	HEFEI MEILING	223	4.20	0.39	4.16
000530	200530	DALIAN REFRIGERATION	222	4.28	0.20	4.29
000539	200539	GUANGDONG ELECTRIC POWER DEVELOPMENT	223	3.92	0.38	3.88
000541	200541	FOSHAN ELECTRICAL AND LIGHTING	218	2.88	0.16	2.92
000550	200550	JIANGLING MOTORS CORPORATION LTD	190	3.84	0.23	3.83
000553	200553	HUBEI SANONDA	223	5.01	0.36	4.96
000570	200570	CHANGCHAI	224	4.45	0.27	4.47
000581	200581	WEIFU FUEL INJECTION	222	3.61	0.28	3.64
000596	200596	ANHUI GUJING DISTILLERY COMPANY LIMITED	223	5.11	0.59	4.97
000613	200613	HAINAN DADONGHAI TOURISM CENTRE, HOLDING	222	7.75	1.42	7.43
000625	200625	CHONGQING CHANGAN AUTOMOBILE	223	4.20	0.36	4.21
000761	200761	BENGANG STEEL PLATES	223	4.00	0.27	4.02
		Average		**5.14**	**0.60**	**5.07**

The data is from 1 March 2000 to 28 February 2001. The table presents the stock codes of A-shares and B-shares and the company names of firms which issue both shares on the Shanghai or Shenzhen stock exchanges. Summary statistics of the price ratios between A-shares and B-shares are tabulated in the table as well, and the price ratio is calculated as P_A / P_B, where P_A and P_B are the daily close prices of A-shares and B-shares, respectively. The companies listed on the Shanghai Stock Exchange are reported in Panel A, while Panel B presents the firms listed on the Shenzhen Stock Exchange.

In calculating the rates of return on individual stocks, the following adjustments are made due to the cash dividend payoffs, stock dividend payoffs, and the rights issue. The amount of cash dividend per share is added to the share price on the ex-dividend date. When there is a stock dividend payoff on the ex-dividend date t, $r_t = \ln \frac{p_t}{p_{t-1}/(1+Div)}$, where Div is the number of stock dividend payoffs per share. On the ex-rights day, theoretically the share price falls by the intrinsic value of rights. In order to consider the effect of the rights issue in calculating the rate of return, the market price of the share just before the ex-rights day is adjusted as follows: the share price before the ex-rights day is multiplied by the number of rights required to buy one new share, plus the exercise price to buy a new share, and then the result is divided by one plus the number of rights required to buy one new share (Su, 1999). The daily excess returns (or the equity premiums) are calculated as follows:

$$\text{Excess return}_t = \ln\left(\frac{\text{Closing price}_t}{\text{Closing price}_{t-1}}\right) - \frac{\text{Risk-free rate p.a.}}{238}.$$

In Swan's (2005) liquidity asset pricing model, the two most important variables to estimate the equity premium are turnover rate and transaction cost. The daily turnover rates are measured as the number of shares traded each day divided by the total number of tradeable shares outstanding. The overall two-sided transaction cost includes the bid-ask spread, the brokerage fee and the stamp duty. The relative bid-ask spread used here is the time-weighted bid-ask spread over each single trading day. Other transaction costs such as the market impact and opportunity costs have been ignored due to a lack of information. On the other hand, the market impact and opportunity costs have been found to be relatively small in comparison to the bid-ask spread and brokerage fees (however significant) on the market where such data is available (see, e.g. Aitken and Swan, 1995). Transaction costs are calculated using the following formulae:

$$\text{Bid-Ask Spread} = (\text{Ask}_t - \text{Bid}_t)/\left(\frac{\text{Ask}_t + \text{Bid}_t}{2}\right),$$

$$\text{Time - weighted Spreads} = \sum_{t=1}^{n} \frac{\text{BidAsk Spread}_t \times \text{Time}_t}{\text{Time}_t},$$

$$\text{TransactionCost} = \text{Time-weightedSpread} + 2 \times \text{StampDuty} + 2 \times \text{BrokerageFee}.$$

Table 4-2 reports the statistical summary of the individual stock returns, turnover rates and trade costs for the A-shares and B-shares respectively[32]. From Table 4-2, the average daily return of B-shares on the Shanghai Stock Exchange is four times higher than the corresponding A-shares' average return over the sample period, and the average daily return of B-shares on the Shenzhen Stock Exchange is twice as high as the corresponding A-share return. Furthermore, during the sample period, the B-share returns on the Shenzhen Stock Exchange underperformed relative to the B-shares on the Shanghai Stock Exchange. The average turnover rate on the A-share market is 600% per annum, which is four times higher than that of the B-share market, and transaction costs for B-shares are twice as high as those for A-shares. Therefore, the conclusion is that A-shares are more liquid than their corresponding B-shares.

Table 4-2: Daily descriptive statistics

		Return			Turnover			Transaction cost (%)		
		Mean	**Std**	**Med**	**Mean**	**Std**	**Med**	**Mean**	**Std**	**Med**
A-shares	SHSE	0.25	6.20	0.13	6.50	7.29	4.14	1.71	0.09	1.70
	SZSE	0.19	6.34	0.13	5.65	5.81	3.76	1.70	0.05	1.68
B-shares	SHSE	1.01	7.92	0.34	1.71	1.68	1.19	3.27	0.99	2.99
	SZSE	0.47	7.53	0.23	1.00	1.20	0.59	3.54	1.11	3.28

The data is from 1 March 2000 to 28 February 2001. The table presents summary statistics of returns on A-shares and B-shares, trading turnover rates and transaction costs from the firms which issue both A-shares and B-shares on the Shanghai or Shenzhen stock exchanges (All daily returns and daily turnover rates are annualised by multiplying by 238).

4.5. Methodology and Results

The purpose of this chapter is to determine whether Swan's (2005) liquidity asset pricing model has explanatory power for different excess returns and price differences

[32] Daily returns and turnover rates are transferred to annual measurements, by multiplying by 238 (since there are 238 trading days in my one-year sample period).

between A-shares and B-shares in the Chinese equity market, especially when comparing it with the other asset pricing determinable variables.

The basic explanation here for the B-share price discount is due to the liquidity difference between the A-share and B-share markets. Stocks in the A-share market have a higher turnover rate and a lower transaction cost, which implies A-shares are more liquid relative to the corresponding B-shares. Based on the liquidity asset pricing model (Swan, 2005), the more liquid stock requires a lower return, which causes a higher share price level. In this chapter, the basic methodological framework is as follows:

Firstly, in order to use Swan's (2005) liquidity asset pricing model, the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) for the A-share and B-share for each individual company, which issues both, are estimated.

Both the equity premiums and equity turnover rates are estimated simultaneously by using non-linear Ordinary Least Square (OLS). The two simultaneous equations are:

$$ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t} c_{i,t} - \alpha_i c_b^{1-\beta_i}), \tag{4.10}$$

and

$$\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}. \tag{4.11}$$

The first equation is the general equity premium formula, while the second equation is simply the relationship between equity turnover and the transaction costs. Simultaneous estimation would maintain the consistency between the estimations of the equity premium and turnover regressions.

Since the non-linear regression is an iterative procedure, the program requires a starting value to estimate each variable, and then these initial values are adjusted to improve

the fit. Normally the turnover elasticity is close to unity. Therefore, by assuming $\beta = 1$, the intrinsic liquidity coefficient (α) values are estimated by using the following two simultaneous equations. The transaction cost for the bond is assumed to be 0.2% here[33].

$$ep_{i,t} = \alpha_i \ln(\frac{c_{i,t}}{c_b}), \tag{4.12}$$

and

$$\tau_{i,t} = \alpha_i / c_{i,t}. \tag{4.13}$$

Then, in order to estimate the starting values of the turnover/liquidity elasticity (β), the non-linear equity premium formula is simplified to a linear equation, namely $ep_{i,t} = [1/(1-\beta_i)]\tau_{i,t}c_{i,t}$, and $\tau_{i,t}c_{i,t}$ is the amortized spread. The regression of equity premium on the amortized spread is run on each individual stock for all the A-shares and B-shares. The coefficient estimation here is $1/(1-\beta)$, and the estimated values of β are used as the starting value for the turnover/liquidity elasticity (β).

The estimation of the starting values of the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) has been calculated individually for each stock or for all stocks together. Table 4-3 reports the starting values for the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) of Swan's (2005) model. In Table 4-3, the average value of estimations of α for each stock and the estimation of α over all the stocks are reported. The average intrinsic liquidity coefficient (α) is 0.1040 for A-shares and 0.0448 for B-shares, and all the results are significant at 5% level. The preceding α estimation results are used as the starting value for α. The results in Table 4-3 indicate that both the average value of individual βs and the overall β estimation for all stocks are between 0.9 and 1, which coincides with the expectation that β is normally close to 1. Most parameter estimations of β are

[33] A sensitivity test has been conducted, and the results are not sensitive to the assumption of bond transaction costs.

statistically significant. By estimating β over all the stocks, the turnover/liquidity elasticity (β) for A-shares and B-shares is 0.9289 and 0.9663 respectively, with both significant at a 5% level.

Table 4-3: Starting value estimation for Swan's (2005) model α and β

			α	t-Value	AdjRSq 1	AdjRSq 2
A-shares	Mean	SHSE	0.1129	13.67	0.0007	0.0219
		SZSE	0.0955	15.27	-0.0003	0.0125
	All		0.0999	113.78	-0.0001	0.0043
B-shares	Mean	SHSE	0.0561	17.87	-0.0093	0.1143
		SZSE	0.0341	14.03	-0.0013	0.0811
	All		0.0434	117.33	-0.0049	0.0647
			1−1/β	t-Value	AdjRSq	β
A-shares	Mean	SHSE	15.4607	4.56	0.0899	0.9138
		SZSE	16.2552	3.79	0.0648	0.9260
	All		14.0564	37.55	0.0712	0.9289
B-shares	Mean	SHSE	29.8357	2.50	0.0273	0.9552
		SZSE	62.1371	2.95	0.0418	0.9765
	All		29.6881	25.09	0.0348	0.9663

The table reports regression results for the sample of 80 companies, which issue both A-shares and B-shares on the Shanghai or Shenzhen Stock Exchange, from 1 March 2000 to 28 February 2001, estimating two simultaneous equations: Equation 4.12 $ep_{i,t} = \alpha_i \ln(c_{i,t} / c_b)$ and Equation 4.13 $\tau_{i,t} = \alpha_i / c_{i,t}$ for the equity premium and the stock turnover rate respectively, and estimating results of equity premiums on amortized spreads, $ep_{i,t} = [1/(1-\beta_i)]\tau_{i,t}c_{i,t}$. The estimated values of α and β are used as the starting value for the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) in the later regressions. The AdjRSq1 is the adjusted R-square of Equation 4.12, and the AdjRSq2 is the adjusted R-square of Equation 4.13. The transaction cost for the bond is assumed to be 0.2%.

The financial literature suggests that rational investors normally hold a diversified market portfolio across all the stocks. When estimating the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β), one identical β across all stocks is assumed. On the other hand, investors who hold the same individual stock are treated as a clientele group with specific β. Both methods have been used, and the results are reported in Table 4-4.

When setting β to be identical across all A-shares and all B-shares, the turnover/liquidity elasticity (β) for A-shares is 0.9340 (t-value 574.94), and for B-shares is 0.9708 (t-value 892.19), with both t-values extremely significant. For the

individual intrinsic liquidity coefficient (α), only one B-share provides an insignificant result. This implies that the model fits quite well with the simultaneous estimation. When setting the different α and β across individual stocks, for A-shares, 77 out of 80 results of intrinsic liquidity coefficients (α) and the turnover/liquidity elasticity (β) are both significant, and for B-shares, 78 out of 80 results of α and β are significant. A t-test has been done to compare the individual β results with the identical result, and it shows there is no statistically significant difference between them. When setting the identical β across all stocks, the R-square for estimation of the equity premium is 7.27% for A-shares and 3.28% for B-shares, and the R-square for estimation of turnover is 9.43% for A-shares and 17.59% for B-shares. When setting the different β across all stocks, the average R-square for estimation of the equity premium is 7.27% for A-shares and 3.26% for B-shares, and the average R-square for estimation of turnover is 0.41% for A-shares and 3.46% for B-shares. Since the identical β setting provides the highest R-square, the identical results are used in the following test when calculating the equity premium specification.

Table 4-4: Swan (2005) model's α & β estimation

		α	t-Value	β	t-Value	AdjRSq 1	AdjRSq 2
				One identical β			
A-shares		0.1358	13.77	0.9340	547.94	0.0727	0.0943
B-shares		0.0366	10.65	0.9708	892.19	0.0328	0.1759
				Different β			
A-shares	Mean	0.1383	10.13	0.9334	72.45	0.0796	0.0136
	All	0.1336	86.81	0.9289	490.75	0.0712	0.0041
B-shares	Mean	0.0376	9.94	0.9714	159.14	0.0369	0.0266
	All	0.0375	84.63	0.9675	780.99	0.0326	0.0346

The table reports regression results for a sample of 80 companies, which issue both A-shares and B-shares on the Shanghai or Shenzhen Stock Exchange, from 1 March 2000 to 28 February 2001, estimating two simultaneous equations: Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ for the equity premium and the stock turnover rate, respectively. One identical β is assumed, and a different β for each individual stock is also assumed. The AdjRSq1 is the adjusted R-square of Equation 4.10, and the AdjRSq2 is the adjusted R-square of Equation 4.11. The transaction cost for the bond is assumed to be 0.2%, and all the starting values of alpha and beta are generated from Table 4-3.

After estimating the intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) for each individual A-share and B-share, the average turnover rate and transaction cost for each individual stock during the whole sample period, between 1 March 2000 and 28 February 2001, are used to estimate the corresponding equity premium specification by using the liquidity asset pricing model:

$$ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right). \tag{4.14}$$

Some other return factors are also estimated. The CAPM betas for each individual stock are estimated from daily returns based on the closing price, the daily market interest rate and the daily return on the market index by using the Equation 4.15.

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}. \tag{4.15}$$

The CAPM beta for each individual stock is estimated over the whole data period, and most CAPM beta estimations are significant. Average estimated CAPM betas of both A-shares and B-shares are close to 1.0.

Another important return factor included is the informativeness of the stock. Following Tighe and Michener's (1994) theoretical model, a regression of the absolute value of the price difference between the opening and closing price for each trading day is run on the daily order flow, which is measured by stock turnover rate. The coefficient of regression for each stock summarizes the informativeness of order flow[34]. This regression is undertaken for every stock during the whole data period, and most of the coefficients provide significant results.

In order to compare the explanatory power of the equity premium specification from Swan's (2005) endogenous liquidity asset pricing model with other return factor variables, an in-sample cross-sectional regression is run over the whole sample period

[34] This measure is related to Kyle's (1985) Lambda (λ) which links stock price to signed order flow.

from 1 March 2000 to 28 February 2001. The market capitalisation and market-to-book ratio are fixed at the beginning of the period (1 March 2000), and the coefficients of variation of the turnover rate on each stock are also included. For these cross-sectional regression tests, the generalized method of moments (GMM) is used, which allows autocorrelation and conditional heteroskedasticity in the disturbance term (Hansen, 1982; Hansen and Singleton, 1982).

In Panel A of Table 4-5, the in-sample cross-sectional regression results of the average equity premium of A-shares on all explanatory variables are reported. The equity premium specification from Swan's (2005) endogenous liquidity asset pricing model has a significantly positive relationship with the observed average excess return or the equity premium with a t-value of 8.09, and the adjusted R-square for this regression is 37.46%. In the regression of equity premium on Fama and French's three-factors, the firm size provides the expected significant negative result as in Fama and French (1992). However, the results of CAPM beta and the market-to-book ratio are both insignificant, and the sign of CAPM beta is negative, which is contrary to its theoretical expectation but consistent with Datar, Naik, and Radcliffe (1998). After including all the explanatory variables in the regression, the equity premium specification provides the only significant coefficient (t-value 5.13), and the coefficients of all the other independent variables are insignificant. Although firm size still provides a negative sign, it becomes insignificant. The firm size is highly positive correlated with the liquidity, and the implication here is the liquidity specification has fully captured the size effect on the equity premium.

Panel B of Table 4-5 provides the results of the in-sample cross-sectional regression on B-shares. The equity premium specification also provides a significant positive coefficient with a t-value of 27.03, and the adjusted R-square is 90.68%. After including all the explanatory variables in the regression, the adjusted R-square only increases by 2%. Except for the equity premium specification, the coefficient of CAPM beta is significant with a t-value of 2.49, and the coefficient of turnover variation is also significant with a t-value of -3.04.

The results of Table 4-5 indicate that Swan's (2005) endogenous liquidity asset pricing model has a fairly high explanatory power for the equity premium on both A-share and B-share markets. The firm size effect reported by Fama and French disappears when the model includes a proxy for liquidity, suggesting that the Fama and French interpretation of firm size really reflects the impact of liquidity on stock returns.

Table 4-5: Estimation of the relationship between the equity premium of A-shares and B-shares vs. Swan's (2005) equity premium specification, and other asset pricing factors
Panel A: A-shares

Model	Intercept	Forecasted EP	CAPM β	Log-Size	M/B	Lamda	Coeff Var Turnover	AdjRSq
1	-0.2998	2.4872						0.3746
	(-4.00)	**(8.09)**						
2	2.435		-0.2275	-0.1743	-0.0050			0.2524
	(-6.03)		(-1.45)	**(-4.18)**	(-1.73)			
3	0.5354					-0.1289	-0.2744	0.0101
	(-2.23)					(-0.28)	(-1.57)	
4	-0.6978	2.9658	-0.1682	0.0291	-0.0048	0.6613	0.0091	0.4220
	(-0.93)	**(5.13)**	(-1.39)	(-0.50)	(-1.22)	(-1.94)	-0.06	

Panel B: B-shares

Model	Intercept	Forecasted EP	CAPM β	Log-Size	M/B	Lamda	Coeff Var Turnover	AdjRSq
1	-0.0036	1.3462						0.9068
	(-0.12)	**(27.03)**						
2	4.6474		0.7042	-0.4144	-0.0147			0.6109
	(6.65)		**(4.13)**	**(-7.72)**	(-0.51)			
3	1.7996					-0.2721	-0.6442	0.3233
	(7.15)					**(-3.70)**	**(-3.91)**	
4	-0.6255	1.3695	0.2010	0.0612	-0.0211	-0.0179	-0.2045	0.9277
	(-1.64)	**(16.68)**	**(2.49)**	(1.99)	(-1.84)	(-1.19)	**(-3.04)**	

The table reports the results of in-sample cross-sectional regressions of equity premiums of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are average equity premiums of A-shares and B-shares over the sample period from 1 March 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 March 2000 to 28 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 28 February 2001, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the A-share equity premium results

Table 4-5 (Continued) are reported, while Panel B presents the results for the B-shares. The transaction cost for the bond is assumed to be 0.2%.

In order to test the robustness of the preceding results and to rank the effect of the explanatory variables, a forward-selection test is done on the in-sample cross-sectional regressions of equity premiums of A-shares and B-shares on all the explanatory variables. The forward-selection method of calculation starts with no variable in the model. When including each of the independent variables, F statistics are calculated. The p-values of these F statistics show the way in which the variable contributes to the model, and they are arbitrarily compared to 0.50. The selection process continues till the significance level of no F statistic is greater than 0.50. Otherwise, the model includes the variable with the largest F statistic. F statistics are calculated again for the variables still not included in the model, and variables are then added to the model in turn, repeating the process until no remaining variable produces a significant F statistic. A variable would be kept in the model, once it is included. (For details, see e.g. Hocking, 1976; Judge, Griffiths, Hill, and Lee, 1980)

The results of the forward-selection test are reported in Table 4-6. The equity premium specifications from the liquidity asset pricing model are ranked as number one explanatory variables on both A-share and B-share markets, with a partial R-square of 38.25% and 90.80% respectively, which are much larger than the other variables. The second important variable on A-shares is Lambda, which is another trade-related variable.

The price ratio of A-shares to B-shares is defined as the ratio of contemporaneous B-share and A-share prices of the same firm. Depending on the liquidity asset pricing model (Swan, 2005), the share price is expressed as:

$$P_{i,t} = D_{i,t} / \{ r_f + \alpha_i^{1/\beta_i} \left[1/(1 - \beta_i) \right] \left(\tau_{i,t}^{1-1/\beta_{i,t}} - \alpha_i^{1-1/\beta_i} \; c_b^{1-\beta_i} \right) \}. \qquad (4.16)$$

Table 4-6: Forward-selection test on estimation of the relationship between the equity premium of A-shares and B-shares vs. Swan's (2005) equity premium specification, and other asset pricing factors

Panel A: A-shares

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	-0.3291	0.2174	2.29	0.13	
1	Forecasted EP	2.7402	0.3966	47.75	<.0001	0.3825
2	Lamda	0.6631	0.2917	5.17	0.03	0.0553
3	CAPM β	-0.1580	0.1169	1.83	0.18	0.0131
4	M/B	-0.0046	0.0034	1.82	0.18	0.0130

Panel B: B-shares

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	-0.6255	0.4194	2.22	0.14	
1	Forecasted EP	1.3695	0.0845	262.59	<.0001	0.9080
2	CAPM β	0.2010	0.0867	5.38	0.02	0.0130
3	Coeff Var Turnover	-0.2045	0.0773	7.00	0.01	0.0069
4	Log-Size	0.0612	0.0329	3.45	0.07	0.0024
5	M/B	-0.0211	0.0133	2.52	0.12	0.0020
6	Lamda	-0.0179	0.0189	0.90	0.35	0.0008

The table reports the ranking results of a forward-selection process in an in-sample cross-sectional regression of equity premiums of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average equity premiums of A-shares and B-shares over the sample period from 1 March 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 March 2000 to 28 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 28 February 2001, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the A-share equity premium results are reported, while Panel B presents the results for the B-shares. The transaction cost for the bond is assumed to be 0.2%.

We can conclude that the price ratio of A-shares to B-shares should be positively related to the B-share equity premium, and negatively related to the A-share equity premium, since both A-shares and B-shares have the same dividend payments. They, in turn, can cancel each other out. The strength of the relationship between the price ratio and equity premium specifications on A-shares and B-shares, and the strength of the relationship between price ratio and other explanatory variables is compared.

The cross-sectional regression results of the average individual price ratio are reported in Panel A of Table 4-7. The regression, which only includes the equity premium specifications, provides a positive and significant coefficient on B-share equity premium specifications, which is consistent with our expectation. However, the parameter estimator of the A-share equity premium specification has positive and nearly significant results as well, and seems to be contrary to expectations. The adjusted R-square for this regression is 59.63%. After including all the explanatory variables in the regression, the adjusted R-square increases to 68.82%, and the firm size provides the only significant result at the 5% level. The results indicate that there is a firm size effect on the price discount for the B-share price.

A further robust test by using the forward-selection process is completed, and the results are reported in Panel B of Table 4-7. Consistent with the Panel A result, the number one explanatory variable is firm size, which has a 60.92% partial R-square. The equity premium specifications of A-shares and B-shares are ranked at two and five respectively.

The daily price ratio change is defined as

$$d(P_t^A / P_t^B) = \ln[(P_t^A / P_t^B)/(P_{t-1}^A / P_{t-1}^B)] = r_t^A - r_t^B . \qquad (4.17)$$

A positive relationship between the change in price ratio and the equity premium of A-shares, and a negative relationship between the change in price ratio and the equity premium of B-shares is expected. An in-sample cross-sectional regression of the average individual price ratio change on all the explanatory variables is completed, and the results are presented in Table 4-8. The results show that the coefficient of the equity premium specification on A-shares and B-shares both have the expected sign, but only the coefficient of the equity premium specification on B-shares provides a significant t-value. In the forward-selection test, the equity premium specifications of A-shares and B-shares are ranked at numbers three and one. The coefficient of variation in the turnover of B-shares also indicates its importance.

Table 4-7: Estimation of the relationship between the price ratio of A-shares to B-shares vs. Swan's (2005) equity premium specifications, and other asset pricing factors

Panel A: Regression

Model	Intercept	Fc EP_A	Fc EP_B	CAPM β_A	CAPM β_B	Log-Size	M/B_A	M/B_B	Lamda_A	Lamda_B	Coeff var t_A	Coeff var t_B	AdjRSq
1	3.2128	5.7704	2.3224										0.5963
	(8.22)	**(1.94)**	**(3.90)**										
2	21.3696			-1.1149	0.1573	-1.3293	0.0630	-0.2657					0.6452
	(8.37)			**(-2.13)**	(0.29)	**(-6.25)**	(0.86)	(-0.59)					
3	9.3632								-1.1482	-0.5615	-0.9652	-1.4490	0.1447
	(5.32)								(-0.55)	**(-2.13)**	(-1.31)	(-1.57)	
4	13.5951	3.7161	1.1208	-0.6381	-0.7020	-0.7704	0.0854	-0.4531	1.9854	-0.0054	0.6144	-0.5828	0.6882
	(3.35)	(1.23)	(1.59)	(-1.61)	(-0.96)	**(-2.92)**	(1.19)	(-1.07)	(1.67)	(-0.04)	(1.13)	(-1.09)	

Panel B: Forward-selection test

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	13.5915	3.2654	17.33	<.0001	
1	Log-Size	-0.7710	0.2481	9.66	0.00	0.6091
2	Fc EP_B	1.1309	0.6164	3.37	0.07	0.0408
3	CAPM β_A	-0.6394	0.4519	2.00	0.16	0.0281
4	M/B_A	0.0850	0.0394	4.65	0.03	0.0214
5	Fc EP_A	3.7034	2.5033	2.19	0.14	0.0062
6	Lamda_A	1.9771	1.0292	3.69	0.06	0.0118
7	M/B_B	-0.4503	0.2952	2.33	0.13	0.0052
8	Coeff var t_B	-0.5799	0.5267	1.21	0.27	0.0040
9	Coeff var t_A	0.6132	0.5760	1.13	0.29	0.0020
10	CAPM β_B	-0.7012	0.7870	0.79	0.38	0.0031

The table reports the results of in-sample cross-sectional regressions of price ratios of A-shares to B-shares on all the explanatory variables. The dependent variables of the regressions are the average price ratios of A-shares to B-shares over the sample period from 1 March 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan's (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares

Table 4-7 (Continued) and B-shares are the average ones during the sample period from 1 March 2000 to 28 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 28 February 2001, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the regression results are reported, while Panel B presents the results of forward-selection of the regression. The transaction cost for the bond is assumed to be 0.2%.

Table 4-8: Estimation of the relationship between the price ratio change of A-shares and B-shares vs. Swan's (2005) equity premium specifications, and other asset pricing factors

Panel A: Regression

Model	Intercept	Fc EP_A	Fc EP_B	CAPM β_A	CAPM β_B	Log-Size	M/B_A	M/B_B	Lamda_A	Lamda_B	Coeff var t_A	Coeff var t_B	AdjRSq
1	-0.0005	0.0051	-0.0051										0.5012
	(-0.72)	(1.35)	**(-7.42)**										
2	-0.0133			0.0002	-0.0017	0.0011	0.0000	0.0003					0.2631
	(-2.14)			(0.33)	(-1.09)	**(2.39)**	(-0.51)	(0.40)					
3	-0.0087								0.0034	0.0005	0.0015	0.0030	0.1860
	(-3.25)								**-2.58**	(1.98)	(0.85)	**(2.38)**	
4	-0.0013	0.0071	-0.0058	-0.0002	0.0006	-0.0002	0.0000	0.0001	0.0025	-0.0002	0.0008	0.0017	0.4942
	(-0.24)	(1.56)	**(-3.78)**	(-0.27)	(0.46)	(-0.55)	(-0.30)	(0.23)	(1.33)	(-1.55)	(0.61)	(1.39)	

Panel B: Forward-selection test

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	-0.0038	0.0017	5.10	0.03	
1	Fc EP_B	-0.0053	0.0008	41.12	<.0001	0.4971
2	Coeff var t_B	0.0015	0.0008	3.66	0.06	0.0232
3	Fc EP_A	0.0073	0.0034	4.59	0.04	0.0126
4	Lamda_A	0.0026	0.0016	2.65	0.11	0.0118
5	Coeff var t_A	0.0009	0.0008	1.32	0.25	0.0079
6	Lamda_B	-0.0002	0.0002	1.22	0.27	0.0073

Table 4-8 (Continued) The table reports the results of in-sample cross-sectional regressions of price ratio changes of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average price ratio changes of A-shares and B-shares over the sample period from 1 March 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 March 2000 to 28 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 28 February 2001, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the regression results are reported, while Panel B presents the results of forward-selection of the regression. The transaction cost for the bond is assumed to be 0.2%.

In order to further test the robustness of the results, the full data are equally divided into two half-year samples. The intrinsic liquidity coefficient (α) and the turnover/liquidity elasticity (β) of the liquidity asset pricing model for the individual A-shares and B-shares are re-estimated by using only the first half-year sample from 1 March 2000 to 31 August 2000. The average turnover and trade cost from the second part of the sample from 1 September to 28 February 2001 are used to calculate Swan's (2005) equity premium specification. All the other explanatory variables are also re-estimated by using only the data from the first half-year sample between 1 March 2000 and 31 August 2000. The CAPM betas, the informativenesses of stock, and the variations in turnover rates are estimated over the sample period from 1 March 2000 to 31 August 2000, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. All the cross-sectional regressions are re-estimated, and the results are presented on the following tables:

Table 4-9: Robust test on estimating the relationship between the equity premium of A-shares and B-shares vs. Swan's (2005) equity premium specification, and other asset pricing factors
Panel A: A-shares

Model	Intercept	Forecasted EP	CAPM β	Log-Size	M/B	Lamda	Coeff Var Turnover	AdjRSq
1	0.0375	0.2225						0.1288
	(0.76)	**(4.13)**						
2	1.8442		-0.0615	-0.1637	-0.0017			0.1479
	(2.69)		(-0.57)	**(-2.92)**	(-0.64)			
3	0.0196					-0.5617	0.0528	0.0230
	(0.09)					(-1.92)	(0.29)	
4	1.5489	0.1787	-0.0099	-0.138	-0.0021	-0.227	0.1034	0.2237
	(2.29)	**(3.64)**	(-0.10)	**(-2.52)**	(-0.69)	(-0.92)	(0.68)	

Panel B: B-shares

Model	Intercept	Forecasted EP	CAPM β	Log-Size	M/B	Lamda	Coeff Var Turnover	AdjRSq
1	0.2663	0.4241						0.5633
	(9.66)	**(12.57)**						
2	2.0775		0.6194	-0.2125	-0.0003			0.3414
	(3.01)		**(3.45)**	**(-4.07)**	(-0.01)			
3	0.2867					-0.0208	0.0520	-0.0195
	(0.91)					(-0.8)	(0.18)	
4	1.5406	0.3548	0.3308	-0.1128	0.0138	-0.0091	-0.3059	0.6287
	(2.46)	**(8.20)**	**(1.88)**	**(-2.30)**	(0.64)	(-0.37)	**(-2.56)**	

The table reports the results of out-of-sample cross-sectional regressions of equity premiums of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average equity premiums of A-shares and B-shares over the sample period from 1 September 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 September 2000 to 31 February 2001. The parameters of Swan (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression over the sample period from 1 March 2000 to 31 August 2000. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 31 August 2000, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the A-share equity premium results are reported, while Panel B presents the results for the B-shares. The transaction cost for the bond is assumed to be 0.2%.

Table 4-10: Robust test on estimating the relationship between the equity premium of A-shares and B-shares vs. Swan's (2005) equity premium specification, and other asset pricing factors by using a forward-selection process

Panel A: A-shares

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	1.6369	0.4525	13.08	0.00	
1	Log-Size	-0.1386	0.0415	11.15	0.00	0.1752
2	Forecasted EP	0.1820	0.0597	9.28	0.00	0.0959
3	Lamda	-0.2327	0.2680	0.75	0.39	0.0074

Panel B: B-shares

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	1.5133	0.4555	9.99	0.00	
1	Forecasted EP	0.3509	2.7454	60.23	<.0001	0.5690
2	Log-Size	-0.1112	0.4704	10.32	0.00	0.0475
3	CAPM β	0.3114	0.1857	4.07	0.05	0.0215
4	Coeff var turnover	-0.2787	0.1612	3.54	0.06	0.0167

The table reports the ranking results of a forward-selection process in an out-of-sample cross-sectional regression of equity premiums of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average equity premiums of A-shares and B-shares over the sample period from 1 September 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 September 2000 to 31 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression over the sample period from 1 March 2000 to 31 August 2000. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 31 August 2000, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the A-share equity premium results are reported, while Panel B presents the results for the B-shares. The transaction cost for the bond is assumed to be 0.2%.

Table 4-11: Robust test on estimating the relationship between the price ratio of A-shares and B-shares vs. Swan's (2005) equity premium specifications, and other asset pricing factors

Panel A: Regression

Model	Intercept	Fc EP_A	Fc EP_B	CAPM β_A	CAPM β_B	Log-Size	M/B_A	M/B_B	Lamda_A	Lamda_B	Coeff var t_A	Coeff var t_B	AdjRSq
1	5.272	-0.1839	0.8121										0.0864
	(23.28)	(-0.63)	**(2.85)**										
2	21.35			-0.0711	-0.3713	-1.3791	0.0835	-0.43033					0.6167
	(8.08)			(-0.19)	(-0.50)	**(-6.36)**	(1.10)	(-0.89)					
3	7.2503								-1.8507	-0.1860	-0.2408	-0.6610	-0.0004
	(3.56)								(-0.98)	(-1.10)	(-0.25)	(-0.58)	
4	20.5575	-0.1514	0.0575	0.3387	-0.4433	-1.3666	0.0870	-0.5145	1.2221	-0.0205	0.7350	-0.7112	0.5746
	(6.81)	(-0.83)	(0.23)	(0.94)	(-0.54)	**(-6.01)**	(1.18)	(-1.13)	(1.06)	(-0.25)	(1.15)	(-1.24)	

Panel B: Forward-selection test

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	20.8678	2.1779	91.81	<.0001	
1	Log-Size	-1.3947	0.1676	69.23	<.0001	0.5918
2	M/B_A	0.0720	0.0401	3.22	0.08	0.0126
3	Lamda_A	1.0383	0.9107	1.30	0.26	0.0072
4	M/B_B	-0.3834	0.2860	1.80	0.18	0.0068
5	Coeff var t_B	-0.6282	0.6544	0.92	0.34	0.0063
6	Coeff var t_A	0.5476	0.6035	0.82	0.37	0.0041
7	Fc EP_A	-0.1489	0.2000	0.55	0.46	0.0029

The table reports the results of out-of-sample cross-sectional regressions of price ratios of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average price ratios of A-shares and B-shares over the sample period from 1 September 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 September 2000 to 31 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression over the sample period from 1 March 2000 Table 4-11 (Continued) to 31 August 2000. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over

Table 4-11 (Continued) the sample period from 1 March 2000 to 31 August 2000, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the regression results are reported, while Panel B presents the results of a forward-selection of the regression. The transaction cost for the bond is assumed to be 0.2%.

Table 4-12: Robust test on estimating the relationship between the price ratio change of A-shares and B-shares vs. Swan's (2005) equity premium specifications, and other asset pricing factors

Panel A: Regression

Model	Intercept	Fc EP_A	Fc EP_B	CAPM β_A	CAPM β_B	Log-Size	M/B_A	M/B_B	Lamda_A	Lamda_B	Coeff var t_A	Coeff var t_B	AdjRSq
1	-0.0016	0.0002	-0.0016										0.3611
	(-6.51)	(0.67)	**(-6.40)**										
2	-0.0152			0.0007	-0.0002	0.0011	-0.0001	0.0004					0.2489
	(-2.48)			(1.02)	(-0.12)	**(2.57)**	(-0.64)	(0.50)					
3	-0.0042								0.0032	0.0001	0.0011	0.0002	0.0015
	(-1.52)								**(2.23)**	(0.49)	(0.52)	(0.19)	
4	-0.0072	0.0002	-0.0011	0.0004	-0.0003	0.0004	-0.0001	0.0007	0.0012	0.0000	-0.0008	0.0012	0.4481
	(-1.98)	(0.70)	**(-3.89)**	(0.72)	(-0.29)	(1.58)	(-1.25)	(1.11)	(1.00)	(-0.25)	(-1.02)	(0.88)	

Panel B. Forward-selection test

Rank	Variable	Estimate	Std Err	F Value	Prob F	Partial RSq
	Intercept	-0.0067	0.0027	6.14	0.02	
1	Fc EP_B	-0.0012	0.0003	21.82	<.0001	0.3724
2	Log-Size	0.0004	0.0002	3.25	0.08	0.0713
3	Coeff var t_B	0.0013	0.0008	2.46	0.12	0.0130
4	M/B_A	-0.0001	0.0000	6.16	0.02	0.0117
5	M/B_B	0.0008	0.0004	5.05	0.03	0.0313
6	Coeff var t_A	-0.0009	0.0007	1.56	0.22	0.0133
7	Lamda_A	0.0010	0.0011	0.80	0.37	0.0047
8	Fc EP_A	0.0002	0.0003	0.79	0.38	0.0054

Table 4-12 (Continued) The table reports the results of out-of-sample cross-sectional regressions of price ratio changes of A-shares and B-shares on all the explanatory variables. The dependent variables of the regressions are the average price ratio changes of A-shares and B-shares over the sample period from 1 September 2000 to 28 February 2001. These explanatory variables are Swan's (2005) equity premium specification, the Fama and French (1993) return factors, the informativeness of stock, and the variation in turnover rate. The Swan (2005) equity premium specification is estimated by using Equation 4.14 $ep_{i,t} = \alpha_i^{1/\beta_i}\left[1/(1-\beta_i)\right]\left(\tau_{i,t}c_{i,t} - \alpha_i^{1-1/\beta_i}c_b^{1-\beta_i}\right)$. Turnover rates and transaction costs of A-shares and B-shares are the average ones during the sample period from 1 September 2000 to 31 February 2001. The parameters of Swan's (2005) liquidity asset pricing model, α and β, are using Equation 4.10 $ep_{i,t} = [1/(1-\beta_i)](\tau_{i,t}c_{i,t} - \alpha_i c_b^{1-\beta_i})$ and Equation 4.11 $\tau_{i,t} = \alpha_i c_{i,t}^{-\beta_i}$ in a simultaneous non-linear regression over the sample period from 1 March 2000 to 31 August 2000. The CAPM betas, informativenesses of stock, and variations in turnover rates are estimated over the sample period from 1 March 2000 to 31 August 2000, and the firm size and book-to-market ratio are fixed at the beginning of the sample period. In Panel A, the regression results are reported, while Panel B presents the results of the forward-selection of the regression. The transaction cost for the bond is assumed to be 0.2%.

The preceding tables (Table 4-9, Table 4-10, Table 4-11, and Table 4-12) show that the results of the robust test are consistent with in-sample tests using the data from 1 March 2000 to 28 February, and, as expected, the R-square is lower than the in-sample test.

4.5. Conclusion

Economic reform in China has provided an opportunity for foreign investors to purchase local Chinese stocks in recent years. The foreign share discount found in China is unlike foreign share premiums reported in other studies on market pricing in Canada, Sweden, Finland, Switzerland, and Thailand, which have found that foreign designated shares typically trade at a premium relative to local shares. Another observed phenomenon is the huge difference in liquidity between these two segmented markets.

In this chapter, an endogenous liquidity asset pricing model (Swan, 2005) is used to explain the equity premium on both the A-share and B-share markets in China. In this model, liquidity is proxied by the security turnover rate. Liquidity is incorporated into the investors' utility function, and the equity premium is a function of the difference between the amortized spread for equity and the amortized spread for Treasury bills deflated by one minus the turnover/liquidity elasticity, which depends on

the responsiveness of turnover to transaction costs. The empirical results are consistent with this implication. The explanatory power of the liquidity model is compared with alternative asset pricing factors proposed in previous research. On the cross-sectional regression, the endogenous liquidity asset pricing specification of the equity premium is the most important significant explanatory variable used to explain the observed equity premium on both the A-share and B-share market, which provides an R-square of 37.46% and 90.68% respectively. These R-squares are higher than those usually generated from asset pricing estimation. The model also holds consistently during the whole data period. The firm size effect present in the Fama and French series of papers has been subsumed by the liquidity model. At the same time, the hypothesis that there is a negative relationship between the trading activity and transaction cost in the securities market is also supported in the study.

In this study, the basic hypothesis is that the price discount of B-shares is due to the liquidity difference between the A-share and B-share markets. When explaining the price ratio between these two markets, although the equity premium specifications of A-shares and B-shares provide significant coefficients, the sign of the coefficient of A-share equity premium specifications is contrary to the hypothesis. The firm size dominates all the other explanatory variables. However, the model explains the change in the price ratio, which is unsurprising since the change in price ratio is just the difference in returns between the two markets. In the price equation, the expected growth rate of the company is assumed as zero. However, as suggested by Sun and Tong (2000), the difference in expectation of firms' growth rates between domestic Chinese investors and foreign investors, is one of the possible explanations of the price discount on the B-share market. If foreign investors were more pessimistic than Chinese investors about Chinese firms, they would pay a lower price than Chinese investors would. However, this also indicates the difficulty in testing the hypothesis.

The implication of the study is that securities markets offer a return premium as compensation to investors for any negative aspects of illiquidity resulting from transaction costs. However, the contemporaneous turnover and trade cost have been

used in this study. Based on the liquidity asset pricing model, the volatility of returns is a natural result both of the trading process and of the demand for liquidity, and it would be closely related to both the volatility and the extent of turnover demand. Therefore, turnover is as volatile as the stock return. To be able to use the liquidity asset pricing model to forecast the future excess return, a better method needs to be found to forecast turnover. The analysis does not illustrate explicitly the reason for the different turnover/liquidity elasticity (β) between stocks. In the following chapter, bid-ask spread, one of the important portions of the transaction cost, on the A-share, B-share and H-share markets is further analyzed.

Recently, the Chinese government has decreased trading costs and improved market transparency. These regulatory changes will further reduce the transaction cost on both A-share and B-share markets, and improve the share price while decreasing the capital cost in China. In this chapter, the one-year period of intra-day data is relatively short for the asset pricing test. A natural extension would be to use a longer data period to re-do the test. Perhaps after a few years of further reform and development in China, researchers will be in a better position to measure these changes and be able to examine their possible impact on the B-share discount phenomenon in a more direct way and with greater success. Future research in this area is needed.

CHAPTER 5

Decomposing the Bid-Ask Spread on a Segmented Equity Market

5.1. Introduction

Over the last decade, as a result of the improvements in information technology and deregulations in financial markets, more exchanges, especially those in emerging markets, have implemented an order-driven mechanism. However, most of the previous academic research has predominantly concentrated on the quote-driven (or the hybrid quote-driven) markets such as NYSE, AMEX and NASDAQ. Only a few studies have been devoted to empirically examining the decomposition of the bid-ask spread in an order-driven market[35], and even less study has been done to compare the components of the spread in a segmented emerging market.

In China, some companies issue two classes of tradable shares, A-shares to domestic investors, and B-shares to foreign investors, and these shares are traded on one of the two domestic stock exchanges in Shanghai and Shenzhen. Some other Chinese companies issue A-shares on the Shanghai or Shenzhen Stock Exchange and issue H-shares on the Stock Exchange of Hong Kong[36]. This segmented mechanism allows international investors to directly invest in the equity markets in China, and also constrains their influence on the listed Chinese companies and the domestic equity market. Contrary to other segmented markets, both B-shares and H-shares are traded at a discount compared to their corresponding A-shares. In the preceding chapter, a liquidity asset pricing model was used to explain the price differences between A-

[35] Brockman and Chung (1999) study the bid-ask spread on the Hong Kong Exchange. DeJong, Nijman, and Roell (1996) investigate the bid-ask component on the Paris Bourse. Ahn, Cai, Hamao and Ho (2002) and (2005) examine the Tokyo Stock Exchange.

[36] Until now, no firm in China has been allowed to issue A-shares, B-shares, and H-shares at the same time.

shares and B-shares. The bid-ask spread, which is a substantial portion of the total transaction costs faced by investors in a financial market, is inversely related to the liquidity. After estimating the components of bid-ask spread, a comparison of the bid-ask spread and its components has been conducted cross-sectionally among different investor groups and different trading locations. Furthermore, in February 2001, the Chinese government started to allow domestic investors with foreign currency to invest in the B-share market. As a result, the bid-ask spread on the B-share market decreased significantly, and trading volume increased dramatically. This event provides a unique opportunity to examine the change of trading activities, the bid-ask spread, and its components on both A-share, B-share and H-share markets as a result of the decreased level of market segmentation. Furthermore, several time-series and cross-sectional regression analyses have been conducted to examine the behaviour of bid-ask spread and its components, in order to determine whether they vary not only before and after the opening of the B-share market, but also across different investors groups. These analyses have been conducted after controlling for trading activities, risk of security returns, firm size and other factors which may have influence on the spread and its components. By investigating components of the bid-ask spread and their determinants, it may be possible in this study to gain further insight into the variables underlying the costs of liquidity, the cost of capital, and the value of the firm. In this chapter, I extend my previous research to include the decomposition of the bid-ask spread and also to compare cross-sectionally the components of the spread among Chinese A-shares, B-shares, and H-shares, and to compare the change of spread components in a time-series manner after the opening of the B-share market to domestic investors. Here, I am able to provide some new evidence of the information asymmetry among the segmented markets in China and to offer some new insights into market segmentation. This study may improve our knowledge of why execution costs vary across markets and stocks. The findings of such research are useful to a wide range of market participants, such as corporate managers, traders, securities exchanges, and securities regulators.

The Chinese stock exchanges provide an ideal setting to analyse an order-driven process. The exchanges in China have no designated dealers or specialists, and no

designated order processors or *saitori* (as on the Tokyo Stock Exchange (Lehman and Modest, 1994)). The only way to supply bid or ask quotes is through public limit orders that are inputted, displayed, and matched by a fully automated computerized trading system[37]. Limit buy (sell) orders are matched against limit sell (buy) orders, and unexecuted buy (sell) orders are arranged in a demand (supply) schedule from the highest to the lowest (vice-versa) prices. The ease of entry and exit for potential market makers, combined with the simplicity of the overall system means that the market can be used as a benchmark from which the effects of more complicated market-making procedures can be measured.

The hypotheses of this chapter can be summarised in the following way. Reducing the level of market segmentation on the B-share market will increase the investor base on that market. It will introduce more uninformed investors to the market and perhaps more informed traders as well. If the proportion of informed investors in the domestic Chinese market is lower, the larger investor base will generate a decrease in the order processing cost, and the lower proportion of informed investors will reduce the adverse selection costs. On the other hand, the substitution effect may cause some investors to move from the A-share market to the B-share market. It may increase the spread and its components on the A-share market, and decrease trading activities on that market as well. This chapter contributes to the literature in the following ways. First, it is a study of an emerging market which uses an order-driven market mechanism. Second, the event study analyses the change of the spread and its components after controlling for other factors.

In this chapter, the bid-ask spread decomposition method utilized is developed by Lin, Sanger and Booth (1995). This method does not consider the inventory costs, since liquidity on both Mainland China and Hong Kong markets is supplied by limit order traders, who do not have to hold an undiversified inventory in securities. The primary findings of this chapter are that reducing the level of market segmentation reduces

[37] During the sample period of this chapter, no upstairs market existed on the Shanghai or Shenzhen stock exchanges.

adverse selection costs and order processing costs on the B-share market, and provide investors with lower transaction costs. The results suggest a decrease in information asymmetry on the B-share market as a result of opening this market to domestic investors, and the adverse selection costs component (relative to price) fall from 0.293% to 0.063%. The B-share limit order trader's gross profit, i.e. the order processing costs (relative to price), also declines to 0.0758% from 0.221%, and this decline may be due to the presence of competition among the larger base of liquidity suppliers. The declines of these two components cause a reduction of the entire relative effective bid-ask spread, and an increase in trading activity on the B-share market. On the other hand, the effective bid-ask spread on the A-share market increases slightly from 0.238% to 0.26%, and the turnover rate decreases from 0.0225 per day to 0.0116 per day. The cross-sectional comparison implies the A-share market is more information-efficient compared to both the B-share and the H-share markets. The possible explanation is that the information of informed traders is inferior on the A-share market, or there is a smaller proportion of informed traders relative to the uninformed ones on the A-share market. The results of the time-series and cross-sectional regressions tend to be consistent with theoretical predictions and the early literature, and the variables that determine the entire bid-ask spread also determine its components. After controlling for all the other factors, the results are still consistent with the simple time-series and cross-sectional comparison results.

Two alternative interpretations can be provided for these results. The first interpretation is that domestic investors are more informed than foreign investors in China. Chakravarty, Sarkar and Wu (1998) argue that foreign investors are less informed than domestic investors in China due to the language barriers and different accounting standards. Hasbrouck (1991a) suggests that the magnitude of the price effect produced by information is a positive function of the proportion of potentially informed traders in the population. Hasbrouck's (1991a) suggestion is my second interpretation. Although reducing the level of market segmentation on the B-share market provides positive effects on this market, the substitution effect causes some level of negative influence on the corresponding A-shares. Generally, an integrated market is preferable.

The remainder of the chapter is organized in the following ways. Section 5.2 addresses the previous literature on this issue. Section 5.3 describes the data, the process of filtering the data, and the summary statistics. Section 5.4 presents the methodology employed in the course of decomposing the bid-ask spread. It also illustrates the empirical results and compares the spread, its components, the trading activity, and the risk associated with stock returns among A-shares, B-shares and H-shares. In addition, it reports the results of time-series and cross-sectional regressions. Section 5.5 concludes the chapter, and provides some suggestions for future research.

5.2. Literature Review

The existing market microstructure literature on the components of bid-ask spread has been developed mainly within the framework of a quote-driven market. A quote-driven market is supplied with liquidity by desired market makers, who continuously quote the bid and the ask prices at which they are prepared to trade. Investors demand liquidity by submitting market orders which are then matched against the market makers' bid or ask prices. (Alternatively, investors are also able to submit public limit orders to compete with the market makers' quotes.) In a quote-driven market setting, there are three types of players – market makers, liquidity traders (uninformed traders) and informed traders – and the theories of the bid-ask spread are usually based on the notion of intermediaries or market makers who must cover the following three trading related costs. These are identified by Demsetz (1968) and Tinic (1972) as the order processing cost that is made up of exchange and clearing fees, bookkeeping and back office costs, the market maker's time and effort, and other 'costs of doing business'. Since at least some of these costs are fixed, the proportional order processing costs (per trade) should be lower for more heavily traded securities.

Order-flow imbalances give rise to the second component of the bid-ask spread, referred to as inventory holding costs (see Stoll, 1978; Amihud and Mendelson, 1980; and Ho and Stoll, 1983). The process of equilibrating order imbalances causes the

market makers' inventory position to deviate from the optimal level. Greater deviation translates into larger inventory holding costs, which in turn, widen the magnitude of the spread in order to compensate for the time value and non-diversifiable risk of the market makers' holding. Bagehot (1971) indicates the existence of informed investors with possession of superior knowledge of the value of a security. Such informed investors only buy when the price is unduly low and sell when the price is unduly high. Therefore, the third spread component (see Copeland and Galai, 1983; Glosten and Milgrom, 1985; and Easley and O'Hara, 1987) is due to the presence of adverse selection (asymmetric information) and informed traders. In order to cover their expected losses to informed traders, market makers must adjust the spread regarding the information conveyed in the transaction until their losses are recovered by gains from trading with liquidity (uninformed) traders.

However, bid-ask spreads are not unique to quote-driven dealer markets. In order-driven systems, public limit orders provide liquidity to the market and establish the bid-ask spread. The difference between the prices of the lowest sell-limit order and the highest buy-limit order determines the bid-ask spread. A trader who seeks immediacy in the execution of his order by submitting a market order can view the spread as one component of his transaction costs. Cohen, Maier, Schwartz, and Whitcomb (1981) show that order-driven auction markets give rise to positive bid-ask spreads, when investors face transaction costs associated with assessing information, monitoring the market, and conveying orders to the market. In addition, Glosten's (1994) proposition three demonstrates that there is a positive bid-ask spread in an order-driven trading environment due to the existence of adverse selection costs. In addition, Handa, Schwartz, and Tiwari (1998) claim that bid-ask spread is a 'natural property' of order-driven trading because market participants are willing to pay for price certainty. In this sense, order-driven market making is similar to quote-driven market-making, and the bid-ask spread compensates investors for providing immediacy to the market.

Several statistical models empirically decompose the components of the bid-ask spread, and there are generally two classes of empirical models[38]. In one class of models one can make inferences about the bid-ask spreads by examining the serial covariance properties of the quote and transaction prices. Roll first developed this approach in 1984. Following Roll (1984), other covariance spread models include Choi, Salandro, and Sharstri (1988), Stoll (1989), George, Kaul, and Nimalendran (1991), Affleck-Graves, Hegde, and Miller (1994), and Kim and Ogden (1996). Stoll (1989) finds about 43% of the quoted spread for NASDAQ stocks are due to adverse selection. George, Kaul, and Nimalendran (1991) indicate that the existence of the autocorrelation in expected returns causes Stoll's (1989) estimation method to be biased. In their revised model, under the assumption that the inventory cost of spread is negligible, they decomposed the spread only into adverse selection and order processing costs. They find that the range of adverse selection components is between 8% to 13% in a sample of stocks on NYSE, AMEX, and NASDAQ. However, Kim and Ogden (1996) further indicate that the assumption of George et al. (1991) that the spread is constant over time would also cause the estimation to be biased. Using data on NYSE and AMEX stocks, they find that approximately 50% of the bid-ask spread is caused by the adverse selection.

In another category of models pioneered by Glosten and Harris (1988), inferences about the spread are based on a trade indicator regression model, which relates changes in prices to transaction size and whether the trades are buyer or seller initiated. They express the adverse selection component and the combined order processing and inventory component as a linear function of transaction volume. However, the unavailability of the quote data prevents them from performing any direct analysis on their proposed model. The model of Madhavan, Richardson, and Roomans (1997) also belongs to this category, and it allows the order flow to be correlated. Huang and Stoll (1994) write a related paper showing the ability to predict short-run stock price change based on microstructure factors and certain other variables. Another related

[38] There are some other market microstructure models which measure adverse selection, such as Hasbrouck (1991b) and Foster and Viswanathan (1993) using market depth, or the Easley, Kiefer, and O'Hara series of papers (1996, 1997a, 1997b) using probability of information-based trading.

paper is written by Lin, Sanger and Booth (1995) where they estimate the effect of trade size on the adverse selection component of the spread. Hasbrouck (1988, 1991a) also proposes a model of a time series of quotes and trades in a vector autoregressive framework to make inferences about the sources of the spread. Huang and Stoll (1997) develop a general indicator model which tries to reconcile the various existing models. Their model allows a three-way decomposition of bid-ask spread into adverse selection, inventory-carrying, and order processing components. Based on their estimation, 9.6% of the quoted spread of the largest and the most actively traded stocks in NYSE are due to adverse selection.

Several early papers provide empirical evidence of the determinants of the entire spread, and the factors find there may explain the cross-sectional variations of the bid-ask spread (see Demsetz, 1968; Tinic, 1972; Benston and Hagerman, 1974; Hamilton, 1976; Branch and Freed, 1977; Stoll 1978; McInish and Wood, 1992; and Huang and Stoll, 1996). The spread is found to be inversely related to the trading activities, which are usually measured by the number of transactions in a given time period, or the trading volume per transaction. The spread is also positively related to the risk of security return. Due to the price discreteness, investors would prefer to trade in high-priced stocks, so that the price of a security is negatively related to the spread. In addition to firm characteristics and trading activities, previous studies of the US and Japanese markets demonstrate that the ownership structure is also a significant determinant of the bid-ask spread and its components (Ahn et al., 2005). There are also some studies that analyse the determinants of the spread components separately (see Brennan and Subrahmanyam, 1995), but most concentrate on the relationship between the spread components and trading volume.

5.3. Data

5.3.1. Data

The high-frequency intraday trade and quote data is obtained from Reuters historical database, and it is one of the most detailed intraday databases on the Chinese stock

markets. The data is time-stamped to the second, including the information on transaction prices, the number of shares traded, the volume of trades in monetary terms, and the quoted ask, bid and mid-prices. My dataset represents 88 firms which issue both A-shares and B-shares on the Shanghai and Shenzhen stock exchanges[39] and 22 firms which issue both A-shares on the Shanghai or Shenzhen stock exchanges and H-shares on the Stock Exchange of Hong Kong[40]. The sample used in this chapter covers a period of almost two years from April 2000 to December 2001. The sample period between January 2001 and March 2001 is excluded to avoid possible transitionary effects. The daily data used in this chapter are obtained from Datastream and the China Market and Accounting Research Database developed by Shenzhen Guo Tai An Information Technology Co.

In order to eliminate outliers and recording errors, several filtering rules are applied to the intraday data set. All observations recorded before the markets open or after the markets close are excluded from the sample[41], and observations with the quoted bid-ask spread larger than 50% are also eliminated. The final intraday sample has almost twelve million observations, and more than 90% of the trades of the sample are made at either the bid or the ask.

5.3.2. Variables

Weighted effective bid-ask spread

Volume-weighted effective bid-ask spreads are used in this study, reflecting the fact that some transactions involve larger trading volumes than others[42]. The proportional effective spread of security i during interval t is a weighted-average, with the

[39] Among them, 44 firms are listed in Shanghai and 44 firms in Shenzhen.

[40] Among them, 16 firms issued A-shares in Shanghai and 6 firms issued A-shares in Shenzhen.

[41] The opening transactions are also excluded from the data set since they are arranged from a call mechanism.

[42] The quoted bid-ask spread is also calculated, and a time-weighted method is used to calculate average value as well. The correlation between the volume-weighted quoted bid-ask spread and the volume-weighted effective bid-ask spread is 86.9%, and between the volume-weighted effective spread with and without logarithms, the correlation is over 99.9%. The correlation between time-weighted and volume-weighted spreads is around 92%. The results are not reported here.

weight being the trading volume of the transaction as a percentage of the total trading volume during the time interval t. First, a proportional effective bid-ask spread is calculated for each transaction as[43]:

$$ebas_t = \frac{2|P_t - M_t|}{M_t}.$$

where the quote middle price, $M_t = (A_t + B_t)/2$; ask price, A_t; bid price, B_t.

Then, a volume-weighted average, $vwebas_{i,t}$, is computed for each security i for each day.

$$vwebas_{i,t} = \sum_{t_{i,0}}^{t_{i,c}} w_{i,t} ebas_{i,t},$$

where $t_{i,0}$ is the time when normal trading commences after an opening algorithm; t_i is the time when a transaction occurs; $t_{i,c}$ is the closing time of trade on a given day.

$w_{i,t} = \dfrac{\text{trade volume}_{i,t}}{\text{total trade volume}_i}$ is the volume weight.

Turnover

Trading activities are negatively related to transaction costs, and relative turnover rate is used here as a proxy of the trading activities.

$$\text{Turnover}_{i,t} = \frac{\text{Trading volume}_{i,t}}{\text{Total number of shares outstanding}_i}.$$

[43] During estimation, the effective spread is calculated as $2|\ln(P_t / M_t)|$, which is approximately equal to $\dfrac{2|P_t - M_t|}{M_t}$

Risk

Two risk measurements are used here. One is the daily volatility, calculated as the squared daily continuously compounded close-to-close return, as:

$$VOL_{i,t} = [\ln(\frac{P_{i,t}}{P_{i,t-1}})]^2 .$$

Another measurement on risk is the standard deviation of intraday middle price returns[44].

Financial Leverage

Earnings of firms with higher financial leverage would be more volatile, which potentially exposes investors with greater information asymmetry (Ness, Ness, and Warr, 2001). The financial leverage used here is

$$FLEVG_{i,t} = \frac{TotalDebt_{i,t}}{TotalAssets_{i,t}}.$$

Firm Size

Because of greater awareness of larger firms on the part of investors (Merton, 1987) and lower costs in obtaining information about larger firms, firm size is an important determinant of the spread and the cost of share price, which will adjust to the new information. Larger firms are expected to have a smaller adverse selection component and a smaller order processing component. Several measurements can be used as the proxy for firm size, such as market capitalisation, total accounting assets, sales, and total number of employees. In China, nearly two-thirds of the outstanding shares of listed firms are non-tradable, so no market value can be observed for these shares (other than to assume they have the same value as publicly traded shares[45]). In

[44] This measurement may be biased, especially for relatively illiquid stocks with thin trading. Goettler, Parlour, and Rajan (2003) indicate that the midpoint of the quoted spread is a not a good proxy for the true value due to the endogeneity of order flow. It is also used in the later regressions, and it does not alter the results materially.

[45] It is possible that the non-tradable state-owned and legal-entity shares could be valued at a price lower than their tradable counterpart, since there is no market liquidity of those shares.

addition, the share prices of domestic A-shares and foreign B- or H-shares are quite different. Both make it hard to calculate the total market capitalization of listed companies in China. The accounting total assets are used as a proxy for firm size, but it should be noted that accounting information only updates once a year, and that might sometimes fail to reflect updated information.

Relative Minimum Tick Size

Many empirical studies find an inverse relationship between the bid-ask spread and the price level of a security (see Benston and Hagerman, 1974). Owing to the different minimum tick size (minimum price variation) among the A-shares, B-shares and H-shares, a relative minimum tick size is included in the analysis.

$$relativeticksize_{i,t} = \frac{ticksize_{i,t}}{pricelevel_{i,t}},$$

where the minimum tick size for all A-shares is RMB0.01, US$0.001 for B-shares listed on the Shanghai Stock Exchange, and HK$0.01 for B-shares listed on the Shenzhen Stock Exchange. The minimum tick sizes on the Stock Exchange of Hong Kong are based on the price level of individual stock, which are as follows:

Price			Minimum Tick Size
From HK$	0.01 to	HK$0.25	HK$0.001
Over	0.25 to	0.5	0.005
Over	0.50 to	2	0.01
Over	2.00 to	5	0.025
Over	5.00 to	30	0.05
Over	30.00 to	50	0.1
Over	50.00 to	100	0.25
Over	100.00 to	200	0.5
Over	200.00 to	1,000.00	1
Over	1,000.00 to	9,995.00	2.5

Ownership

The ownership variables used in this chapter are different from the ones used for US or Japanese firms. Only around one third of the shares of listed Chinese firms are tradable on the stock exchanges. For those non-tradable shares, part are owned by the Chinese government, and part belong to other legal entities. Three ownership

variables are used here. GOVN is the percentage stock owned by the government, INST is the percentage stock owned by the legal entities, and TRAD is the percentage of tradable A-shares, or B-shares, or H-shares. A larger government or legal entity ownership, both of which are non-tradable, may indicate a more serious information asymmetry problem. On the other hand, a higher proportion of tradable shares would lead to a lower adverse selection.

Table 5-1 provides summary statistics, including the mean, median, and standard deviation for a number of variables, of the sample of 88 firms which issue A-shares and B-shares and 22 firms which issue A-shares and H-shares. The full sample is further separated into two sub-sample periods, which are before and after February 2001. Average figures in the table are computed by averaging time-serially for each stock and then averaging cross-sectionally across stocks. The variables in Panel A include volume-weighted effective bid-ask spread, volume-weighted quoted bid-ask spread, daily turnover rate, and two different measurements of volatility. Panel B of Table 5-1 provides summary statistics on some other characteristics of stocks, such as proportion of state ownership, proportion of legal-entity ownership, proportion of tradable shares, price level relative to the minimum tick size, total assets and debt-to-equity ratio. In the following description, most emphasis is placed on comparing the means of these two sub-sample periods.

Average daily volume-weighted effective bid-ask spreads for all A-shares is 0.238% before February 2001, and 0.26% after February 2001. The volume-weighted effective bid-ask spreads for B-shares decrease dramatically from 1.3% before February 2001 to 0.36% after February 2001. For H-shares, the volume-weighted effective bid-ask spreads is 2.0% and 1.3%, before and after February 2001 respectively. During the sample period, the average daily turnover rate for all A-shares is 0.022[46] before February 2001 and 0.011 after February 2001. The average daily turnover rate for all B-shares increases significantly from 0.005 before February 2001 to 0.015 after February 2001. The daily turnover rate of H-shares also increases

[46] This is equivalent to the annual turnover rate, over 550%.

from 0.008 to 0.0159 during the same time period. Volatility, calculated as the squared daily continuously compounded close-to-close return, decreases slightly for A-shares and B-shares before and after February 2001. H-shares become slightly more volatile before and after February 2001, but the difference between these two is not significant. The intraday middle price return volatility suggests that after February 2001, while the volatility of return on B-shares reduces significantly, B-shares still exhibit larger volatility than A-shares. The H-shares are more volatile than the other two shares. For the sample firms, around one third of issued shares are owned by the Chinese government, while around 20% of ownership belongs to other legal entities, and both are non-tradable on any stock exchanges. For firms that issue both A-shares and B-shares, the proportion of A-shares is around 17% of total shares outstanding, and the proportion of B-shares is around 28%. For firms that issue both A-shares and H-shares, around 12% of shares outstanding are A-shares, while around 32% are H-shares. Before February 2001 the sizes of those firms with H-share, measured by accounting total assets, are two to three times larger than B-share firms, whereas after February 2001, the H-share firms are over ten times larger than the B-share firms. The price levels relative to the minimum tick size indicate that A-shares have a much higher share price relative to corresponding B-shares and H-shares.

Table 5-2 contains the results of the equality test of means for volume-weighted bid-ask spread, turnover, and volatility. In Panel A of Table 5-2, the results of a time-series comparison before and after February 2001 are reported. The results of a cross-sectional comparison among A-shares, B-shares, and H-shares are tabulated in Panel B of Table 5-2. The results imply that before February 2001 the A-share market has much lower transaction costs relative to the B-share market and H-share market. After February 2001, although it is still cheaper to trade on the A-share market, the trading cost differences between A-shares and B-shares have reduced significantly. The average daily turnover rate of B-shares is only one fourth that of A-shares before February 2001, but after February 2001, the average daily turnover rate of B-shares is larger than that of A-shares. The results further support the inverse relationship between liquidity and spread, and also suggest that opening the B-share market greatly

improves liquidity of this market, but the trading activity and transaction cost of the corresponding A-shares deteriorate slightly during the same time period.

Table 5-1: Descriptive statistics of the sample
Panel A: Descriptive statistics of endogenous variables

Shares		Before February 2001			After February 2001		
		Mean	Median	StdDev	Mean	Median	StdDev
All A-shares	Vw effective bas	0.00238	0.00201	0.00242	0.00260	0.00203	0.00545
A-shares with B issued only		0.00241	0.00200	0.00235	0.00259	0.00201	0.00375
A-shares with H issued only		0.00227	0.00205	0.00270	0.00261	0.00210	0.00956
B-shares		0.01306	0.01001	0.01129	0.00360	0.00299	0.00300
H-shares		0.01978	0.01379	0.01816	0.01341	0.01151	0.00806
All A-shares	Vw quoted bas	0.00202	0.00177	0.00129	0.00222	0.00186	0.00159
A-shares with B issued only		0.00205	0.00175	0.00140	0.00225	0.00184	0.00172
A-shares with H issued only		0.00191	0.00184	0.00062	0.00209	0.00194	0.00088
B-shares		0.01368	0.01059	0.01062	0.00331	0.00279	0.00221
H-shares		0.01966	0.01377	0.01743	0.01345	0.01150	0.00824
All A-shares	Turnover	0.02255	0.01428	0.02673	0.01157	0.00637	0.01814
A-shares with B issued only		0.02218	0.01399	0.02648	0.01173	0.00642	0.01801
A-shares with H issued only		0.02411	0.01559	0.02772	0.01091	0.00616	0.01862
B-shares		0.00508	0.00294	0.00621	0.01590	0.00910	0.01862
H-shares		0.00804	0.00397	0.01151	0.01236	0.00626	0.01673
All A-shares	Intra volatility	3.2183E-06	1.9545E-06	7.1415E-06	2.5922E-06	1.4602E-06	4.6844E-06
A-shares with B issued only		3.5022E-06	2.1593E-06	7.0400E-06	2.8070E-06	1.5697E-06	5.0818E-06
A-shares with H issued only		2.0229E-06	1.3669E-06	7.4370E-06	1.7489E-06	1.1094E-06	2.4119E-06
B-shares		6.8603E-05	3.4174E-05	1.4108E-04	6.6693E-06	4.1734E-06	9.5925E-06
H-shares		1.3379E-04	3.8922E-05	4.7431E-04	7.0041E-05	3.3126E-05	1.3319E-04
All A-shares	Volatility	0.000587	0.000180	0.001277	0.000518	0.000131	0.001393
A-shares with B issued only		0.000590	0.000180	0.001274	0.000532	0.000137	0.001447
A-shares with H issued only		0.000574	0.000180	0.001292	0.000465	0.000110	0.001159
B-shares		0.001157	0.000226	0.002406	0.001038	0.000273	0.003297
H-shares		0.002129	0.000610	0.004977	0.002203	0.000571	0.004980

Panel B: Descriptive statistics of exogenous variables

Shares		Before February 2001			After February 2001		
		Mean	Median	StdDev	Mean	Median	StdDev
All A-shares	P_state	0.31302	0.36983	0.24961	0.33387	0.37367	0.23988
A-shares with B issued only		0.30967	0.33096	0.24565	0.31260	0.33079	0.23336
A-shares with H issued only		0.32709	0.42614	0.26518	0.41741	0.50885	0.24681
B-shares		0.31095	0.36107	0.24533	0.31262	0.33079	0.23316
H-shares		0.32831	0.42614	0.26903	0.42046	0.50885	0.24582
All A-shares	P_legal	0.21739	0.10437	0.22513	0.18170	0.07670	0.21068
A-shares with B issued only		0.21593	0.11792	0.21573	0.19250	0.10107	0.20551
A-shares with H issued only		0.22354	0.05926	0.26094	0.13925	0.02439	0.22496
B-shares		0.21545	0.11269	0.21620	0.19258	0.10107	0.20558
H-shares		0.22507	0.05200	0.26193	0.13665	0.02439	0.22318
All A-shares	P_tradable	0.15672	0.12558	0.11112	0.16700	0.13959	0.10744
A-shares with B issued only		0.16660	0.13624	0.11707	0.17707	0.14720	0.11101
A-shares with H issued only		0.11512	0.10213	0.06704	0.12745	0.10099	0.08072
B-shares		0.28179	0.27285	0.09781	0.29042	0.27901	0.09764
H-shares		0.32924	0.32196	0.05360	0.31215	0.30922	0.05453
All A-shares	Price level	1306.36	1283.22	482.92	1337.16	1304.34	526.21
A-shares with B issued only		1398.56	1351.18	452.02	1442.64	1388.86	504.82
A-shares with H issued only		918.17	855.19	410.35	922.94	913.89	385.04
B-shares		314.65	295.12	140.73	863.15	830.29	305.94
H-shares		99.25	87.17	36.29	116.58	107.69	36.69
All A-shares	Total Assets	3788849729	2364938705	4386740524	7172743153	2272443986	34253930632
A-shares with B issued only		2859859606	2092802113	2419744251	2899483988	2095801739	2594902699
A-shares with H issued only		7895963955	4454892244	7759812787	24265779811	5269509840	75363442791
B-shares		2859859606	2092802113	2419744251	2899483988	2095801739	2594902699
H-shares		7895963955	4454892244	7759812787	24265779811	5269509840	75363442791
All A-shares	Debt ratio	0.48433	0.46508	0.27095	0.55779	0.48715	0.55370
A-shares with B issued only		0.49759	0.46790	0.28131	0.58284	0.50484	0.60818
A-shares with H issued only		0.42569	0.38663	0.21602	0.45759	0.44278	0.21402
B-shares		0.49759	0.46790	0.28131	0.58284	0.50484	0.60818
H-shares		0.42569	0.38663	0.21602	0.45759	0.44278	0.21402

Table 5-1 (Continued) The sample consists of the 88 companies which issue both A-shares to domestic investors and B-shares to foreign investors on the Shanghai or Shenzhen stock exchanges, and the other 22 companies which issue both A-shares and H-shares in Mainland China and Hong Kong. The two sub-sample periods are between April 2000 and December 2000, and between April 2001 and December 2001 respectively. The means, medians, and standard deviations of the volume-weighted effective bid-ask spread, the volume-weighted quoted bid-ask spread, the daily turnover rate, the intraday return volatility, and the close-to-close daily volatility, which are the endogenous variables in the later analyses, are presented in Panel A. Panel B tabulates the summary statistics of the exogenous determinant variables of the spread and its components, such as the percentage of state ownership, legal-entity ownership, and tradable shares, price level relative to minimum tick size, total accounting assets, and debt ratio. All means represent cross-sectional averages.

Table 5-2: Mean comparison of the sample
Panel A: Time-series comparison

Shares		Before February 2001 vs. After February 2001	
		Mean differences	t statistics
All A-shares	Vw Effective Bas	-0.00021	-4.83 **
A-shares with B issued only		-0.00018	-4.97 **
A-shares with H issued only		-0.00034	-2.1 **
B-shares		0.00950	100.85 **
H-shares		0.00640	19.2 **
All A-shares	Vw Quoted Bas	-0.00020	-13.13 **
A-shares with B issued only		-0.00020	-11.11 **
A-shares with H issued only		-0.00019	-10.44 **
B-shares		0.01040	119.17 **
H-shares		0.00620	19.33 **
All A-shares	Turnover	0.01100	45.88 **
A-shares with B issued only		0.01040	39.48 **
A-shares with H issued only		0.01320	23.57 **
B-shares		-0.01100	-66.78 **
H-shares		-0.00400	-12.33 **
All A-shares	Intra Volatility	6.26E-07	9.89 **
A-shares with B issued only		6.95E-07	9.69 **
A-shares with H issued only		2.74E-07	2.07 **
B-shares		0.0001	54.09 **
H-shares		0.0001	7.34 **
All A-shares	Volatility	0.0001	5.01 **
A-shares with B issued only		5.82E-05	3.73 **
A-shares with H issued only		0.0001	3.82 **
B-shares		0.0001	3.67 **
H-shares		-7.40E-05	-0.75

Panel B. Cross-sectional comparison

	Variable	Shares	Shares	Mean differences	t statistics
Full Sample Period	Vw Effective Bas	A-shares with B issued only	A-shares with H issued only	0.00006	0.70
		A-shares with B issued only	B-shares	-0.00600	-102.42 **
		A-shares with H issued only	H-shares	-0.01400	-75.23 **
		B-shares	H-shares	-0.00800	-45.8 **
	Vw Quoted Bas	A-shares with B issued only	A-shares with H issued only	0.00010	11.56 **
		A-shares with B issued only	B-shares	-0.00600	-119.12 **
		A-shares with H issued only	H-shares	-0.01400	-89.01 **
		B-shares	H-shares	-0.00800	-45.86 **
	Turnover	A-shares with B issued only	A-shares with H issued only	-0.00032	-1.02
		A-shares with B issued only	B-shares	0.00640	39.35 **
		A-shares with H issued only	H-shares	0.00690	20.36 **
		B-shares	H-shares	0.00020	1.10
	Intra Volatility	A-shares with B issued only	A-shares with H issued only	1.27E-06	17.34 **
		A-shares with B issued only	B-shares	-3.50E-05	-57.39 **
		A-shares with H issued only	H-shares	-9.80E-05	-23.87 **
		B-shares	H-shares	-6.20E-05	-14.85 **
	Volatility	A-shares with B issued only	A-shares with H issued only	0.00004	2.74 **
		A-shares with B issued only	B-shares	-0.00054	-29.74 **
		A-shares with H issued only	H-shares	-0.00200	-32.19 **
		B-shares	H-shares	-0.00100	-20.6 **

	Variable	Shares	Shares	Mean differences	t statistics
Before February 2001	Vw Effective Bas	A-shares with B issued only	A-shares with H issued only	0.00010	2.96 **
		A-shares with B issued only	B-shares	-0.01100	-115 **
		A-shares with H issued only	H-shares	-0.01800	-56.92 **
		B-shares	H-shares	-0.00700	-21.17 **
	Vw Quoted Bas	A-shares with B issued only	A-shares with H issued only	0.00010	9.17 **
		A-shares with B issued only	B-shares	-0.01200	-135.38 **
		A-shares with H issued only	H-shares	-0.01800	-60.74 **
		B-shares	H-shares	-0.00600	-19.65 **
	Turnover	A-shares with B issued only	A-shares with H issued only	-0.00200	-3.73 **
		A-shares with B issued only	B-shares	0.01710	75.97 **
		A-shares with H issued only	H-shares	0.01610	31.24 **
		B-shares	H-shares	-0.00300	-13.8 **
	Intra Volatility	A-shares with B issued only	A-shares with H issued only	1.48E-06	10.64 **
		A-shares with B issued only	B-shares	-6.50E-05	-56.92 **
		A-shares with H issued only	H-shares	-1.30E-04	-15.68 **
		B-shares	H-shares	-6.50E-05	-7.69 **
	Volatility	A-shares with B issued only	A-shares with H issued only	0.00002	0.67
		A-shares with B issued only	B-shares	-0.00057	-25.97 **
		A-shares with H issued only	H-shares	-0.00200	-21.04 **
		B-shares	H-shares	-0.00097	-13.29 **

	Variable	Shares	Shares	Mean differences	t statistics
After February 2001	Vw Effective Bas	A-shares with B issued only	A-shares with H issued only	-0.00001	-0.09
		A-shares with B issued only	B-shares	-0.00100	-25.38 **
		A-shares with H issued only	H-shares	-0.01100	-52.91 **
		B-shares	H-shares	-0.01000	-73.22 **
	Vw Quoted Bas	A-shares with B issued only	A-shares with H issued only	0.00020	7.99 **
		A-shares with B issued only	B-shares	-0.00100	-45.71 **
		A-shares with H issued only	H-shares	-0.01100	-83.86 **
		B-shares	H-shares	-0.01000	-74.63 **
	Turnover	A-shares with B issued only	A-shares with H issued only	0.00080	-0.09
		A-shares with B issued only	B-shares	-0.00400	-25.38 **
		A-shares with H issued only	H-shares	-0.00100	-52.91 **
		B-shares	H-shares	0.00350	-73.22 **
	Intra Volatility	A-shares with B issued only	A-shares with H issued only	1.00E-04	18.42 **
		A-shares with B issued only	B-shares	1.06E-06	-0.09
		A-shares with H issued only	H-shares	-5.10E-04	-43.19 **
		B-shares	H-shares	-3.90E-06	-25.38 **
	Volatility	A-shares with B issued only	A-shares with H issued only	-0.00200	-31.05 **
		A-shares with B issued only	B-shares	-0.00007	-52.91 **
		A-shares with H issued only	H-shares	-0.00100	-28.8 **
		B-shares	H-shares	-0.00006	-73.22 **

The sample consists of the 88 companies which issue both A-shares to domestic investors and B-shares to foreign investors on the Shanghai and Shenzhen Stock Exchanges, and the 22 companies which issue both A-shares and H-shares in Mainland China and Hong Kong. These statistical descriptions are computed from the cross-sectional daily average. In Panel A, the variables are compared in a time-series approach before and after February 2001. The cross-sectional comparison results are reported in Panel B.

*, ** represent 10 percent and 5 percent significant levels, respectively.

5.4. Methodology and Results

5.4.1. Decomposition of Bid-Ask Spread

Previous estimates of bid-ask spread components exhibit considerable variation across sample periods, companies, exchange structures, and empirical studies. These diverse results suggest that empirical testing is still at an early stage of development, and therefore much work remains to be done. This study contributes to our knowledge of spread components and market structures by providing empirical evidence for cross-listing stocks in segmented markets using order-driven trading mechanisms. The importance of such trading structures has grown considerably over the past decade as more exchanges have implemented electronic public limit order books, and opened up the market-making process. However, the focus of this chapter is to compare the components of bid-ask spread rather than the absolute values of them.

In an order-driven market, owing to the absence of a designated dealer or market maker, the limit-order traders have no obligation to supply liquidity to the market. Therefore, it is plausible to assume no inventory-holding cost component, and this is suggested by DeJong, Nijman, and Roell (1996)[47]. As a result it can be said that in an order-driven market, the components of bid-ask spread consist only of the adverse selection component and the order processing component. The empirical study here is based on that proposed by Lin, Sanger and Booth (1995), because we can easily use this model to estimate different components for different stocks each month. Lin et al.'s (1995) model considers the components of bid-ask spread to be the adverse selection costs, the order processing costs, and the order persistence component[48]. According to Lin et al. (1995), the costs of spread components are identified as follows[49]:

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[47] Even in a quote-driven market, inventory costs are suggested to be relatively small (See Hasbrouck, 1988; Stoll, 1989; George, Kaul, and Nimalendran, 1991; and Madhavan and Smidt, 1991). Several studies on quote-driven markets, which only concentrate on order processing and adverse selection costs, have ignored such costs (See, Lin, Sanger, and Booth, 1995; and McInish and Ness, 2002).

[48] Order persistence could be caused by factors such as the splitting of large orders into small orders or adjusting to limit orders slowly when new information arrives on the market (Lin, et al., 1995).

[49] See Lin et al. p. 1155 to p. 1158 for details.

Conditional on transaction price at time t, $P_t = B_t$ (a market sell order is executed at bid price), the expected future transaction price is $E_t(P_{t+1}) = \delta B_{t+1} + (1-\delta)A_{t+1}$. Therefore, the expected profit of a liquidity supplier at time $t+1$ is:

$$E_t(P_{t+1}) - P_t = \delta(B_{t+1} - B_t) + (1-\delta)(A_{t+1} - B_t), \tag{5.1}$$

where A_t and B_t are the ask and bid quotes at time t respectively, δ is the probability of transaction continuation, that a sell (buy) order is followed by a sell (buy) order, and $1-\delta$ is the probability of transaction reversion.

Taking into account possible adverse information shown by a trade at time t, quote revisions are assumed as $B_{t+1} = B_t + \lambda z_t$, $A_{t+1} = A_t + \lambda z_t$, where $0 < \lambda < 1$ reflects the quote revision as a portion of the effective spread due to adverse selection, $M_t = (A_t + B_t)/2$ is the middle price of the bid and ask at time t, and $z_t = P_t - M_t$ is half of the signed effective bid-ask spread with $z_t < 0$ for a sell-initiated trade, and $z_t > 0$ for a buy-initiated trade[50]. If trades are executed at the quoted bid or ask price, the effective bid-ask spread equals the quoted spread[51]. Then, Equation (5.1) is mathematically linked to the effective bid-ask spread.

$$\begin{aligned} E_t(P_{t+1}) - P_t &= [\delta B_{t+1} + (1-\delta)A_{t+1}] - P_t) \\ &= \lambda z_t + (1-2\delta)[(A_t + B_{t+1})/2 - B_t] + [(A_t + B_{t+1})/2] - P_t \\ &= -(1-\lambda-\theta)z_t, \end{aligned} \tag{5.2}$$

where $\theta = 2\delta - 1$. When buy orders and sell orders arrive randomly, $\delta = 0.5$, $\theta = 0$. Choi, Salandro, and Shastri (1988) and Hasbrouck (1991b) suggest that buy (sell) orders tend to follow buy (sell) orders, so the probability of transaction

[50] The method here is similar to the Lee and Ready (1991) trade classification procedure, that if the transaction price is larger than the middle price, it is buyer initiated, if the transaction price is lower than the middle price, it is seller initiated, and if the transaction price is equal to the middle price, it is indecisive. Some studies do not use zero, and classify all the trades as either buyer or seller initiated by using additional characteristics of the order flow, e.g. the direction of previous trades (See Ellis, Michaely, and O'Hara, 2000).

[51] Over 90% of the transactions from my data set are executed at bid, or ask price, and this is also corroborated by the high correlation between effective spread and quoted spread.

continuation, δ, is greater than 50%, and the order persistence component, θ, is between zero and one.

When a market sell order is executed at ask price, A_t, at time t, the same equation as Equation (5.2) can be derived. Therefore, a temporary price effect (or order processing costs) as a fraction of the effective spread is $\gamma = 1 - \lambda - \theta$.

The estimation equations are as follows:

$$M_{t+1} - M_t = \lambda z_t + \varepsilon_{t+1}, \tag{5.3}$$

$$z_{t+1} = \theta z_t + \eta_{t+1}, \tag{5.4}$$

and

$$\begin{aligned} P_{t+1} - P_t &= (M_{t+1} - M_t) + z_{t+1} - z_t \\ &= -\gamma z_t + \mu_{t+1}, \end{aligned} \tag{5.5}$$[52]

where the adverse selection cost component is relative to the effective bid-ask spread, $0 < \lambda < 1$; the order persistence component is relative to the effective bid-ask spread, $0 < \theta < 1$; and the order processing cost component is relative to the effective bid-ask spread, $0 < \gamma < 1$.

In the estimation, the logarithms of the transaction price and the quoted midpoint are used empirically so as to give a continuously compounded rate of return for the dependent variable and to reduce the problem of price discreteness.

[52] Equation (5.5) can be derived from equation (5.3) and (5.4) where $\gamma = 1 - \lambda - \theta$, and $\mu_{t+1} = e_{t+1} + \eta_{t+1}$.

5.4.2. Spread Components Results

In this section, the results of spread components obtained using the Lin et al. (1995) model are reported. The three parameters, λ, θ, and γ,[53] which represent the components of the bid-ask spread in Equations (5.3), (5.4), and (5.5) can be estimated simultaneously by using the generalized method of moments (GMM) procedure (Hansen, 1982), and this method imposes very weak distribution assumptions. The GMM procedure also adjusts for the general form of autocorrelation and/or conditional heteroskedasticity that may present in the data set (Menyah and Paudyal, 2000). These three spread components are estimated for each stock in each month, and the resulting estimates are a monthly time-series of an individual stock's bid-ask spread components for all A-shares, B-shares, and H-shares in the sample[54]. The dollar adverse selection component and dollar order processing component as a percentage of stock price are calculated by multiplying the coefficient estimates with the effective bid-ask spread relative to the price.

Table 5-3 depicts the summary statistics on the estimated effective bid-ask spread components for A-shares, B-shares, and H-shares. The summary statistics include the mean coefficient estimates, the mean t-statistics[55] for the proportion of the spread due to the adverse selection (λ), the order consistence (θ), the order processing costs (γ), and these cost components as a percentage of stock price, which measures the cost of trading for a given dollar amount transaction. The average estimate of λ (the adverse selection component relative to the effective bid-ask spread) is around 20% for A-shares, 25.4% for B-shares, and 46.3% for H-shares before February 2001. After February 2001, the average estimate of the adverse selection component relative to the effective spread for A-shares, B-shares, and H-shares are 18%, 18.5%, and 45.9% respectively. The adverse selection component relative to the price of B-shares is 0.293% before February 2001, and decreases to 0.063% after February 2001. The

[53] The extent of the order persistence component has influences on adverse selection and order-processing components, but it is not used in the later analyses.

[54] Only components relative to the effective bid-ask spread between zero and one and significant at the 10% level are used in calculating the averages and later regressions.

[55] When calculating the average of t-statistics, all t-values are included.

adverse selection component of H-shares relative to price also decreases during the same time period, but the magnitude of decrease is not as great as that of the B-shares. The estimated average gamma (the order processing component relative to the effective bid-ask spread) is around 69% for the A-shares, 64.4% of the B-shares, and 27.6% for the H-shares before February 2001. After February 2001, the proportional order processing components are around 60% for the A-shares, 66% for the B-shares, and 26% for the H-shares. The order processing costs as a percentage of the price have reduced for B-shares and H-shares, but the extent of the decrease for the B-shares is much greater than that of the H-shares. As a result of decreasing all the components of the spread of B-shares relative to price, the entire effective bid-ask spread of the B-shares reduced significantly. For the A-shares, even the adverse selection and order processing costs relative to the price reduced slightly, and the order persistent component relative to the price doubled during the period, which caused an increase across its entire spread. Most of the estimates of λ, θ, and γ are between zero and one, and are statistically significant. These estimates are broadly consistent with the estimates reported in other studies.

Overall, these results suggest that both foreign-owned B-shares and H-shares are associated with a higher adverse selection cost component and order processing component, and the H-share market has the highest information asymmetry. This evidence is consistent with the previous study of Chakravarty, Sarkar, and Wu (1998), which concludes that foreign investors are less informed about local firms than domestic investors. After reducing the level of market segmentation of the B-share market, the reduction of adverse selection, order processing costs, and order persistence lead to a reduction in the entire bid-ask spread. On the other hand, the spread on the A-share market increased correspondingly owing to the increase of order persistence.

Table 5-3: Cost components of bid-ask spreads based on Lin, Sanger and Booth (1995)

Shares		Before February 2001			After February 2001		
		Relative to Effective Bas	t-statistics	Relative to Price	Relative to Effective Bas	t-statistics	Relative to Price
A-shares with B issued only	Lambda	0.20116	5.34	0.00048	0.18050	5.29	0.00043
A-shares with H issued only		0.19004	7.56	0.00042	0.17484	6.82	0.00039
B-shares		0.25375	4.19	0.00293	0.18556	4.84	0.00063
H-shares		0.46343	9.60	0.00902	0.45930	12.23	0.00616
A-shares with B issued only	Theta	0.14894	3.48	0.00039	0.23855	7.44	0.00071
A-shares with H issued only		0.12534	4.67	0.00028	0.18971	23.37	0.00083
B-shares		0.19377	1.83	0.00237	0.16252	4.44	0.00061
H-shares		0.34605	8.19	0.00591	0.32357	10.97	0.00412
A-shares with B issued only	Gamma	0.68877	15.61	0.00161	0.59307	13.76	0.00137
A-shares with H issued only		0.69659	23.46	0.00155	0.64229	20.45	0.00147
B-shares		0.64395	8.32	0.00758	0.66510	13.84	0.00221
H-shares		0.27676	4.90	0.00437	0.26184	6.63	0.00300

Equations (5.3), (5.4) and (5.5) are estimated using the data on 88 companies, which issue both A-shares and B-shares, and 22 companies, which issue both A-shares and H-shares. The GMM Procedure is used to estimate the parameters. The results reported here are the monthly mean coefficient estimate across A-shares, B-shares and H-shares before February 2001 and after February 2001. In the process of estimation, extreme observations were removed from the sample. λ is the adverse selection costs component, θ is the order persistent component, and γ is the order processing cost component.

*, ** represent 10 percent and 5 percent significant levels, respectively.

5.4.3. Determinants of Bid-Ask Spread and its Components

Various time-series and cross-sectional pooled regressions are conducted to determine the effects of various market variables on the bid-ask spread and its components. The order processing-costs and adverse selection costs components are calculated for each stock i in each month using the estimating method of Lin et al. (1995). To compare spread components across securities and over time, the effective spread and the cost components for each stock relative to the price in each month are calculated by multiplying the proportional component by the volume-weighted effective bid-ask spread.

I follow Benston and Hagerman (1974) in expressing both their dependent and independent variables in natural logarithms, even though they admit that they tried various functional forms and chose log linear form based on assumptions related to least squares. In the following analyses, all the variables have been transformed by using natural logarithms.

The five regression equations are as follows:

$$\begin{aligned}\ln(Spread_{i,t}) = {} & \alpha_0 + \alpha_1 \ln(Turnover_{i,t}) + \alpha_2 \ln(Vol_{i,t}) + \alpha_3 \ln(TickRatio_{i,t}) \\ & + \alpha_4 \ln(StateShare_{i,t}) + \alpha_5 \ln(LegalShare_{i,t}) + \alpha_6 \ln(TradableShare_{i,t}) \\ & + \alpha_7 \ln(TotalAssets_{i,t}) + \alpha_8 \ln(DebtRatio_{i,t}) \\ & + \alpha_9 D_{A\_after} + \alpha_{10} D_{B\_before} + \alpha_{11} D_{B\_after} + \alpha_{12} D_{H\_before} + \alpha_{13} D_{H\_after} \\ & + \varepsilon_1,\end{aligned} \tag{5.6}$$

$$\begin{aligned}\ln(AS_{i,t}) = {} & \beta_0 + \beta_1 \ln(Turnover_{i,t}) + \beta_2 \ln(Vol_{i,t}) + \beta_3 \ln(TickRatio_{i,t}) \\ & + \beta_4 \ln(StateShare_{i,t}) + \beta_5 \ln(LegalShare_{i,t}) + \beta_6 \ln(TradableShare_{i,t}) \\ & + \beta_7 \ln(TotalAssets_{i,t}) + \beta_8 \ln(DebtRatio_{i,t}) \\ & + \beta_9 D_{A\_after} + \beta_{10} D_{B\_before} + \beta_{11} D_{B\_after} + \beta_{12} D_{H\_before} + \beta_{13} D_{H\_after} \\ & + \varepsilon_2,\end{aligned} \tag{5.7}$$

$$\begin{aligned}\ln(OP_{i,t}) = {} & \gamma_0 + \gamma_1 \ln(Turnover_{i,t}) + \gamma_2 \ln(Vol_{i,t}) + \gamma_3 \ln(TickRatio_{i,t}) \\ & + \gamma_4 \ln(StateShare_{i,t}) + \gamma_5 \ln(LegalShare_{i,t}) + \gamma_6 \ln(TradableShare_{i,t}) \\ & + \gamma_7 \ln(TotalAssets_{i,t}) + \gamma_8 \ln(DebtRatio_{i,t}) \\ & + \gamma_9 D_{A\_after} + \gamma_{10} D_{B\_before} + \gamma_{11} D_{B\_after} + \gamma_{12} D_{H\_before} + \gamma_{13} D_{H\_after} \\ & + \varepsilon_3,\end{aligned} \tag{5.8}$$

$$\begin{aligned}\ln(Turnover_{i,t}) = {} & \delta_0 + \delta_1 \ln(Vol_{i,t}) + \delta_2 \ln(AS_{i,t}) + \delta_3 \ln(OP_{i,t}) + \delta_4 \ln(TickRatio_{i,t}) \\ & + \delta_5 \ln(StateShare_{i,t}) + \delta_6 \ln(LegalShare_{i,t}) + \delta_7 \ln(TradableShare_{i,t}) \\ & + \delta_8 \ln(TotalAssets_{i,t}) + \delta_9 \ln(DebtRatio_{i,t}) \\ & + \delta_{10} D_{A\_after} + \delta_{11} D_{B\_before} + \delta_{12} D_{B\_after} + \delta_{13} D_{H\_before} + \delta_{14} D_{H\_after} \\ & + \varepsilon_4,\end{aligned} \tag{5.9}$$

and

$$\begin{aligned}\ln(Vol_{i,t}) = {} & \eta_0 + \eta_1 \ln(Turnover_{i,t}) + \eta_2 \ln(AS_{i,t}) + \eta_3 \ln(OP_{i,t}) + \eta_4 \ln(TickRatio_{i,t}) \\ & + \eta_5 \ln(StateShare_{i,t}) + \eta_6 \ln(LegalShare_{i,t}) + \eta_7 \ln(TradableShare_{i,t}) \\ & + \eta_8 \ln(TotalAssets_{i,t}) + \eta_9 \ln(DebtRatio_{i,t}) \\ & + \eta_{10} D_{A\_after} + \eta_{11} D_{B\_before} + \eta_{12} D_{B\_after} + \eta_{13} D_{H\_before} + \eta_{14} D_{H\_after} \\ & + \varepsilon_5,\end{aligned} \tag{5.10}$$

where $Spread_{i,t}$ is the monthly proportional effective bid-ask spread for each stock i in each month t; $AS_{i,t}$ is the monthly adverse selection component as a percentage of stock price for each stock i in each month t; $OP_{i,t}$ is the natural log of the monthly order processing component as a percentage of stock price for each stock i in each month t; $Turnover_{i,t}$ is the monthly turnover rate over the number of the tradable shares outstanding for each stock i in each month t. $Vol_{i,t}$ is the monthly volatility of daily returns for each stock i in each month t; $StateShare_{i,t}$, $LegalShare_{i,t}$, and $TradableShare_{i,t}$ is the proportion of state ownership, legal-entity ownership, and specific tradable shares over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $TotalAssets_{i,t}$, in this study and are transformed into a natural log to account for distribution; $DebtRatio_{i,t}$, financial leverage, is the debt-to-asset ratio on stock i in month t as

measured by the book value of debt divided by the book value of total assets; D_{A_after} is equal to one for A-shares after February 2001, but otherwise equal to zero; D_{B_before} is equal to one for B-shares before February 2001, but otherwise equal to zero; D_{B_after} is equal to one for B-shares after February 2001, but otherwise equal to zero; D_{H_before} is equal to one for H-shares before February 2001, but otherwise equal to zero; D_{H_after} is equal to one for H-shares after February 2001, but otherwise equal to zero. The intercept captures the A-shares before February 2001.

5.4.4. OLS Regression Results

In order to obtain some preliminary insights into the determinants of bid-ask spread and its components, the ordinary least square (OLS) method is used in this section. However, the OLS regression ignores the potential endogeneity problem that exists in the relationships among spread, its components, the trading activities of firms and volatility of stock returns. A two-stage least squares simultaneous regression framework will be used in the next section to account for this potential endogeneity problem. The dependent variables in the OLS analysis include the effective bid-ask spread, its components (adverse selection costs and order processing costs) relative to price, the trading turnover rate, and the volatility of stock returns.

Table 5-4 presents the results of ordinary least squares (OLS) regressions (Newey West adjusted) of the dependent variables, namely the effective bid-ask spread, the adverse selection components, the order processing components, the trading turnover rate and the volatility of stock returns on the various variables in order to control for some of the spurious correlations. The monthly panel data provide opportunities to discover both the cross-sectional and time-series underlying implications. The findings reveal that the spread and its components are inversely related to the turnover, which means that more highly traded stocks have less informational problems and lower transaction costs. Since the variables are expressed in natural log form, the coefficients indicate that a 100 percent increase in transaction turnover will cause the spread to go down by around 23 percent. The results here on the negative relationship between transaction

cost and trading activity are generally consistent with the previous empirical results. The transaction costs are directly related to the risk associated with stock returns, which indicates there is more uncertainty regarding the value of high risk stocks, and the coefficients indicate that a 100 percent increase in risk will cause the spread to go up by around 21 percent. Consistent with the early literature, minimum tick size relative to the price level is positively related to the spread and its components. The relationships between the firm size, which is measured by accounting total assets, and the spread and its components, are negative and significant as anticipated. When looking at ownership variables, the proportion of tradable shares is negatively related to the spread and its components at a 5% significance level. Surprisingly, government ownership is also negatively related to the spread and the adverse selection components at a 5% significance level, but it is not related to the order processing component. The share ownership of legal entities has no impact on the spread and its components at all. The spread and adverse selection components are also inversely related to the financial leverage of the firms. When turnover rate and volatility are used as the dependent variables respectively, the results suggest a positive relationship between them. The spread components have a negative impact on turnover rate, but a positive impact on volatility. The turnover rate is negatively related to all the ownership variables. The volatility is positively related only to the proportion of the tradable shares. The findings suggest that the factors that affect the variation in the spread can also explain the differences of the spread components. The equations can explain 88.8% of the variations in the spread, 88.6% and 80% of the variations in its components, 61.9% of the variations in the turnover, and 57.9% of the variations in the volatility associated with the stock returns. All the five regression equations are estimated separately.

The five dummy variables represent A-shares after the B-share market opens, B-shares before and after the B-share market opens, and H-shares before and after the B-share market opens, and the intercepts of the regression capture A-shares before the market opens. A Wald test is used to compare the equality of the dummy variables' coefficients. The coefficient estimates of the dummy variables indicate that the spreads of H-shares and B-shares are significantly larger than that of A-shares before

February 2001 owning to the larger adverse selection costs of B-shares and H-shares and order processing costs of B-shares even after controlling for all the other factors. After February 2001, the order processing costs of B-shares are still larger than those of A-shares, and the adverse selection costs of B-shares are not significantly different from those of A-shares. For H-shares, although the order processing costs are lower than those of A-shares, the higher adverse selection costs cause the spread of H-shares to be larger than that of A-shares. Based on the summary statistics, A-shares have a higher bid-ask spread after February 2001, but after controlling for all the other factors, the bid-ask spread is actually lower than it was before February 2001.

Table 5-4: OLS regression results

	ln Bid-ask Spread	t-statistics	ln Lambda	t-statistics	ln Gamma	t-statistics
Adjusted RSq	0.8882		0.8862		0.7996	
intercept	-0.56636	-1.66 *	-1.49271	-4.02 **	-1.98729	-5.31 **
ln_turnover	-0.23026	-17.2 **	-0.29705	-18.11 **	-0.18811	-11.66 **
ln_volatility	0.21254	18.27 **	0.22848	15.06 **	0.22876	17.44 **
ln_tick_ratio	0.31775	10.3 **	0.27208	8.7 **	0.28949	9.37 **
ln_p_state_shares	-0.04208	-3.05 **	-0.07782	-3.91 **	-0.02014	-1.1
ln_p_legal_shares	-0.01623	-1.5	-0.00554	-0.39	-0.00764	-0.58
ln_p_tradable_shares	-0.22761	-13.72 **	-0.21593	-10.54 **	-0.18811	-11.19 **
ln_total_assets	-0.14466	-13.06 **	-0.19988	-14.96 **	-0.08611	-6.38 **
ln_de_ratio	0.02908	2.23 **	0.03954	2.23 **	0.01735	0.96
dummy_A_l	-0.05500	-1.8 *	-0.20817	-6.5 **	-0.24674	-8.82 **
dummy_B_b	0.77236	19.09 **	0.95936	17.75 **	0.76664	15.77 **
dummy_B_l	0.14930	5.67 **	0.03898	1.13	0.10338	3.55 **
dummy_H_b	0.94381	12.76 **	1.83770	17.3 **	-0.07023	-0.65
dummy_H_l	0.79781	10.69 **	1.67952	18.21 **	-0.27954	-2.66 **
Wald Test		**Chi-Square**		**Chi-Square**		**Chi-Square**
dummy_A_l=dummy_B_b		289.8 **		461.48 **		355.92 **
dummy_A_l=dummy_B_l		38.16 **		50.58 **		104.6 **
dummy_A_l=dummy_H_b		142.13 **		364.1 **		2.38
dummy_A_l=dummy_H_l		101.68 **		415.18 **		0.09
dummy_B_b=dummy_B_l		386.34 **		453.18 **		269.81 **
dummy_B_b=dummy_H_b		12.22 **		124.94 **		68.37 **
dummy_B_b=dummy_H_l		0.24		116.53 **		132.69 **
dummy_B_l=dummy_H_b		140.83 **		340.58 **		2.72 *
dummy_B_l=dummy_H_l		91.68 **		386.53 **		14.54 **
dummy_H_b=dummy_H_l		9.55 **		3.44 *		2.89 *

	ln Turnover	t-statistics	ln Volatility	t-statistics
Adjusted RSq	0.6195		0.5794	
intercept	-3.86691	-5.86 **	-0.26368	-0.5
ln_lambda_cost	-0.73892	-16.2 **	0.39371	9.3 **
ln_gamma_cost	-0.38230	-5.44 **	0.53821	10.39 **
ln_volatility	0.60524	23.6 **		
ln_turnover			0.50921	24.8 **
ln_tick_ratio	-0.01381	-0.22	-0.08173	-1.54
ln_p_state_shares	-0.08505	-2.32 **	0.05095	1.51
ln_p_legal_shares	-0.06649	-2.47 **	0.00826	0.35
ln_p_tradable_shares	-0.33584	-8.82 **	0.18766	5.6 **
ln_total_assets	-0.22069	-8.81 **	0.05101	2.34 **
ln_de_ratio	0.09317	2.88 **	0.05476	1.86 *
dummy_A_l	-0.67708	-12.96 **	0.31930	7.12 **
dummy_B_b	0.26161	2.15 **	-0.01508	-0.15
dummy_B_l	-0.24953	-4.15 **	0.48117	9.74 **
dummy_H_b	0.94957	4.04 **	0.42328	2.47 **
dummy_H_l	0.94596	4.82 **	0.43423	2.81 **
Wald Test		**Chi-Square**		**Chi-Square**
dummy_A_l=dummy_B_b		57.58 **		8.87 **
dummy_A_l=dummy_B_l		43.54 **		6.88 **
dummy_A_l=dummy_H_b		47.06 **		0.32
dummy_A_l=dummy_H_l		66.76 **		0.47
dummy_B_b=dummy_B_l		25.71 **		37.34 **
dummy_B_b=dummy_H_b		14.55 **		12.79 **
dummy_B_b=dummy_H_l		20.23 **		16.41 **
dummy_B_l=dummy_H_b		30.1 **		0.14
dummy_B_l=dummy_H_l		43.45 **		0.11
dummy_H_b=dummy_H_l		0		0.01

The OLS regressions results of Equations (5.6), (5.7), (5.8), (5.9) and (5.10) are reported, and comparison results of coefficients of dummy variables are reported by using a Wald test.

* and ** indicate significance at 10% and 5% levels, respectively.

5.4.5. Simultaneous Regression Results

Owing to the endogenous nature of turnover rate and volatility, in this section a four-equation two-stage or three-stage simultaneous estimating framework is introduced. The system of four equations is Equations (5.7), (5.8), (5.9), and (5.10). The estimate results are presented in Table 5-5, which summarizes the estimation results of the simultaneous determination of adverse selection costs, order processing costs, turnover rate, and volatility for the Chinese firms which issue both shares to domestic and international investors. The hypothesized variables jointly account for about 82.9% of the variation in adverse selection costs, 68.6% of the variation in order processing costs, 19.6% of the variation in turnover rate, and 52.1% of the variation in volatility. After controlling for the potential problem of endogeniety, the simultaneous regression results indicate that causality runs both ways between trading activities and the spread components, that lower transaction costs increase trading activities, and more active trading result in lower transaction costs. The results of most of the variables are consistent with those presented in Table 5-4. However, the results of the Wald test indicate that there is no change in the bid-ask spread components of the H-shares. Furthermore, the results suggest that after the opening of the B-share market, both the adverse selection and the order processing costs are lower than those of A-shares before February 2001. Also, the order processing costs component of H-shares are always lower than those on the A-shares market, which may suggest that the stock market in Mainland China does not operate efficiently compared to the Stock Exchange of Hong Kong, even though both markets are using an order-driven mechanism.

Table 5-5: Simultaneous regression results

	ln Lambda	t-statistics	ln Gamma	t-statistics	ln Turnover	t-statistics	ln Volatility	t-statistics
Adjusted RSq	0.8290		0.6858		0.1956		0.5209	
intercept	-1.32960	-2.98 **	-0.95686	-2.25 **	-2.51211	-3.11 **	1.09118	1.77 *
ln_lambda_cost					-1.03097	-10.58 **	0.39089	4.22 **
ln_gamma_cost					-1.26021	-11.15 **	1.08755	10.67 **
ln_turnover	-0.43286	-17 **	-0.36806	-16.31 **			0.60826	24.53 **
ln_volatility	0.52218	10.22 **	0.64006	17.68 **	1.41641	32.43 **		
ln_tick_ratio	0.19134	5.82 **	0.16682	4.85 **	0.35439	4.82 **	-0.23063	-4.04 **
ln_p_state_shares	-0.07917	-3.83 **	-0.04645	-2.24 **	-0.14213	-3.36 **	0.09192	2.67 **
ln_p_legal_shares	-0.01747	-1.17	-0.02028	-1.34	-0.04662	-1.45	0.03285	1.39
ln_p_tradable_shares	-0.20820	-9.53 **	-0.18947	-9.47 **	-0.45760	-9.65 **	0.29031	8.08 **
ln_total_assets	-0.15765	-10.71 **	-0.06609	-4.41 **	-0.25806	-8.18 **	0.13647	5.35 **
ln_de_ratio	0.02449	1.18	0.01358	0.7	0.05397	1.37	-0.01993	-0.69
dummy_A_l	-0.27385	-7.76 **	-0.34671	-10.79 **	-0.78372	-12.38 **	0.51133	11.16 **
dummy_B_b	0.67779	8.39 **	0.36850	6.01 **	1.06004	6.45 **	-0.57339	-4.52 **
dummy_B_l	-0.16288	-3.05 **	-0.21326	-5.34 **	-0.49544	-6.38 **	0.36955	7.09 **
dummy_H_b	1.39404	10.16 **	-0.44998	-3.42 **	0.85027	3.04 **	0.05307	0.22
dummy_H_l	1.35210	11.33 **	-0.64198	-5.26 **	0.49784	1.8 *	0.30169	1.25
Wald Test		**Chi-Square**		**Chi-Square**		**Chi-Square**		**Chi-Square**
dummy_A_l=dummy_B_b		159.83 **		130 **		114.77 **		60.81 **
dummy_A_l=dummy_B_l		4.94 **		9.95 **		11.05 **		4.8 **
dummy_A_l=dummy_H_b		155.46 **		0.58		33.36 **		3.55 *
dummy_A_l=dummy_H_l		197.15 **		5.61 **		21.02 **		0.73
dummy_B_b=dummy_B_l		280.73 **		193.15 **		150.69 **		83.95 **
dummy_B_b=dummy_H_b		63.76 **		57.17 **		1.07		12.55 **
dummy_B_b=dummy_H_l		82.97 **		98.78 **		7.11 **		20.47 **
dummy_B_l=dummy_H_b		192.58 **		3.97 **		28.29 **		2.04
dummy_B_l=dummy_H_l		252.05 **		14.38 **		15.36 **		0.09
dummy_H_b=dummy_H_l		0.19		2.18		4.47 **		3.29 *

The simultaneous 2SLS regression model results of Equations (5.6), (5.7), (5.8), (5.9) and (5.10) are reported, and comparison results of coefficients of dummy variables are reported by using a Wald test.

Table 5-5 (Continued) *, ** represent 10 percent and 5 percent significant levels, respectively.

5.5. Conclusion

This chapter decomposes the bid-ask spreads in a segmented stock market using two different electronic limit order books. High-frequency intraday data of Chinese listed companies, which issue both A-shares and B-shares to domestic and foreign investors, and issue both A-shares on two domestic stock exchanges and H-shares on the Stock Exchange of Hong Kong, are analyzed, over a seventeen-month period from April 2000 to December 2001. This study provides empirical evidence of the bid-ask spread components generated from one of the world's largest order-driven markets. The use of electronic public limit order books in an order-driven market structure has been growing rapidly in recent years for both equity and derivative security markets. Improvements in information technology and ongoing deregulation of financial markets suggest this trend will continue. To date, reported bid-ask spread decompositions rely almost exclusively on data from quote-driven systems. The purpose of this study is to extend the spread decomposition literature into the order-driven environment.

In February 2001, the Chinese government started to allow domestic Chinese investors with foreign currency to invest in B-shares. After this event, the bid-ask spread and its components on the B-share market decreased dramatically, and the trading activity on this market increased significantly. Based on a sample of 7,912,049 observations for A-shares, 3,128,355 observations for B-shares, and 892,355 observations for H-shares, Lin et al.'s (1995) model is used to decompose the effective bid-ask spread. The spread, its components, the trading turnover rate and volatility associated with stock returns are compared cross-sectionally across the A-shares, the B-shares and H-shares. The comparison across these stocks was also conducted in a time-series manner before and after new Chinese regulation. Several pooled regressions are conducted to analyze the determinants of the spread and its components, and also to investigate the inter-relationship between the transaction costs, trading activities, and risk of stock returns. By controlling for all the other factors, I am able to further

compare all the variables time-serially and cross-sectionally using a simultaneous pool regression framework.

The estimates of spread components are generally within the range of previously reported quote-driven estimates, although there exists a large dispersion of estimates within the literature. The results also indicate that the variables that determine the entire spread also determine its components. The results support the view that there is an inverse interactive relationship between transaction costs and trading activities. The model indicates that in the B-share and H-share markets, the bid-ask spread has a higher proportion of adverse selection components. The results suggest that the H-share market has a lower liquidity and a higher transaction cost, and this higher proportion of trading costs is due to the adverse selection cost component, even though the order processing costs in this market are the lowest. Adverse selection costs are an indication of the degree of asymmetric information regarding the true value of stock and the probability that informed traders can capitalize on this asymmetric information (Ness, Ness, and Warr, 2001). Previous literature hypothesizes that adverse selection costs become greater when more or better information hits the market or when the ratio of informed traders to liquidity traders increases. Since the adverse selection component of the bid-ask spread can be treated as a proxy for the information asymmetry of the share, the results suggest that the H-share market has the highest level of information asymmetry. When investing in the Chinese equity market, foreign investors may realize that it is more difficult for them to access and assess information about local Chinese firms than it is for local investors. This may be due to the language barriers, different accounting standards, and insufficient reliable information about the local firms and economy (Chakravarty, Sarkar and Wu, 1998). In contrast, , domestic investors have the advantage of accessing local information sources on an informal basis, sources to which non-resident investors do not have access (Chakravarty, Sarkar and Wu, 1998).

Opening the B-share market to domestic Chinese investors reduces the level of market segmentation, and increases the investor base. Increasing the market competition

among the liquidity suppliers could lead to a lower order processing component (Hamilton, 1978; Demsetz, 1968; and Weston, 2000). The effects of competition on the adverse selection component should decrease as the costs of adverse selection would be shared by more uninformed investors. Huang and Stoll (1996) claim that competition among multiple dealers results in smaller adverse selection costs on NASDAQ, and this negative relationship is further supported by Affleck-Graves, Hegde, and Miller (1994). The underlying implication is that the reduction of the level of market segmentation on the B-share market improves the market trading conditions, but at the same time transaction costs increase, and trading activities decrease on the corresponding A-shares owing to the substitution effect.

In this chapter, I have investigated the bid-ask spread only of companies that issue both A-shares and B-shares, and both A-shares and H-shares. A natural extension would be to analyse the intraday variation in components of bid-ask spread, to compare the bid-ask spread components between the two exchanges in China, or do an 'events study' to assess the effect of information release on spread components. The B-share price discount, relative to its corresponding A-shares, has decreased significantly, and further research on the price discount after the new Chinese regulation is also necessary. Further research is clearly warranted.

CHAPTER 6

Does Foreign Ownership have an Impact on the Domestic Return Volatility: A Study in China

6.1. Introduction

The nature of corporate ownership structure in China is quite different to that of Anglo-Saxon and German-Japanese origin[56]. The ownership structure of firms in China is normally assigned by government bureaucrats during the transition of firms from state-owned enterprises to shareholding companies. Even after partial privatization (or listing), the majority of shares of most listed firms are non-tradable and belong to the state or legal-entities (institutional investors). When setting up the stock market, the Chinese government had concerns from the outset about the negative impact of foreign capital flows. On the other hand, the government also sought to attract foreign investors to enter the stock market. The purpose of this is not only to provide equity capital investment, but also to improve the quality of management in these listed firms. A segmented market between domestic and foreign investors therefore developed in China. The Chinese government allows certain listed firms to issue tradable foreign shares (B-shares) on one of the two domestic stock exchanges in China, and certain firms to issue shares known as H-shares on the Stock Exchange of Hong Kong[57]. In addition, some foreign institutional investors hold specific non-tradable legal-entity shares. All these foreign-owned shares have the same monetary claims and voting rights as A-shares traded on the two domestic stock exchanges, which are only available to domestic investors, and other non-tradable shares held by the state or domestic legal-entities. This kind of ownership structure has the effect of partially opening the Chinese equity market, while also maintaining government control over

[56] There are some survey papers on corporate governance, such as Denis (2001) and Shleifer and Vishny (1997) on general corporate governance; Denis and McConell (2003) on international corporate governance; Bekaert and Harvey (2003) on the emerging markets; Claessens and Fan (2002) on the Asia.

[57] A few companies issue N-shares on the New York Stock Exchange (NYSE). Owing to the small of number of such companies and lack of relevant data, they are not included in this study.

international capital flows within the market. This mechanism ensures that international capital flows would only have a limited direct impact on the domestic Chinese stock markets, since these markets are segmented from the international markets as a result of government regulations. However, investors in either domestic or international markets are able to observe market information, such as transaction prices, trading activities, and market information transfers from one investor group to another.

Most of the previous studies on corporate governance issues in China concentrate on analysing the relationship between ownership structure and firm performance (see Xu and Wang, 1999; Qi, Wu, and Zhang, 2000; Chen, 2001; and Sun and Tong, 2003). There are also some other empirical studies on Chinese corporate governance-related issues, such as Che and Qian (1998), Gul (1999), and Liu and Woo (2001). To the best of my knowledge, no study has been done on examining the relationship between ownership structure and domestic market volatility, especially the impact of foreign ownership on A-share return volatility in China. The unique Chinese ownership structure provides an opportunity to examine the impact of different foreign ownership on domestic market return volatility.

International capital flows are blamed as one of the reasons for the 1997 Asia financial crisis (see Mahathir, 1997; Radelet and Sachs, 1998; and Stiglitz, 1998). The argument is that the rapid movement of international capital flows results in large price fluctuations in an illiquid emerging market (Bae, Chan, and Ng, 2004). However, owing to market segmentation, the domestic stock market (A-share market) in China does not suffer directly from the impact of international capital flows. The purpose of the Chinese government in establishing this segmented market mechanism is to limit the exposure of the domestic equity market to international capital flows. Therefore, the question raised here is whether the return volatility on the domestic Chinese market is still subject to the influence of foreign investors. In this chapter, a cross-sectional approach is used to study the impact of ownership structure, especially foreign ownership, on the segmented Chinese domestic equity market, by examining the

relationship between a firm's ownership structure and its domestic A-share return volatility.

Bae et al. (2004) provide one of the few studies to use a cross-sectional approach to investigate the impact of foreign equity investments on emerging markets. They examine the relationship between a share's accessibility to foreigners or 'investibility' and its return volatility. The investiblity measurement used by Bae et al. (2004) is the foreign ownership limit for different securities. As they recognize, one of the drawbacks of this measurement is that the degree of investibility is not necessarily a good surrogate for the actual proportion of foreign ownership, since not every stock reaches its foreign ownership limitation. As a result it may be difficult to identify systematic patterns between foreign ownership and stock return volatility. Instead, in this chapter, the exact figures of foreign ownership are used. Furthermore, foreign investors are able to invest in listed Chinese firms by owning different types of shares, namely B-shares, H-shares, or non-tradable legal-entity shares. The different kinds of foreign ownership may have a different impact on domestic market volatility. Bae et al. (2004) also indicate that investibility may be correlated with some other characteristics of the firms (or, some other firm characteristics could affect stock volatility). Therefore, in this chapter, all other characteristics are controlled for, to isolate the impact of foreign ownership on the return volatility of these firms.

This study is developed at the individual firm level, and the foreign ownership level is used directly to examine how foreign ownership would explain cross-sectional variations in the individual firm's domestic stock return volatility and its correlation with the world market. Based on different foreign ownership types, all the A-share companies are classified into different groups as follows: companies without any foreign ownership; companies that have foreign ownership in the form of non-tradable shares; companies that issue foreign-owned tradable B-shares on one of the two domestic stock exchanges in Shanghai and Shenzhen; and companies that issue foreign-owned tradable H-shares on the Stock Exchange of Hong Kong. The findings of this chapter indicate that the A-shares of companies which have foreign ownership,

especially tradable foreign ownership, are subject to more return volatility. Furthermore, the trading location of the foreign ownership also has a differing impact on domestic return volatility. Firms which issue H-shares on the Stock Exchange of Hong Kong are associated with a higher positive sensitivity to foreign ownership. After decomposing the return volatility into systematic risk and idiosyncratic risk, I find that foreign ownership does not have the same impact on idiosyncratic risk as on total risk, which implies that the major impact of foreign ownership is on the systematic risk part of return volatility. Although the Chinese equity market is segmented, the transformation of market information might induce those shares with tradable foreign ownership to become more integrated with the world market, and also to experience increased world market risk.

The remainder of the chapter is organized as follows. Section 6.2 describes the data and presents preliminary statistics. Section 6.3 discusses the empirical model and the variables used in the study, as well as presenting the empirical results. Section 6.4 summarizes the main results and draws the conclusions.

6.2. Data

The Chinese data used in this chapter are collected from the Shenzhen Guo Tai An Information Technology Co. database which covers all shares in China, and the sample period is from December 1993 to January 2002. The world market index and the Asian market index are from Datastream.

The sample consists of all the listed companies in China which issued A-shares (the tradable domestic shares) on the Shanghai and Shenzhen stock exchanges over the sample period. Among them, some firms issued B-shares, H-shares, and some had non-tradable foreign ownership. Table 6-1 provides summary of the number of these listed companies in China between December 1993 and December 2001. The number of listed companies which issued A-shares in China increases dramatically from 176 at the end of 1993 to 1135 at the end of 2001. The number of companies issuing both

A-shares and B-shares rose from 25 to 88 during the same period. There are only three companies issuing both A-shares and H-shares at the end of 1993, and that number increased to 25 at the end of 2001[58]. Some foreign institutional investors own non-tradable legal-entity shares in Chinese listed companies, and there are seventeen of these at the end of 1993 and 52 at the end of 2001. In December 1993, nine companies have both foreign ownership of B-shares and non-tradable shares, while eight companies have this kind of foreign ownership in December 2001. No company has both foreign ownership of H-shares and non-tradable shares during the sample period.

Table 6-1: Number of listed companies which issue A-shares in China

Year	Firms issuing B-shares	Firms issuing H-shares	Firms with Non-tradable Foreign Ownership	Firms with B-shares and Non-tradable Foreign Ownership	Sub Total Firms with Foreign Ownership	Total
1993	35	3	17	9	46	176
1994	54	6	26	14	72	287
1995	58	11	26	13	82	311
1996	69	14	38	14	107	514
1997	76	17	41	14	120	719
1998	80	18	27	9	116	824
1999	82	19	23	8	116	919
2000	86	19	49	13	141	1,059
2001	88	25	52	8	157	1,135

The data is from December 1993 to December 2001. The Table presents the total number of firms in the sample, the number of firms which issue both A-shares and B-shares on the Shanghai or Shenzhen stock exchanges, the number of firms which issue both A-shares in Mainland China and H-shares on the Stock Exchange of Hong Kong, and the number of the A-share firms which have non-tradable foreign ownership at the end of each year.

Table 6-2 presents the summary statistics of foreign ownership as a percentage of the total number of shares outstanding during the sample period[59]. The proportion of B-share ownership ranges from 7.08% to 49.94%, and the average proportion of H-share ownership is around 30%. Between 1994 and 2001, the average proportion of non-

[58] Tianjin Zhongxin Pharmaceutical Co. (local stock code: 600329) issued A-shares in Shanghai, and also issued shares on the Singapore Stock Exchange. This firm's foreign tradable shares are treated as H-shares in the following analyses.

[59] When calculating the average, only firms which have a specific foreign ownership category are included.

tradable foreign shares ranges from 15.5% in 1999 to 26.3% in 1995. During the entire sample period, no company in China has foreign ownership of any single category (B-shares, H-shares or non-tradable shares) of more than 50%[60].

Table 6-2: Summary statistics of foreign ownership

	Month	No firms	Mean	Std	Min	Max	Med
B-shares	1993-Dec	35	23.56	9.88	7.08	41.12	24.52
	1994-Dec	54	26.54	10.39	7.08	47.68	26.88
	1995-Dec	58	26.74	9.97	8.88	47.68	27.23
	1996-Dec	69	27.90	9.55	8.88	47.68	27.90
	1997-Dec	76	28.56	9.83	8.88	48.21	27.62
	1998-Dec	80	28.90	9.85	8.88	48.21	28.05
	1999-Dec	82	28.53	10.33	8.88	49.94	27.31
	2000-Dec	86	28.05	9.79	8.88	49.94	27.31
	2001-Dec	88	29.20	9.76	8.88	49.94	27.62
H-shares	1993-Dec	3	32.44	5.81	26.97	38.54	31.82
	1994-Dec	6	29.06	5.23	25.00	38.54	26.69
	1995-Dec	11	30.72	5.24	25.00	38.54	29.54
	1996-Dec	14	32.22	5.58	25.00	42.66	31.37
	1997-Dec	17	32.58	5.13	25.00	42.66	32.20
	1998-Dec	18	32.59	4.98	25.00	42.66	32.44
	1999-Dec	19	33.31	5.77	25.00	46.33	32.69
	2000-Dec	19	32.32	5.38	25.00	46.33	31.82
	2001-Dec	25	30.70	5.67	19.35	46.33	30.15
Nontradable foreign	1993-Dec	17	25.02	10.78	3.84	44.84	25.00
	1994-Dec	26	26.16	11.23	3.84	44.84	25.55
	1995-Dec	26	26.34	10.36	3.70	43.17	25.42
	1996-Dec	38	24.65	11.08	2.00	46.13	25.07
	1997-Dec	41	23.92	10.79	2.00	46.13	25.00
	1998-Dec	27	18.28	11.78	0.59	43.17	19.90
	1999-Dec	23	15.55	13.66	0.00	43.17	16.70
	2000-Dec	49	17.90	11.25	0.00	46.16	17.08
	2001-Dec	52	18.69	11.14	0.00	46.16	18.37

The data is from December 1993 to December 2001. The Table presents summary statistics of foreign ownership for listed Chinese A-share companies at the end of each year. Foreign ownership is measured as a percentage of the number of foreign-owned shares relative to the total number of shares outstanding, and only firms which belong to the specific foreign ownership category are included in the calculation.

Unit: %

[60] There are six firms in the sample where the total foreign ownership of both B-shares and non-tradable legal-entity shares exceeds 50%.

The volatility measurement used in this chapter is calculated as the monthly average of the squared daily continuously compounded close-to-close return[61], as follows:

$$VOL_{i,t} = [\ln(\frac{P_{i,t}}{P_{i,t-1}})]^2 .$$

In Table 6-3, summary statistics of the return volatility are tabulated, and include the mean, dispersion, and median of monthly return volatility. The entire sample period is further divided into four sub-periods: before the 1997 Asian financial crisis, from January 1994 to June 1997; during the 1997 Asian financial crisis, from July 1997 to June 1998; after the Asian financial crisis, from July 1998 to January 2001; and after the opening of the B-share market to domestic Chinese investors, from February 2001 to January 2002. During the whole sample period, the average A-share return volatility of companies issuing only A-shares is 0.00096. This is lower than for other companies with foreign ownership. However, during the first sub-period, the average A-share return volatility of companies issuing A-shares is only lower than the volatility of companies that have non-tradable foreign ownership. During the 1997 Asian financial crisis, those companies which solely issue A-shares have the second lowest A-share return volatility. During the third sub-sample period, the average A-share return volatility of companies issuing solely A-shares is lower than for companies which have tradable foreign ownership. After the opening of the B-share market to the Chinese domestic investor in February 2001, the average A-share return volatility of companies issuing both A-shares and B-shares is 0.108. This it is higher than both that of the companies issuing A-shares only or the companies issuing both A-shares and H-shares. It should be noted that the results of the whole sample are largely influenced by high volatility during the first sub-sample period. The summary statistics also indicate that the distribution of return volatility here is highly skewed, so the natural logarithm form of return volatility is used in later analyses in order to normalize the distribution.

[61] The daily return variance is also calculated for each stock on each month, and the correlation between these two measurements is 99.47% during the sample period.

Table 6-3: Summary statistics of return volatility

Shares	Period	Mean	Std	Med
A-shares only	Jan 1994 to Jun 1997	0.00186	0.00251	0.00111
B-shares only		0.00172	0.00223	0.00099
H-shares only		0.00174	0.00274	0.00093
Non-tradable foreign shares		0.00191	0.00235	0.00117
B- and Non-tradable foreign shares		0.00164	0.00192	0.00097
A-shares only	Jul 1997 to Jun 1998	0.00083	0.00053	0.00070
B-shares only		0.00080	0.00054	0.00064
H-shares only		0.00085	0.00066	0.00061
Non-tradable foreign shares		0.00088	0.00054	0.00080
B- and Non-tradable foreign shares		0.00087	0.00054	0.00076
A-shares only	Jul 1998 to Jan 2001	0.00076	0.00077	0.00050
B-shares only		0.00081	0.00073	0.00058
H-shares only		0.00079	0.00067	0.00057
Non-tradable foreign shares		0.00076	0.00076	0.00053
B- and Non-tradable foreign shares		0.00089	0.00081	0.00061
A-shares only	Feb 2001 to Dec 2002	0.00059	0.00066	0.00035
B-shares only		0.00069	0.00103	0.00043
H-shares only		0.00057	0.00064	0.00033
Non-tradable foreign shares		0.00058	0.00060	0.00035
B- and Non-tradable foreign shares		0.00058	0.00052	0.00039
A-shares only	All period	0.00096	0.00138	0.00056
B-shares only		0.00108	0.00148	0.00065
H-shares only		0.00101	0.00158	0.00061
Non-tradable foreign shares		0.00108	0.00151	0.00065
B- and Non-tradable foreign shares		0.00122	0.00149	0.00075

The data is from January 1994 to January 2002. The Table presents summary statistics of Chinese domestic A-share return volatility. All A-shares companies are categorized into five groups: the companies which issue A-shares only; companies which have both A-shares and B-shares; companies which have both A-shares and H-shares; companies which have both A-shares and non-tradable foreign ownership; and companies which have A-shares, B-shares, and non-tradable foreign ownership. The entire sample period is further divided into four sub-periods, which are: before the 1997 Asian financial crisis, from January 1994 to June 1997; during the 1997 Asian Financial Crisis, from July 1997 to June 1998; after the Asian financial crisis, from July 1998 to January 2001; and after the opening of the B-share market to domestic Chinese investors, from February 2001 to January 2002.

6.3. Empirical Model and Results

6.3.1. Relationship between Foreign Ownership and Return Volatility

All the listed firms which issue A-shares in China are analysed to investigate whether there is a relationship between foreign ownership and domestic return volatility. In order to single out the influence of foreign ownership on the return volatility of domestic A-shares, several control variables are included in the regression. The following time-series and cross-sectional regression is estimated:

$$\begin{aligned}\ln(Vol_{i,t+1}) = {} & \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} \\ & + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares \text{ and } Non-tradable} \\ & + \beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}) \\ & + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},\end{aligned} \tag{6.1}$$

$$\text{subject to } \sum_{k=1}^{21} \gamma_k = 0,\ \sum_{k=1} \delta_k = 0, \text{ and } \sum_{k=1}^{2} \tau_k = 0,$$

where $Vol_{i,t+1}$ is the monthly volatility of A-share daily returns on stock i in month $t+1$, $Dummy_{B-shares}$, $Dummy_{Non-tradable}$, $Dummy_{H-shares}$, $Dummy_{B-shares \text{ and } Non-tradable}$ are dummy variables for companies which also have B-shares, non-tradable shares, H-shares, and both B-shares and non-tradable shares respectively. $ST_{i,t}$ and $LP_{i,t}$ is the proportion of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, $Month_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry[62], month, and exchange[63]. All dummy variables are

[62] Industry classification is based on the China Securities Regulatory Commission (CSRC) standards, and there are 21 industries altogether.

[63] All the A-shares are traded either on the Shanghai Stock Exchange or the Shenzhen Stock Exchange.

set to one if the observation of the dependent variable belongs to the relevant category, and zero otherwise. Restrictions, i.e. that the sum of the coefficients of the dummy variables is equal to zero, are imposed on industry, month, and exchange dummy variables in order to avoid the situation of perfect multicollinearity.

The estimate of intercept, α, reflects the average A-share return volatility level of companies which have no foreign ownership, and the coefficients of foreign ownership dummy variables show the deviation of return volatility of companies that have different foreign ownership. The regression is estimated by using generalized method of moments (GMM) procedure (Hansen, 1982), which impose very weak distribution assumptions. The GMM procedure also adjusts for the general form of autocorrelation and/or conditional heteroskedasticity that may be presented in the data set (Menyah and Paudyal, 2000).

Table 6-4 presents the parameter estimates of the regression, and the regression is also estimated for each sub-sample period. Over the entire sample period, the results indicate that return volatility is positively related to foreign ownership. The coefficient estimates of $Dummy_{B-shares}$, $Dummy_{Non-tradable}$, $Dummy_{H-shares}$, and $Dummy_{B-shares \text{ and } Non-tradable}$ are 0.0932, 0.023, 0.1207, and 0.1221 respectively, and are all significantly different from zero. During the first sub-sample period, from January 1994 to June 1997, the A-share return volatility is positively and significantly related only to the non-tradable foreign ownership dummy variable. During all the other sub-sample periods, the A-share return volatility is positively and significantly related to all foreign ownership dummy variables, except the dummy variable which stands for companies with only non-tradable foreign ownership. The results of the Wald test on equality of the coefficient estimates indicate that during and after the 1997 Asian financial crisis, the coefficient estimate of the H-share dummy variable is significantly greater than that of the B-shares. However, after the opening of the B-share market, the coefficient estimate of the B-share dummy variable is significantly greater than that of H-share.

The coefficient estimates of state and legal-entity ownership are inconsistent, and over the entire sample period both coefficient estimates are non-significant. They are only significant over two out of the four sub-sample periods, but these coefficient estimates are positively related to the A-share return volatility in one sub-sample period, and negative in another. Overall, the findings suggest the proportions of government and legal-entity ownership have no impact on A-share return volatility. The results of other share characteristics are consistent with general expectations. The A-share return volatility is positively related to both A-share turnover rate and the financial leverage ratio, and inversely related to firm size. The adjusted R-square of the regression for the overall sample is 65.95%, and the adjusted R-squares for the regression over sub-periods range from 40.8% to 70.96%.

Table 6-4: Regression results of A-share return volatility on foreign ownership dummy variables and other stock characteristics

	All		Jan 1994 to Jun 1997		Jul 1997 to Jun 1998		Jul 1998 to Feb 2001		Mar 2001 to Jan 2002	
Independent Variables	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	-5.7620	-87.84**	-6.4227	-51.19**	-4.9325	-29.11**	-5.1108	-21.61**	-5.5640	-37.12**
trab_dummy (p1)	0.0932	9.91**	-0.0132	-0.79	0.0691	3**	0.1509	9.04**	0.2113	8.69**
foreign_nontra_dummy (p2)	0.0230	1.7*	0.0516	2.08**	0.0405	1.32	0.0384	1.62	-0.0204	-0.67
trah_dummy (p3)	0.1207	6.41**	0.0101	0.25	0.1951	3.77**	0.2416	7.18**	0.0836	2.18**
b_nontra_dummy (p4)	0.1221	6.51**	-0.0213	-0.75	0.1752	4.27**	0.2412	6.75**	0.2405	4.34**
p_state_shares	-0.0116	-0.57	0.0855	2.15**	0.0368	0.71	-0.0724	-2.35**	0.0236	0.51
p_legal_shares	-0.0225	-1.11	0.0683	1.72*	-0.0260	-0.49	-0.0903	-3.01**	0.0209	0.46
lg_total_assets	-0.0655	-19.51**	-0.0147	-2.24**	-0.1146	-13.3**	-0.1073	-8.94**	-0.0996	-13.48**
leverage_ratio	0.2322	15.27**	0.0226	0.74	0.3643	9.99**	0.2425	10.39**	0.2948	8.1**
lg (turnover)	0.2020	45.92**	0.1776	20.6**	0.1940	20.1**	0.1994	27.14**	0.1861	18.74**
Wald Test										
Chi Square Test for p1 = p2		20.14**		5.31**		0.62		15.3**		38.45**
Chi Square Test for p1 = p3		1.96		0.34		5.66**		8.46**		9.36**
Chi Square Test for p1 = p4		2.46		0.08		6.19**		6.63**		0.28
Chi Square Test for p2 = p3		18.66**		0.81		6.92**		24.37**		4.81**
Chi Square Test for p2 = p4		20.61**		4.55**		8.42**		23.42**		18.18**
Chi Square Test for p3 = p4		0		0.47		0.1		0		5.75**
Adjusted R Square	0.6595		0.7096		0.408		0.5607		0.5938	

Table 6-4 (Continued) Pooled regression of monthly return volatility on foreign ownership dummy variables, proportion of state ownership, proportion of legal-entity ownership, firm size, financial leverage, trading turnover, industry, time and exchange dummy variables.

The following time-series and cross-sectional regression model is estimated:

$$\begin{aligned}\ln(Vol_{i,t+1}) = {} & \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} \\ & + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares \text{ and } Non-tradable} \\ & + \beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}) \\ & + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},\end{aligned}$$

subject to $\sum_{k=1}^{21} \gamma_k = 0$, $\sum_{k=1} \delta_k = 0$, and $\sum_{k=1}^{2} \tau_k = 0$.

The dependent variable here, $\ln(Vol_{i,t+1})$, is the natural log of monthly A-share return volatility for each share in each month. $Dummy_{B-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-shares and B-shares. $Dummy_{H-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-shares and H-shares. $Dummy_{Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t only has non-tradable foreign ownership. $Dummy_{B-shares \text{ and } Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t both issues B-shares and has foreign non-tradable ownership. $ST_{i,t}$ and $LP_{i,t}$ are the proportions of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, $Month_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry, month, and exchange.

*, ** represent 10 percent and 5 percent significance levels, respectively.

In order to investigate the relationship between A-share return volatility and the proportional foreign ownership as a percentage of total number of shares outstanding, the following times-series and cross-sectional regression[64] is also estimated. Only companies that have foreign ownership are included here.

$$\begin{aligned}\ln(Vol_{i,t+1}) = {} & \alpha + \rho_1 P_{B-shares} + \rho_2 P_{Non-tradable} + \rho_3 P_{H-shares} \\ & + \beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}) \\ & + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,i} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},\end{aligned} \tag{6.2}$$

subject to $\sum_{k=1}^{21} \gamma_k = 0$, $\sum_{k=1} \delta_k = 0$, and $\sum_{k=1}^{2} \tau_k = 0$,

where $P_{B-shares}$ is the proportion of B-shares over the total number of shares outstanding, $P_{Non-tradable}$ is the proportion of non-tradable foreign-owned legal-entity shares over the total number of shares outstanding, and $P_{H-shares}$ is the proportion of B-shares over the total number of shares outstanding. All the other variables are the same as defined in Equations (6.1).

The regression results are presented in Table 6-5. Although the overall coefficient estimates of foreign ownership dummy variables are positively and significantly related to A-share return volatility, during each sub-sample period the results are not as strong as those in Table 6-4 which are obtained using foreign ownership dummy variables. In all cases, each category of foreign ownership is lower than 50% of the total ownership, which gives no foreign investor group control over any listed firms in China. The results suggest that the proportion of foreign ownership has little direct impact on Chinese domestic market volatility, but what matters is the existing market information resulting from tradable foreign-owned shares.

[64] From February 2001, domestic investors in China who hold foreign currency were eligible to purchase B-shares. Therefore, there is a drawback in this study in using the proportion of B-shares as a proxy for foreign ownership, since after that time a proportion of B-shares are owned by domestic investors in China. However, it should not have an impact on the results using the dummy variable as an indication of firms' foreign ownership.

Table 6-5: Regression results of A-share return volatility on proportional foreign ownership and other stock characteristics

	All		Jan 1994 to Jun 1997		Jul 1997 to Jun 1998		Jul 1998 to Feb 2001		Mar 2001 to Jan 2002	
Independent Variables	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	-5.8672	-34.7**	-6.5224	-22.31**	-4.4899	-9.97**	-5.8665	-15.35**	-5.3677	-12.7**
p_B-shares	0.1744	2.44**	-0.2428	-1.61	0.0024	0.01	0.1596	1.4	0.6893	4.3**
p_H-shares	0.2516	2.82**	-0.1309	-0.59	0.3703	1.57	0.2826	1.98**	0.3253	1.68*
p_Non-tradable foreignshares	0.3269	3.71**	0.1672	1	0.2853	1.24	0.4435	2.87**	0.0123	0.05
p_state_shares	0.3296	5.34**	0.2818	2.25**	0.3816	2.24**	0.3805	3.8**	0.2059	1.54
p_legal_shares	0.3470	5.22**	0.3190	2.41**	0.4332	2.37**	0.3257	3.02**	0.1839	1.25
lg_total_assets	-0.0699	-8.23**	-0.0162	-1.04	-0.1486	-6.37**	-0.0790	-4.14**	-0.1127	-5.62**
leverage_ratio	0.2562	6.22**	0.0956	1.17	0.5598	4.81**	0.2633	4.68**	0.2204	2.73**
lg (turnover)	0.1981	18.73**	0.1659	10.01**	0.1649	6.41**	0.2150	11.08**	0.1700	6.56**
Wald Test										
Chi Square Test for p1 = p2		1.45		0.59		5.13**		1.52		5.96**
Chi Square Test for p1 = p3		5.47**		14.42**		3.65*		4.8**		12.87**
Chi Square Test for p2 = p3		0.72		2.99*		0.17		0.94		1.72
Adjusted R Square	0.6510		0.7199		0.4540		0.5184		0.5675	

Table 6-5 (Continued) Pooled regression of monthly return volatility on foreign ownership dummy variables, proportion of state ownership, proportion of legal-entity ownership, firm size, financial leverage, trading turnover, industry, time and exchange dummy variables.

The following time-series and cross-sectional regression model is estimated:

$$\ln(Vol_{i,t+1}) = \alpha + \rho_1 P_{B-shares} + \rho_2 P_{Non-tradable} + \rho_3 P_{H-shares} + \beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}), + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,i} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},$$

subject to $\sum_{k=1}^{21} \gamma_k = 0$, $\sum_{k=1} \delta_k = 0$, and $\sum_{k=1}^{2} \tau_k = 0$.

The dependent variable here, $\ln(Vol_{i,t+1})$, is the natural log of monthly A-share return volatility for each share in each month. $P_{B-shares}$ is the proportion of B-shares over the total number of shares outstanding, $P_{Non-tradable}$ is the proportion of non-tradable foreign-owned legal-entity shares over the total number of shares outstanding, and $P_{H-shares}$ is the proportion of B-shares over the total number of shares outstanding. $ST_{i,t}$ and $LP_{i,t}$ are the proportions of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, $Month_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry, month, and exchange.

*, ** represent 10 percent and 5 percent significance levels, respectively.

6.3.2. Risk Decomposition

The results so far show that the existence of foreign ownership, especially tradable foreign ownership, has a positive impact on domestic share return volatility in China. The international market impact could be a possible explanation. In this section, the total return volatility is decomposed into systematic risk and idiosyncratic risk, and then the relationship of idiosyncratic risk to foreign ownership is examined.

Bae et al.'s (2004) decomposition method is applied here, and the systematic variation is assumed to be driven by foreign ownership dummy variables, proportion of state ownership, proportion of legal-entity ownership, firm size, financial leverage, turnover rate and industry and exchange dummy variables, cross-sectionally. For a particular

month $t+1$, the return of an individual stock i is regressed against these stock characteristics in month t. The return regression is as follows:

$$\begin{aligned} r_{i,t+1} = {} & \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} \\ & + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares \text{ and } Non-tradable} \\ & + \beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}), \\ & + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + e_{i,t+1}, \end{aligned} \tag{6.3}$$

$$\text{subject to } \sum_{k=1}^{21} \gamma_k = 0, \text{ and } \sum_{k=1}^{2} \tau_k = 0,$$

where $r_{i,t+1}$ is the A-share monthly return on stock i in month $t+1$, $e_{i,t}$ is the idiosyncratic return with a zero mean and no cross-correlation, and the other variables are the same as defined in Equation (6.1). After estimating Equation (6.3) for every month, a time series of the idiosyncratic returns for stock $i(e_{i,t})$ is obtained. Then, $\ln(e_{i,t+1}^2)$ is used as the dependent variable regressed against foreign ownership dummy variables and other firm characteristic variables in Equation (6.1) in order to examine the relationship between idiosyncratic risk and foreign ownership. The results presented in Table 6-6 indicate that over the entire sample period, the idiosyncratic risk of the returns is not positively associated with foreign ownership dummy variables, even during the four sub-sample periods. Therefore, the results suggest that the higher A-share return volatility of companies which issue foreign shares is subject to systematic risk. The relationships between the idiosyncratic risk and size, the idiosyncratic risk and the leverage, and the idiosyncratic risk and the turnover ratio are still consistent with the results of total return volatility. This suggests that although foreign ownership dummy variables are included in Equation (6.3) first in explaining stock returns, and then in Equation (6.1) in explaining idiosyncratic risk, one should not expect that the positive relationship between foreign ownership and volatility would disappear. The adjusted r-square of the regression for the overall sample is 8.16%, and the adjusted R-squares for the regression over sub-periods range from 3.25% to 14.38%.

Table 6-6: Regression results of A-share idiosyncratic risk on foreign ownership dummy variables and other stock characteristics

	All		Jan 1994 to Jun 1997		Jul 1997 to Jun 1998		Jul 1998 to Feb 2001		Mar 2001 to Jan 2002	
Independent Variables	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	-3.8061	-14.08**	-6.3627	-10.94**	-3.2227	-4.53**	-2.6957	-4**	-4.1346	-7.46**
trab_dummy (p1)	-0.0616	-1.73*	-0.2075	-2.89**	0.0623	0.67	-0.0404	-0.67	-0.0010	-0.01
foreign_nontra_dummy (p2)	-0.0117	-0.21	-0.0595	-0.53	-0.0119	-0.09	0.0587	0.59	-0.0439	-0.39
trah_dummy (p3)	-0.2267	-3.29**	-0.5312	-3.5**	-0.4336	-2.53**	-0.0706	-0.63	-0.1799	-1.18
b_nontra_dummy (p4)	-0.0170	-0.24	-0.2482	-2.15**	0.0436	0.24	0.1397	0.98	-0.1468	-0.73
p_state_shares	-0.3611	-4.8**	-0.5404	-3.34**	0.1893	0.91	-0.4673	-3.77**	-0.4020	-2.32**
p_legal_shares	-0.2954	-3.97**	-0.3956	-2.51**	0.2242	1.08	-0.4471	-3.68**	-0.2463	-1.39
lg_total_assets	-0.1174	-8.93**	-0.0040	-0.15	-0.1492	-4.14**	-0.1590	-4.69**	-0.1193	-4.51**
leverage_ratio	0.4033	7.77**	0.2959	2.2**	0.5024	3.2**	0.3013	3.87**	0.5018	4.75**
lg (turnover)	0.3047	19.4**	0.3425	9.7**	0.2411	6.38**	0.3214	13.35**	0.2149	6.57**
Wald Test										
Chi Square Test for p1 = p2		0.63		1.45		0.23		0.76		0.11
Chi Square Test for p1 = p3		5.25**		4.54**		7.86**		0.07		1.22
Chi Square Test for p1 = p4		0.35		0.11		0.01		1.49		0.49
Chi Square Test for p2 = p3		6.26**		6.66**		4**		0.77		0.55
Chi Square Test for p2 = p4		0		1.77		0.07		0.23		0.21
Chi Square Test for p3 = p4		4.83**		2.55		4.07**		1.52		0.02
Adjusted R Square	0.0816		0.1438		0.0379		0.0688		0.0325	

Table 6-6 (Continued) Pooled regression of monthly A-share idiosyncratic risk on foreign ownership dummy variables, proportion of state ownership, proportion of legal-entity ownership, firm size, financial leverage, trading turnover, industry, time and exchange dummy variables.

The following time-series and cross-sectional regression model is estimated:

$$\ln(e_{i,t+1}^2) = \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares\ and\ Non-tradable}$$
$$+\beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t})$$
$$+\sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},$$

subject to $\sum_{k=1}^{21} \gamma_k = 0$, $\sum_{k=1} \delta_k = 0$, and $\sum_{k=1}^{2} \tau_k = 0$.

The dependent variable here, $\ln(e_{i,t+1}^2)$, is the natural log of idiosyncratic risk for each share in each month, $t+1$. $Dummy_{B-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-share and B-shares. $Dummy_{H-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-shares and H-shares. $Dummy_{Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t has only non-tradable foreign ownership. $Dummy_{B-shares\ and\ Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t both issues B-shares and has foreign non-tradable ownership. $ST_{i,t}$ and $LP_{i,t}$ are the proportions of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, $Month_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry, month, and exchange.

*, ** represent 10 percent and 5 percent significance levels, respectively.

In Panel A of Table 6-7, the summary statistics of the parameter estimates in Equation (6.3) are presented. The estimate of α reflects the return of an equal-weighted A-share portfolio from companies without foreign ownership. The estimates of $\alpha+\rho_1$ to $\alpha+\rho_4$ reflect the returns of an equal-weighted A-share portfolio from companies with B-shares, with non-tradable foreign shares, with H-shares, and with both B-shares and non-tradable foreign shares, respectively. The mean estimates of α, $\alpha+\rho_1$ $\alpha+\rho_2$, $\alpha+\rho_3$, and $\alpha+\rho_4$ are 0.0996, 0.0981, 0.0974, 0.0935, and 0.0995, which indicates positive average returns of these portfolios during the sample period. However, the results of equality test indicate that there is no significant difference between the returns of these domestic A-shares, suggesting firms cannot reduce the cost of capital of A-shares by obtaining foreign ownership. The standard deviations for these five portfolios are 0.41071, 0.42825, 0.42447, 0.43369, and 0.43388,

respectively, but a Bartlett test cannot reject the null hypothesis of equal variance for the five portfolios. However, it is not necessary to suggest an inconsistency with the earlier results. Furthermore, the world market betas for these five portfolios are 1.1700, 1.1842, 1.1161, 1.3554, and 1.2713, and all A-share portfolios from companies with tradable foreign ownership have higher world market betas relative to the beta of equal-weighted A-share portfolios from companies without any foreign ownership. This suggests that these A-share portfolios from companies which have foreign-tradable foreign ownership are more integrated with the world market.

Panel B of Table 6-7 presents correlations among the parameter estimates from Equation (6.3) and the world market return. There is a positive correlation between the return on equal-weighted A-share portfolios from companies without foreign ownership (α), which suggests that during the sample period, even without any foreign ownership, the A-shares still positively co-move with the world market. Since ρ measures the return difference between A-share portfolios from companies with and without foreign ownership, and the correlations between ρ of A-share portfolios from companies which have tradable foreign ownership and world market return are all positive, it supports the view that A-shares from companies with tradable foreign ownership are more sensitive to the world market shocks.

Table 6-7: Cross-sectional regression results of A-share return on foreign ownership dummy variables and other stock characteristics
Panel A: Summary statistics

	Mean	Std	Min	Max	Med	World Beta
World market return	0.00446	0.04159	-0.15257	0.08601	0.01052	1.0000
a0	0.09956	0.41071	-1.07783	1.22259	0.10245	1.1700
ap1	0.09815	0.42825	-1.12583	1.22634	0.10337	1.1842
ap2	0.09741	0.42447	-1.05499	1.35693	0.10382	1.1161
ap3	0.09345	0.43369	-1.14936	1.26798	0.10557	1.3554
ap4	0.09946	0.43388	-1.10721	1.23131	0.09931	1.2713
Equality test	**P-value**					
	0.6677					
	0.6223					
	0.3162					
	0.9842					

Panel B: Correlation

	α	ρ_1	ρ_2	ρ_3	ρ_4	MSACW
α	1.0000					
ρ_1	0.5162	1.0000				
	(<.0001)					
ρ_2	0.2747	0.5402	1.0000			
	0.0065	(<.0001)				
ρ_3	0.32345	0.3151	-0.0268	1.0000		
	(0.0012)	(0.0017)	(0.7945)			
ρ_4	0.4193	0.7085	0.4295	0.3335	1.0000	
	(<.0001)	(<.0001)	(<.0001)	(0.0008)		
World market return	0.1185	0.0183	-0.0524	0.1292	0.0848	1.0000
	(0.2478)	(0.859)	(0.6100)	(0.2071)	(0.4091)	

Cross-sectional regression of monthly return on foreign ownership dummy, proportion of state ownership, proportion of legal entity ownership, firm size, leverage, trading turnover, industry and time dummy variables.

The following time-series and cross-sectional regression model is estimated for each month:

$$r_{i,t+1} = \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares \text{ and } Non-tradable}$$
$$+\beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t}) + \sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t}$$
$$+e_{i,t+1}.$$

The dependent variable here, $r_{i,t+1}$ is the A-share monthly return on stock i in month $t+1$. $Dummy_{B-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues B-shares. $Dummy_{H-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues H-shares. The $Dummy_{Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t only has non-tradable foreign ownership. $Dummy_{B-shares \text{ and } Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t both issues B-shares and has foreign non-tradable ownership. $ST_{i,t}$ and $LP_{i,t}$ are the proportions of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry, and exchange.

In order to check the robustness of the study, a traditional market factor model is also used to decompose return volatility[65]. Since both the world market return and the Asian market return can be important, a two-index model (see Eckel, Eckel, and Singal, 1997) is used to decompose the return volatility of individual firms.

[65] In this model, the betas of individual stocks are assumed to be constant throughout the entire sample period.

The world market index and the Asian market index are used in the two-index model to decompose volatility:

$$R_{i,t} = \alpha_i + \beta_i R_{WM,t} + \gamma_i \eta_{AM,t} + e_{i,t}, \tag{6.4}$$

where $R_{i,t}$ is the rate of stock return of firm i in month t, $R_{WM,t}$ is the rate of return of the world market[66] in month t, $\eta_{AM,t}$ captures the movements in the Asian market return [67] apart from any changes in the overall world market[68] over the period t, and $\tilde{\varepsilon}_{i,t}$ is a random error term. After estimating Equation (6.4) for each stock, $\ln(e^2_{i,t+1})$ is used as the dependent variable regressed against the foreign ownership dummy variables and other firm characteristic variables in Equation (6.1) in order to examine the relationship between idiosyncratic risk and foreign ownership. The results presented in Table 6-8 indicate that although for the overall sample period the idiosyncratic risk of return is still positively associated with foreign ownership dummy variables, the relationship during the four sub-sample periods is much weaker than the results from Table 6-4. During the 1997 Asian financial crisis period, the non-tradable foreign share dummy variable is positively or significantly related to the A-share idiosyncratic risk. Between July 1998 and February 2001, the relationship between the idiosyncratic risk and the dummy variable for firms which issue both A-shares and B-shares is insignificant, and this is the same case for the dummy variable for firms which issue both A-shares and H-shares during the fourth sub-period. Therefore, the results confirm that the higher A-share return volatility of companies with tradable foreign ownership is due to greater world market risk.

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[66] Morgan Stanley Capital International Inc. (MSCI) All Country World Index (MSWACF) is used here to measure world market return.

[67] MSCI All Country Asia excluding Japan Index (MSASXJ) is used here to measure Asian market return.

[68] These changes are based on the hypothesis that the return on the Asia market, $R_{AM,t}$, is a linear function of the world market return, and the disturbance term, $\eta_{AM,t}$, from a regression of $R_{AM,t}$ on $R_{WM,t}$ will be orthogonal to the world market return and represents the part of the Asian market return that cannot be explained by the world market return.

Table 6-8: Regression results of A-share idiosyncratic risk on foreign ownership dummy variables and other stock characteristics

	All		Jan 1994 to Jun 1997		Jul 1997 to Jun 1998		Jul 1998 to Feb 2001		Mar 2001 to Jan 2002	
Independent Variables	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.	Coeff.	t-Stat.
Intercept	-3.2358	-13.51**	-4.5483	-9.98**	-1.9560	-2.77**	-3.3198	-3.76**	-2.1126	-4.15**
trab_dummy (p1)	0.0631	1.83*	0.0301	0.49	-0.0639	-0.64	0.0941	1.46	0.1574	2.03**
foreign_nontra_dummy (p2)	0.0124	0.24	0.0115	0.11	-0.0287	-0.22	0.0585	0.62	0.0550	0.58
trah_dummy (p3)	0.1788	2.79**	0.1261	1.02	-0.0656	-0.35	0.3042	2.5**	0.2203	1.59
b_nontra_dummy (p4)	0.1791	2.71**	0.0650	0.65	0.4441	2.65**	0.2416	1.76*	0.2738	1.63
p_state_shares	-0.1072	-1.46	0.1862	1.31	-0.1438	-0.72	-0.2816	-2.41**	0.0129	0.08
p_legal_shares	-0.1207	-1.67*	0.0300	0.21	-0.2613	-1.3	-0.2902	-2.58**	0.1100	0.68
lg_total_assets	-0.1028	-8.54**	-0.0153	-0.64	-0.1667	-4.61**	-0.1112	-2.5**	-0.1862	-7.63**
leverage_ratio	0.4110	8.55**	-0.0086	-0.07	0.4775	2.94**	0.3591	4.62**	0.6695	7.27**
lg (turnover)	0.2367	16.55**	0.2938	10.59**	0.2593	6.68**	0.2076	8.2**	0.1468	4.87**
Wald Test										
Chi Square Test for p1 = p2		0.73		0.03		0.05		0.10		0.77
Chi Square Test for p1 = p3		2.93*		0.58		0.00		3.5*		0.17
Chi Square Test for p1 = p4		2.9*		0.11		8.77**		1.11		0.44
Chi Square Test for p2 = p3		4.33**		0.54		0.03		2.54		1.03
Chi Square Test for p2 = p4		4.45**		0.17		6.3**		1.27		1.37
Chi Square Test for p3 = p4		0.00		0.17		4.6**		0.14		0.06
Adjusted R Square	0.1973		0.3249		0.0933		0.1253		0.1771	

Table 6-8 (Continued) Pooled regression of monthly A-share idiosyncratic risk on foreign ownership dummy variables, proportion of state ownership, proportion of legal-entity ownership, firm size, financial leverage, trading turnover, industry, time and exchange dummy variables.

The following time-series and cross-sectional regression model is estimated:

$$\ln(e_{i,t+1}^2) = \alpha + \rho_1 Dummy_{B-shares} + \rho_2 Dummy_{Non-tradable} + \rho_3 Dummy_{H-shares} + \rho_4 Dummy_{B-shares \text{ and } Non-tradable}$$
$$+\beta_1 ST_{i,t} + \beta_2 LP_{i,t} + \beta_3 \ln(Size_{i,t}) + \beta_4 Leverage_{i,t} + \beta_5 \ln(Turnover_{i,t})$$
$$+\sum_{k=1}^{21} \gamma_k Industry_{k,t} + \sum_{k=1} \delta_k Month_{k,t} + \sum_{k=1}^{2} \tau_k Exchange_{k,t} + \varepsilon_{i,t},$$

subject to $\sum_{k=1}^{21} \gamma_k = 0$, $\sum_{k=1} \delta_k = 0$, and $\sum_{k=1}^{2} \tau_k = 0$.

The dependent variable here, $\ln(e_{i,t+1}^2)$, is the natural log of idiosyncratic risk for each share in each month, $t+1$. $Dummy_{B-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-share and B-shares. $Dummy_{H-shares}$ is the dummy variable that takes the value of one if the firm i at time t only issues both A-shares and H-shares. $Dummy_{Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t only has non-tradable foreign ownership. $Dummy_{B-shares \text{ and } Non-tradable}$ is the dummy variable that takes the value of one if the firm i at time t both issues B-shares and has foreign non-tradable ownership. $ST_{i,t}$ and $LP_{i,t}$ are the proportions of state ownership and legal-entity ownership over the total number of shares outstanding, respectively. The accounting total assets are taken as a proxy for size, $Size_{i,t}$, in this study and are transformed into the natural log to account for distribution. $Leverage_{i,t}$, financial leverage, is debt-to-asset ratio on stock i in month t as measured by the book value of the debt divided by the book value of the total assets. $Turnover_{i,t}$ is the A-share monthly turnover rate over the number of A-shares outstanding on stock i in month t. $Industry_{k,t}$, $Month_{k,t}$, and $Exchange_{k,t}$ are dummy variables for industry, month, and exchange.

*, ** represent 10 percent and 5 percent significance levels, respectively.

6.4. Conclusion

Owing to the globalization and liberalization of the capital market, more and more capital has flowed from one market to another in the last decade. These capital flows lower the cost of capital of the market and help finance economic growth in the most efficient way (see Kim and Singal, 2000; Henry, 2000; Bekaert and Harvey, 2000, 2003). On the other hand, people have started to show concern about the way unrestricted movements of capital may destabilize the market. The international capital flows were seen as the primary cause of the 1997 Asian financial crisis.

The Chinese government set up a segmented equity market between domestic investors and foreign investors. This market mechanism has the effect of partially opening the

Chinese equity market, and also minimizing the direct impact of international capital flows on the domestic A-share market in China. However, Sun and Tong (2003) indicate the ineffectiveness of foreign ownership in governing listed Chinese firms. In contrast to other studies, which focus on the information discovery or volatility transfer between dual listed stocks (see Chui and Kwok, 1998; Fung, Lee and Leung, 2000; Poon and Fung, 2000; Sjoo and Zhang, 2000; Su and Fleisher, 1999; and Tian and Wan, 2004), this chapter employs a cross-sectional approach to study the impact of different foreign ownership on domestic A-share return volatility. The results shows that A-shares from companies which have tradable foreign ownership are more volatile than A-shares from companies without any foreign ownership. This is so even after controlling for stock characteristics, such as firm size, degree of financial leverage, trading turnover, and industry. After decomposing the return volatility into systematic risk and idiosyncratic risk, the results suggest that the higher risk is mainly due to higher systematic risk, or high exposure to international market risk. The chapter should have some implications which will be of interest to both policy-makers and academics. In a segmented A-share market in China, even without direct impact from international capital flows, domestic return volatility can still be affected by information diffusion between the markets. Now is the time to carefully examine this market mechanism.

CHAPTER 7

Conclusion

This dissertation comprises of three independent studies on the segmented Chinese equity market. In particular, it has focussed on the impact of market segmentation on asset pricing, market microstructure, and return volatility. Each study addresses one distinct and specific aspect of this market. The Chinese equity market was chosen as the subject of the dissertation because of the growth and importance of the gradually emerging Chinese economy.

The first study examined in this dissertation, in Chapter 4, concerns the share price differences between Chinese domestic A-shares and foreign B-shares. The foreign B-share in China is traded at a price much lower than its corresponding A-share, which is different from the other segmented markets. A liquidity asset pricing model is used to explain this price difference. This contributes to the literature by considering liquidity as one of the main explanatory variables for asset pricing. The results are generally consistent with the liquidity asset pricing model used here.

Chapter 5 investigates the components of the bid-ask spreads of A-shares, B-shares, and H-shares in China. Bid-ask spread is an important portion of the entire transaction cost. Both a time-series and cross-sectional comparison is undertaken on the spread and its components, after controlling for the other factors which may determine them. The results suggest a high transaction cost in the foreign-owned share markets, which reflects both the difficulties of foreign investors in acquiring and assessing information regarding local Chinese firms relative to domestic investors, and the likelihood of higher information asymmetry. The results also indicate the effect of the economies of scale and scope on transaction costs and trading activities.

Finally, Chapter 6 examines the impact of the ownership structure, especially the different forms of foreign ownership, on the domestic return volatility in China. Previous research has investigated the relationship between ownership structure and firm performance in China. This work concentrates on the impact of foreign ownership on domestic A-share return volatility. This study extends the ownership literature by estimating the relationship between three forms of ownership: government ownership, legal-entity ownership and foreign ownership, and the return volatility. After controlling for the other share characteristics, these results suggest that foreign ownership, especially tradable foreign ownership, increases local market volatility, and possibly makes the local market more integrated with the world market. These results question the effectiveness of market segmentation in eliminating local domestic market volatility due to foreign markets.

The healthy development of the stock market is one of the important determinants of economic prosperity. I believe that my research will provide a valuable contribution to our understanding of the Chinese equity market.

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APPENDIX 1

China's Financial Services Industry: The Intra-industry Effects of Privatization of the Bank of China Hong Kong[69]

Abstract

As a new member of the WTO, China is required to open her financial services industry to foreign financial institutions. To this end, China has embarked on a policy of reform to her financial services sector including the process of privatization of her four major banks. The purpose of this paper is to discuss and apply some of the key issues and lessons from similar privatization in other parts of the world to the partial privatization of the Bank of China Hong Kong (BOCHK). The empirical results of this paper indicate that some of the banks and non-banking financial institutions reacted negatively to the partial privatization announcements of the BOCHK. The empirical results also show that HSBC, the largest bank in Hong Kong had no significant reaction to the restructuring announcement or the listing announcement of the BOCHK. However, the Hang Seng Bank, the third largest bank in Hong Kong, suffered a loss after the announcement of the BOCHK listing. The cumulative returns over the local market return in Hong Kong, used to assess the effects of the privatization of the BOCHK, clearly indicate that in the first one and half years following the partial privatization, the BOCHK did not over-perform the Hong Kong financial industry index, but under-performed an equal-weighted rival firm portfolio. Compared with the banks and non-banking financial institutions in China, the BOCHK over-performed the rival firms in Mainland China one year after its partial privatization.

JEL *classification*: G15; G25

Keywords: Privatization; financial institutions' reactions; ownership and control

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1. Introduction

The Uruguay Round of trade negotiations and the declaration of the Fourth Ministerial Conference in Doha in November 2001 provided opportunities for many financial institutions to expand their business activities globally. Over the last two decades there have been significant efforts made to quantify the amount of international financial services generated and to improve the way international data is entered into national statistics. At the same time a number of research studies have explored the role of financial development, an effective financial services sector and deregulation of financial markets as those factors that have contributed to economic growth and to global financial market integration. For instance, the study by Beck and Levine (2002) finds that economic growth is linked to overall financial development and the financial services industry. The study by Demirguc-Kunt and Maksimovic (1998) indicates that a firm's growth is positively related to the development of both the securities market and the banking system. Moshirian (2001, 2004) analyzed the role of foreign financial institutions in the host countries and those factors that contribute to the development of the host countries' financial services. The study by La Porta et al. (2002) demonstrates that countries with a free market and private ownership of banks are more likely to experience economic growth than those countries whose banks are mainly owned by the government.

China is one of the fastest growing emerging economies in the world that has embarked on reform of its agriculture and manufacturing sectors. There have been a number of studies that analyzed the effects and the consequences of these reforms on China's economy and its productivity. As China's agriculture and manufacturing sectors have evolved in the last twenty years or so, the role of the services sector, particularly the role of effective and efficient financial institutions in contributing to further development and reforms in other sectors of China cannot be underestimated. Indeed, the above studies related to the role of effective and privately owned financial institutions that influence the economic growth and sustained development are directly applicable to the reform of the financial institutions in China. As China is now a member of the WTO, most of the issues that form the framework for the General

Agreement on Trade in Services (GATS) including issues related to trade in financial services, as are highlighted in a recent study by Moshirian (2004), would become applicable to her. Indeed, China itself has pledged that in five years after joining the WTO, foreign banks would be allowed to freely operate in China and be able to conduct their business in local currency. Therefore, the increase in efficiency and internationally accepted banking practices in China and its commitment to free trade in financial services are imperative to China's long term economic prosperity. One of the steps taken by China to reform its banking sector is to partially privatize its four major banks and ensure that these banks are able to compete with foreign banks entering China. The first step for the implementation of this policy has been the partial privatization of the Bank of China, Hong Kong (BOCHK) in July 2002. While there have been a number of studies of the effects and consequences of privatization of manufacturing in different parts of the world including for the former Soviet Union, Eastern European Countries and China, there is only one recent published study by Otchere and Chan (2003) that focused on the effects of the privatization of the banking sector, with a focus on a bank in Australia. Therefore, a study of the effects of partial privatization of the Bank of China Hong Kong (BOCHK) is the first study of partial privatization of the banking sector in a developing country and hence it could be of interest to both policy makers and academics. To this end, the purpose of this paper is to discuss and analyze the effects of the partial privatization of the BOCHK on its rivals. This paper is an attempt to examine the reaction of the rival banks and non-banking financial institutions, listed both on the Hong Kong Exchange and on the two Mainland China stock exchanges, to the privatization announcements of the BOCHK which could have had a bearing on these rival banks' stock prices and long term profitability. Furthermore, this paper analyzes the effects of this partial privatization on the share price and the general performance of this bank one and half years after its IPO in July 2002, and the future challenges for this partially privatized banking sector as well as other banks that are going to embark on the process of privatization in China.

The empirical studies of this paper that analyzes 23 banks and non-banking financial institutions in Mainland China and Hong Kong over the period March 1999 to January

2004 indicate that some of the banks and non-banking financial institutions reacted negatively to the partial privatization announcements of the BOCHK. Most of the banks and non-banking financial institutions in Hong Kong reacted negatively to the conclusion draft of China's entry into the WTO. Most of the financial institutions in Mainland China reacted positively to the announcements of the privatization of the BOCHK. The empirical results also show that HSBC, the largest bank in Hong Kong, had no significant reaction to the restructuring announcement and the listing announcement of the BOCHK. However, the Hang Seng Bank, the third largest bank in Hong Kong, suffered a loss after the announcement of the BOCHK listing.

In order to assess the effects of the partial privatization of the BOCHK, the paper compares the cumulative returns of the BOCHK over the financial industry returns in Hong Kong and compares the cumulative abnormal returns of (equal-weighted) portfolios of rival financial institutions both in Hong Kong and in Mainland China with the cumulative abnormal returns of the BOCHK. The cumulative returns over the local financial industry returns in Hong Kong clearly indicate that in the first one and half years after partial privatization, the BOCHK did not over-perform the financial industry index, but under-performed the portfolios of rival financial institutions in Hong Kong. Compared with the banks and non-banking financial institutions in China, the BOCHK over-performed the portfolio of financial institutions in Mainland China one year after privatization. The remaining part of this paper is structured as follows: Section 2 discusses the overall issues with respect to China's state owned enterprises, Section 3 discusses the banking sector in China, Section 4 discusses some of the issues related to financial integration between Mainland China and Hong Kong, Section 5 discusses the data used in this study, Section 6 presents a model measuring the market reactions of its rival financial institutions to the partial privatization of the BOCHK, Section 7 reports the empirical results of the reactions of the rival financial institutions to the partial privatization of the BOCHK, Section 8 analyzes the effects of the privatization of the BOCHK on itself both in the short and medium terms, Section 9 deals with the short-term and long-term abnormal returns of the rival firms to the partial privatization of the BOCHK, and Section 10 concludes.

2. State Owned Enterprises

As part of economic reform, China has embarked on a vigorous policy to reform its state-owned enterprises (SOEs), since 1978. There have been four distinct stages in the evolution of the reform of the SOEs whose difficulties and challenges are well documented in Liu and Gao (1999). While some of these SOEs have had major challenges in adjusting their operations based on a new mindset and the expectation that they should rely on some of the elements of the market forces for their survival, over the last twenty years, there has been a decline in the number of money losing SOEs and a reasonable increase in the number of profitable SOEs. Regarding whether the privatization of SOEs have been successful or not, there are mixed results. There are some researchers such as Groves et al. (1994), Cornelli and Li (1997) who provided evidence of positive empirical effects of privatization. On the other hand, there are studies such as Lin et al. (1998) who argue that this policy was not successful. Lin et al. (1998) argue that the Chinese government should be pro-active in removing the policy burden imposed on the SEOs and ensure that they have the right environment to be able to compete with other firms. They argue that, otherwise, the reforms of the SOEs are not going to be effective. Qi et al. (2000) demonstrated that the ownership structure, composition and the relative dominance of each of the five different classes of equity ownership (i.e., state owned shares, legal person shares, tradable A-shares, employee shares and shares only available to foreigners B-shares) can affect the performance of partially privatized SOEs and hence a different composition of these shareholders could have a bearing on the outcome of the partial privatization. However, the recent study by Sun and Tong (2003) demonstrate that China's SOEs in manufacturing have had some successes. However, it appears that once these successes are compared with privatization in other parts of the world, these successes are not very significant. Sun and Tong (2003) attribute the lack of full success in the partial privatization of the Chinese SOEs to the inability of the private sector to be able to have full control of these firms' operations. Furthermore, they argue that due to the large proportion of government ownership of SOEs, foreign investors' contributions to those partially privatized firms have been less than were initially anticipated and hence less gains have been obtained from the partial privatization of these SOEs.

Such mixed empirical results about China are also consistent with the literature about privatization which also has mixed results. For instance, the studies by Martin and Parker (1995) and Kole and Mulherin (1997), amongst other studies, indicate that private ownership is not necessarily more efficient than government ownership. On the other hand, Megginson and Neffer (2001) survey a number of studies that indicate that privatization of firms have had positive effects on the firms' performances.

The balance between public and private ownership and the optimal outcome for the firm is a matter of continuous debate, although studies showing greater benefits of full privatization appear to be more convincing. As the reforms of SOEs in agriculture and manufacturing continue, China is now committed to the WTO principles and hence the reform of the services sector, particularly financial institutions, is amongst the new challenges facing China. To this end, the next section of this paper will analyze the banking sector in China with a focus on the partial privatization of the Bank of China Hong Kong (BOCHK).

3. China's Banking Sector

The People's Bank of China (PBOC) was the only bank in China with the full capacity to provide comprehensive financial services until the late 1970s. However, due to economic and financial reform in China in the late 1970s, the other banks have gradually assumed more responsibility and roles in providing financial services, and hence the PBOC became China's central bank. There are now four major state owned commercial banks in China. These are the Industrial and Commercial Bank of China, the China Construction bank, the Agricultural Bank of China and the Bank of China. While the first three banks mainly focus on specialized sectors as their names imply, the Bank of China, which is the second largest bank in China, is the main international banking organization with branches in both China and overseas. The Bank of China's financial services and products include activities in foreign exchange markets, participation in loan syndication, issuance of bonds, export financing, international

banking services and being active in providing financial services to foreign companies operating in China. In the meantime, it should be noted that China has given its permission for the establishment of a private bank, Minsheng.

In addition to the state owned banks, there are now shareholding banks that while they have initially been set up to provide some specialized niche products, are now providing full financial services. Two of the largest shareholding banks are the Bank of Communications and the CITIC Industrial Bank. In addition to these banks, the China Development Bank, the Export-Import Credit Bank and the Agricultural Development bank are there to provide credit and services to the designated sectors or projects identified by the government. In addition to the above categories of banks in China, there are also international trust and investment companies, credit co-operatives as well as asset management companies.

As part of the reform policy of China for its SOEs and also as part of China's commitment to free trade since it regained its membership of the WTO, China committed itself to free trade in financial services and all the principles envisaged in the GATS, including permission for full participation of foreign banks in China after five years of China's membership of the WTO. To this end, China is keen to ensure that the Chinese financial institutions are efficient and have the ability to apply the standard of international best practices as a way of being able to compete with the foreign financial institutions which could increase in number in China over the next three to five years. To this end, partial privatization of the BOCHK in July 2002 was one of the first steps in reforming the financial services industry.

As a way of creating a viable commercial bank in Hong Kong prior to the partial privatization of the bank, in October 2001, the Bank of China Hong Kong branch was created through the merging of 12 different independent banks which belonged to the Bank of China and had been operating in Hong Kong over many decades. The emergence of the Bank of China Hong Kong's (BOCHK) banking operation has

provided an opportunity to bring the operation of this bank up to the standard of international best practices. The annual reports of the BOCHK in the last two years indicate a significant restructuring of the operation of the BOCHK including addressing the issues related to its IT capability, its risk management strategies and corporate governance. Furthermore, the BOCHK increased its asset quality management and wrote off some of its bad debt in both 2001 and 2002, upgraded its clearing and payment system and its retail banking, and also centralized its IT system.

The IPO of the BOCHK took place at the end of July 2002 which raised US$2.6 billion for 2.298 billion shares. This amounted to 21.74% of issued capital of the BOCHK. This offering was the world's third-largest and Asia's largest IPO in 2002. This offering was also the biggest IPO in Hong Kong ever. In addition to Hong Kong, there was a global public offering to institutional investors around the world as well as a public offering without a listing in Japan. In August 2002, the BOCHK sold an additional 155.48 million shares worth $168.4 million. In December 2003, the BOCHK sold a further 1 billion shares worth nearly US$2 billion, which increased the number of free-floating shares on the market from 24.05% to 34.18%. It is noteworthy that the BOCHK is the second largest bank in Hong Kong, in terms of assets and customer deposits, as well as one of the two biggest corporate lenders, and one of the three issuing banks in Hong Kong.

The partial privatization of the Bank of China could be argued to be consistent with the study by Perotti (1995) that argued that initial small percentage privatized ownership of the firm may well be considered by the market as a positive signal for further privatization and also commitment to foreign shareholders' wealth. One should also take into account the other studies such as Jefferson (1998) who argue against a quick and complete privatization due to the nature of the legal system and property rights in the developing countries. Furthermore, Schmitz (2000) argues that partial privatization may well be the optimal ownership outcome. At the same time, one should also take into account the recent study by La porta el al. (2000) who highlight the significance of the legal system and effective law enforcement of the countries in

which the private shares are issued and see whether China is able to uphold these principles for foreign shareholders. However, given the five categories of shareholders in China and a number of other economic and financial issues that could affect the operations of the banking sector in China, it would be hard to pin down an optimal privatization or even establish the effects of full privatization of the BOCHK or other banks in China.

4. Financial Integration between Mainland China and Hong Kong

Economic reform in Mainland China has led to economic prosperity in the country which is partially reflected in the average economic growth of ten percent per annum over the last two decades. Low cost of labor and growth in Chinese per capita income, have encouraged many businesses based in Hong Kong to move their operations to Mainland China. Such an expansion of business from Hong Kong to Mainland China was associated with the establishment of the banks from Hong Kong in Mainland China as a way of providing both corporate banking as well as retail banking. Hong Kong banks are engaged in providing securities services on China's B-share market. Furthermore, those banks that have Renminbi business licenses are offering mortgages to Hong Kong customers who are engaged in the purchase of properties in Mainland China.

At the same time, despite the restrictions on the flow of Renminbi leaving China, Hong Kong is increasingly using the Renminbi to purchase both goods and services. For instance, according to one article in the Far Eastern Economic Review (2003), some automated teller machines offer customers the choice of withdrawing Renminbi rather than Hong Kong dollars. Furthermore, Mainland Chinese banks are issuing credit cards in Renminbi in Hong Kong.

The level of financial integration between the Mainland and Hong Kong is so high that in February 2002, the Governor of the People's Bank of China indicated that the Hong Kong government was looking at the possibility of allowing all Hong Kong based

financial institutions to accept Renminbi deposits (see BOCHK prospectus). At the same time, financial institutions from Hong Kong are providing important financial services to both Chinese and foreign companies operating in Mainland China. According to the BOCHK 2002 annual report, by the end of 2002, the BOCHK had 14 branches in Mainland China as a way of facilitating the increasingly large cross border banking services between Mainland China and Hong Kong. Some of these branches have been allowed to conduct foreign currency trading for Chinese citizens and enterprises. Furthermore, the BOCHK has full access to the broad distribution network of the BOC as a way of providing the best services to its clients. Furthermore, according to the annual report of the BOCHK (2002), this bank is collaborating with the BOC to "supply exclusive administrative and processing support for the International Card, which is the only foreign currency credit card offered by the BOC". It is also argued in the annual report of the BOCHK (2002) that in the near future this bank will compete directly with the BOC in Mainland China. Some of the current plans for joint work between the BOCHK and the BOC that can be found in the BOCHK annual reports are: expand credit card and merchant acquiring business in Mainland China, jointly develop flexible Renminbi/Hong Kong currency mortgage payment mechanisms, expand its corporate lending business in Mainland China, develop its trade finance business in Mainland China, extend its corporate base in Mainland China.

In addition to the integration and synergy between the BOCHK and the BOC in Mainland China that is a reflection of financial and economic market integration between Mainland China and Hong Kong, the other two major banks in Hong Kong (i.e. the HSBC and the Hang Seng Bank) have also developed integrated business with Mainland China. For instance, according to the annual report of the HSBC (2002), in November 2002 it completed the acquisition of a 10 percent equity stake in the Ping An insurance company (which is the second largest life insurer and the third-largest in Mainland China) at a cost of US$600 million. The HSBC, through branches and subsidiaries of the Hong Kong and Shanghai Banking Corporation, offers its services to 11 major cities in Mainland China. The HSBC was the first foreign bank to be allowed to provide Renminbi services to those who were not citizens of China.

One can also note in the HSBC annual report in 2002, the year that the BOCHK was partially priviatized that the "HSBC's strong presence in Mainland China is supported by a wide range of business capabilities in commercial and corporate banking as well as personal financial services. With further liberalization of China's financial market, banking regulations have been relaxed to permit foreign banks to provide foreign currency services to Mainland Chinese companies and individual Chinese citizens. HSBC became the first foreign bank to offer foreign currency service to local citizens and companies, at 10 locations across the country, and launched online personal banking services to local citizens and international customers in Mainland China in December 2002".

Similarly, the Hang Seng Bank is expanding its business in Mainland China. In 2002, the bank launched personal e-Banking in Mainland China. According to this bank's annual report in 2002, there are branches of this bank in a number of large cities in China.

It is noteworthy that the business activities of the BOCHK as well as its two major rival banks (i.e., HSBC and Hang Seng Bank) are both in traditional banking as well as non-banking services. For instance, based on their annual reports in 2002, one can find that for the BOCHK, 23.03 percent of its income was derived from non-interest financial services activities. This ratio was 41.87 percent and 28.3 percent for the HSBC and the Hang Seng Bank respectively. According to the annual report of the BOCHK (2002), this bank not only provides traditional banking but also provides an integrated securities brokerage, life property and casualty insurance, trade finance, syndicated loan arrangements (the bank earns fees when it acts as arranger, underwriter, manager or participant), cash management products and investment management products and services. It is also reported in its annual report that the BOCHK (2002) "continuously leverages its relationship with BOC's non-commercial banking subsidiaries and affiliates in Hong Kong to maximise cross selling efforts,

increase its non-interest income, enhance its product range and jointly develop customised products".

It is also noted in the annual reports of the BOCHK (2002) that the bank is fully engaged in trading in securities, foreign exchange and bullion trading. It "sells a number of international mutual funds and guaranteed funds" and earns commissions. It also offers corporate bonds and derivatives services to its clients. Furthermore, the BOCHK as an agent for a number of insurance companies, including BOC Insurance and BOC Life, offers a range of insurance agency services to its corporate customers, such as marine cargo, fire, employee compensation, life and medical insurance. The BOCKH received about HK$136 million in commissions for sales of insurance products for the year 2001.

5. Data

The data period of this study is from 28 March 1999 (one-year before the first event in the study) to 24 January 2004 (one and half years after the IPO of the Bank of China Hong Kong).

Rival financial institutions of the Bank of China Hong Kong (BOCHK) in this study are the banks and other non-banking financial institutions listed on the Hong Kong Exchange and on the two Mainland China stock exchanges during the period of privatization (see Table A-1). Although the Bank of China Hong Kong's current business is only limited to the Hong Kong area, its listing would still possibly have some influence on the banks and other non-banking financial institutions which operate in Mainland China. Only financial institutions that had complete stock price data during the event period are included in the study. The sample consisted of 23 financial institutions in total, among them five financial institutions are listed in Mainland China (two on the Shanghai Stock Exchange, three financial institutions on the Shenzhen Stock Exchange), and the other 18 financial institutions are listed on the

Hong Kong Exchange. Among them, 12 are banks in Hong Kong, and 2 are banks in Mainland China.

The announcement dates (reported in Table A-2) for the privatization were identified from the Factiva (A joint venture between Dow Jones & Reuters) database. The adjusted daily stock prices, and the market indices for the Hong Kong Exchange, the Shanghai Stock Exchange, and the Shenzhen Stock Exchange, and the Hong Kong Official cash rates were collected from Datastream.

Table A-1: List of rival financial institutions and their basic descriptions

Name	Industry	Listed Exchange	Market Cap.	Currency Unit (million)
HSBC HDG.	Bank	Hong Kong	786654.81	HK$
HANG SENG BANK	Bank	Hong Kong	131917.13	HK$
BANK OF EAST ASIA	Bank	Hong Kong	23910.16	HK$
DAH SING FINANCE HDG.	Bank	Hong Kong	6883.18	HK$
WING LUNG BK.	Bank	Hong Kong	6698.67	HK$
CITIC INTL.FINL.HDG.	Bank	Hong Kong	5837.53	HK$
WING HANG BK.	Bank	Hong Kong	5761.88	HK$
ICBC (ASIA)	Bank	Hong Kong	3155.44	HK$
LIU CHONG HING BANK	Bank	Hong Kong	2914.50	HK$
HK CHINESE LTD.	Bank	Hong Kong	2303.09	HK$
INTL.BANK OF ASIA	Bank	Hong Kong	1758.24	HK$
ASIA FINANCIAL	Bank	Hong Kong	1376.87	HK$
CHINA EVERBRIGHT	Non-bank financial inst.	Hong Kong	9804.81	HK$
CELESTIAL ASIA SECS.	Non-bank financial inst.	Hong Kong	3181.22	HK$
ALLIED GROUP	Non-bank financial inst.	Hong Kong	3173.22	HK$
SUN HUNG KAI & CO.	Non-bank financial inst.	Hong Kong	1953.12	HK$
E2-CAPITAL (HDG.) LTD.	Non-bank financial inst.	Hong Kong	1013.73	HK$
TAI FOOK SECURITIES GP.	Non-bank financial inst.	Hong Kong	724.83	HK$
SHAI.PUDONG DEV.BK.	Bank	Shanghai	61454.99	RMB
SHN.DEV. BANK	Bank	Shenzhen	29004.00	RMB
HONGYUAN SECS.CO.	Non-bank financial inst.	Shenzhen	7809.46	RMB
SHAANXI INTL.TRUST	Non-bank financial inst.	Shenzhen	4360.90	RMB
ANSHAN TST.& INV.	Non-bank financial inst.	Shanghai	3779.59	RMB

The firm market capitalization is measured on 28 March 2000, the first date of the event.

Table A-2: Events related to the privatization of the Bank of China Hong Kong

Press Date	Event Descriptions
2000-Mar-28	The Bank of China announced the restructuring plan to merge the 12 member banks of the Bank of China Group in Hong Kong into a single new bank. The restructuring is seen as a prelude to a public float.
2001-Feb-06	The Bank of China for the first time officially confirmed the appointment of three investment banks, Goldman Sachs, UBS Warburg, and BOC International (the investment banking arm of the Bank of China), to manage the initial public offering of the Bank of China's Hong Kong unit.
2001-Jul-12	Hong Kong's legislative council passed a bill to allow the restructuring of the Bank of China's Hong Kong operations to become one of the territory's largest banking groups.
2001-Sep-17	China WTO accession draft agreement concluded.
2001-Oct-01	The Bank of China Hong Kong was formally established, which indicated the finalization of its restructuring plan.
2002-Mar-16	The Bank of China Hong Kong announced that it was going to be listed on the Hong Kong Stock Exchange in June or July 2002.
2002-May-16	The Bank of China Hong Kong filed a listing application to the Hong Kong stock exchange.
2002-Jun-20	The Hong Kong stock exchange gave its approval for the Bank of China Hong Kong to list on its main board.
2002-Jul-07	The Bank of China Hong Kong announced that it would list on the Hong Kong Stock Exchange on July 25, 2002. Just after the announcement, the bank commenced two-week long marketing activities, and announced the issue price on 14th July.
2002-Jul-15	The Bank of China Hong Kong opened the initial sales to retail investors.
2002-Jul-25	The Bank of China Hong Kong listed on the Hong Kong Stock Exchange.
2003-Dec-15	The Bank of China Hong Kong free floated 10.18% more shares, and increased the total floating shares from 24.05% to 34.18%.

6. A Model Measuring the Reaction of its Rivals to the Partial Privatization of the BOCHK

The purpose of this section is to measure whether rival financial institutions in Mainland China and Hong Kong have reacted negatively to the partial privatization announcements of the BOCHK. While there could be various reasons for negative or even positive reactions to these announcements, one could argue that if rival financial institutions believe that they are going to face a more efficient, more credible and more effective competitor which could have the capacity to offer more competitive financial products, with the possibility of a decline in their profitability, then they could react negatively to such announcements. Therefore, one of the issues to be considered is whether the rival financial institutions' stock prices fell around the time of those

announcements that signalled the likelihood of partial privatization of the BOCHK. At the same time, one has to note that the partial privatization of the BOCHK (about 25 percent) may not allow the bank to pursue all its financial and economic objectives and hence those potential increases in efficiency may not necessarily be realised meaning that those negative reactions of the rival financial institutions may not be observed.

The previous studies of privatization such as Gala et al. (1994), Megginson et al. (1994) found an improvement in the profits of firms after privatization. However, one has to also see whether those improvements are due to privatization, to a change in the market conditions, a change in government policies, or other factors. In addition, the above two studies and some other studies rely only on accounting data to measure the effects of privatization. However, as Healy (1985) and Barber and Loyn (1997) argued, the firms' directors could manipulate the companies' data and hence the apparent positive outcome of privatization reported by these newly privatized firms may not necessarily have occurred. Therefore one could argue that data from the stock market should be unbiased and could represent changes in the privatized firm more accurately. In the case of China, given the current challenges of trying to improve its international accounting standard and at the same time, the lack of such accounting data for China for this particular study, we only use data from the stock market in order to measure the effects of the partial privatization of the BOCHK.

The other issue to be considered is that due to the fact that privatization is a government decision and, at the same time it could have some impacts on the rival financial institutions, one should treat privatization as a "regulatory event". To this end, in this paper, similar to the study of the privatization of British Airways by Eckel et al. (1997) we analyze the returns to a portfolio of both rival banks and non-banking financial institutions to each of those 12 events (listed in Table A-2) prior to the IPO of the BOCHK (with the exception of the last event listed in Table A-2). This is because changes in policies and procedures occur over time and each of these events could convey marginal news about the impending changes.

Furthermore, in this study, similar to the studies by Binder (1985), Schipper and Thompson (1985), Eckel et al. (1997) and Otchere and Chan (2003)[70] we use a simultaneous equations multivariate regression approach based on Zellner's (1962) seemingly unrelated regression (SUR) in order to measure the effects of the rival financial institutions on the partial privatization of the BOCHK. This is because in the case of "regulatory events" such as privatization which affect a number of financial institutions contemporaneously, the assumptions of independent and identically distributed residuals are violated when all the banks and non-banking financial institutions are clustered as part of one group in order to see how they are affected by the partial privatization of the BOCHK.

Finally, as part of the analysis of the intra-industry effects of the partial privatization of the BOCHK, the stock market performance of the BOCHK is also analyzed for the first one and half years following the initial partial privatization.

As with other studies of contemporaneous events of several firms or a regulatory event, Zellner's (1962) seemingly unrelated regression (SUR) method is used here to measure the rival financial institutions (both banks and non-banks) reactions to the partial privatization of the BOCHK.

$$R_{it} = \alpha_i + \beta_{i1} R_{mt} + \beta_{i2} R_{mt-1} + \beta_{i3} R_{mt+1} + \tau_i I_t^U + \lambda_i D_t + e_{it}, \qquad \text{(A.1)}$$

where R_{it} is the return of financial institution i on day t; R_{mt} is the market return on day t; I_t^U is the unanticipated change in interest rates orthogonalization with respect to the market returns[71]; D_t is a dummy variable that equals one during the event period and zero otherwise, and the dummy variable, which captures abnormal returns of rival financial institutions to the privatization of the BOCHK.

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[70] In this study, equation (A.1) and all the related notations are adapted from Otchere and Chan (2003).

[71] Due to lack of interest rate data in Mainland China, this variable is not used in the regression of the Mainland China portfolio and individual firms listed in Mainland China.

Equation (A.1) includes control and event variables, and parameters that are used to capture the rival financial institutions' reaction to the partial privatization announcement of the BOCHK. The control portion encompasses two factors, R_m and I^U and is represented by $\alpha_i + \beta_{i1}R_{mt} + \beta_{i2}R_{mt-1} + \beta_{i3}R_{mt+1} + \tau_i I_t^U$. The first variable ($R_{mt}$) is used to control the general stock market movements and its lag and lead variables are also included in order to correct for non-synchronous trading, especially for those small financial institutions. The market returns are those of financial institutions' listed exchange returns. For the Hong Kong financial institutions, the Hang Seng Stock Index is used, for the financial institutions listed on the Shanghai Stock Exchange, the Shanghai A-stock Index is used, and for the financial institutions listed on the Shenzhen Stock Exchange, the Shenzhen A-stock Index is used. Following the study of Otchere and Chan (2003), the interest rate is also included as the second control variable. The daily interest rate change is defined as $I_t = \ln(CR_t / CR_{t-1})$, where $\ln CR_t$ is the log of the cash rate on day t. In order to avoid the problem of multicollinearity between the change of interest rates and market return, the daily change of the interest rate is orthogonalized by regressing I_t on R_{mt}. The residuals of the regression, I_t^U, are used in Equation (A.1).

The daily abnormal stock return for financial institutions i over the event period, λ_i, is an estimate of λ_i. The event parameter, λ_i, captures the rival financial institutions reaction (abnormal returns) to the partial privatization announcements of the BOCHK. The coefficient is expected to be less than zero if the privatization announcement of the BOCHK has negative effects on rival financial institutions' future profitability.

Five different event windows are used for estimation: 0 to +1, –1 to 0, –1 to +1, 0 to +2, and –2 to 0. The regressions are estimated for the period from t = –250 to the latest event period where day 0 is the event date. Only the shorter event windows are

used here, mainly because the longer window is noisier, which makes it harder to find significant results.

7. Empirical Results of the Reactions of Rival Financial Institutions to the Announcements of Privatization of the BOCHK

To identify the importance of the effects of 12 events (reported in Table A-2) associated with the announcement of the partial privatization of the BOCHK, Equation (A.1) is run separately on portfolios of all the financial institutions in Hong Kong, the banks in Hong Kong, the non-banking financial institutions in Hong Kong and all the financial institutions in Mainland China[72].

i) Empirical Results for Four Major Categories of Financial Institutions

Portfolio returns for each event of the 12 events related to the privatization (as listed in Table A-2) are given below. Four different portfolios are used, one consists of all listed banks and non-banking financial institutions in Mainland China, one consists of all listed banks and non-banking financial institutions in Hong Kong. Another two sub-portfolios are also included, one consists of all listed banks in Hong Kong, and one consists of all listed non-banking financial institutions in Hong Kong. The ordinary least squares estimates of abnormal returns to a portfolio of financial institutions for an event, based on a market index model, are obtained by using the following equation:

$$R_{it} = \alpha_i + \beta_{i1} R_{mt} + \beta_{i2} R_{mt-1} + \beta_{i3} R_{mt+1} + \tau_i I_t^U + \lambda_i D_t + e_{it}, \qquad \text{(A.1)}$$

where R_{it} is the rate of stock return to a portfolio of financial institutions and R_{mt} is the rate of return on the relevant index for the period t. The dummy variable, D_t, takes the value of one during the event period for which the abnormal return is being determined and zero otherwise. These results of the regression, along with portfolio raw returns, are presented in Table A-3.

[72] Since there are only two banks listed on the Mainland China stock exchanges, we did not separate them into sub-portfolios.

Table A-3: Portfolio returns around events related to privatization

Panel A	Hong Kong Financial Institutions Portfolio					Hong Kong Financial Institutions Portfolio				
Event date	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
2000-Mar-28	-0.0175	-0.0072	-0.0105	-0.0084	0.0048	-0.0148	-0.0169	-0.0149	0.0010	-0.0027
t-stat						*-1.47*	*-1.68 **	*-1.81 **	*0.12*	*-0.33*
2001-Feb-06	0.0050	0.0025	0.0017	-0.0002	0.0023	0.0003	0.0056	0.0019	-0.0014	0.0058
t-stat						*0.04*	*0.70*	*0.29*	*-0.22*	*0.90*
2001-Jul-12	-0.0078	-0.0087	-0.0101	-0.0053	-0.0059	-0.0105	-0.0076	-0.0092	-0.0072	-0.0047
t-stat						*-1.57*	*-1.14*	*-1.69 **	*-1.33*	*-0.86*
2001-Sep-17	-0.0317	-0.0201	-0.0197	-0.0180	-0.0100	-0.0215	-0.0120	-0.0148	-0.0176	-0.0056
t-stat						*-3.14 ***	*-1.77 **	*-2.65 ***	*-3.12 ***	*-1.00*
2001-Oct-01	0.0119	0.0133	0.0163	0.0083	0.0066	-0.0003	0.0013	0.0001	-0.0003	-0.0079
t-stat						*-0.04*	*0.18*	*0.02*	*-0.05*	*-1.36*
2002-Mar-16	-0.0123	-0.0169	-0.0133	-0.0118	-0.0104	-0.0119	-0.0152	-0.0117	-0.0082	-0.0109
t-stat						*-1.78 **	*-2.27 ***	*-2.15 ***	*-1.49*	*-1.98 ***
2002-May-16	0.0016	0.0023	0.0027	-0.0019	0.0013	-0.0008	-0.0003	-0.0012	0.0001	0.0003
t-stat						*-0.13*	*-0.05*	*-0.24*	*0.02*	*0.05*
2002-Jun-20	-0.0136	-0.0058	-0.0121	-0.0019	-0.0063	-0.0109	-0.0029	-0.0071	-0.0012	-0.0047
t-stat						*-1.81 **	*-0.47*	*-1.43*	*-0.23*	*-0.95*
2002-Jul-07	-0.0068	-0.0054	-0.0046	-0.0075	0.0001	-0.0065	-0.0054	-0.0047	-0.0062	-0.0030
t-stat						*-1.09*	*-0.91*	*-0.97*	*-1.28*	*-0.61*
2002-Jul-15	-0.0099	0.0006	-0.0045	-0.0100	-0.0045	-0.0035	-0.0001	-0.0020	-0.0040	-0.0008
t-stat						*-0.58*	*-0.02*	*-0.41*	*-0.82*	*-0.16*
2002-Jul-25	-0.0122	-0.0108	-0.0138	-0.0089	-0.0006	-0.0065	0.0011	-0.0034	-0.0085	0.0033
t-stat						*-1.07*	*0.18*	*-0.69*	*-1.70 **	*0.67*
2003-Dec-15	-0.0131	0.0021	-0.0036	-0.0111	0.0080	-0.0056	0.0027	0.0005	-0.0053	0.0063
t-stat						*-1.06*	*0.51*	*0.12*	*-1.22*	*1.45*

Panel B	Hong Kong Bank Portfolio					Hong Kong Bank Portfolio				
Event date	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
2000-Mar-28	-0.0133	0.0000	-0.0055	-0.0063	0.0045	-0.0088	-0.0085	-0.0085	0.0050	-0.0020
t-stat						*-0.88*	*-0.86*	*-1.04*	*0.60*	*-0.24*
2001-Feb-06	0.0031	0.0053	0.0019	-0.0014	0.0034	-0.0018	0.0066	0.0011	-0.0033	0.0051
t-stat						*-0.21*	*0.79*	*0.15*	*-0.48*	*0.75*
2001-Jul-12	-0.0046	-0.0039	-0.0062	-0.0023	-0.0042	-0.0078	-0.0034	-0.0061	-0.0048	-0.0033
t-stat						*-1.00*	*-0.43*	*-0.96*	*-0.74*	*-0.51*
2001-Sep-17	-0.0291	-0.0207	-0.0173	-0.0194	-0.0090	-0.0214	-0.0142	-0.0140	-0.0207	-0.0052
t-stat						*-2.64* **	*-1.78* *	*-2.12* **	*-3.11* **	*-0.78*
2001-Oct-01	0.0194	0.0160	0.0226	0.0108	0.0142	0.0055	0.0017	0.0056	0.0004	-0.0016
t-stat						*0.68*	*0.21*	*0.83*	*0.05*	*-0.23*
2002-Mar-16	0.0019	-0.0053	-0.0029	-0.0021	-0.0020	0.0020	-0.0038	-0.0017	0.0011	-0.0026
t-stat						*0.25*	*-0.46*	*-0.26*	*0.17*	*-0.38*
2002-May-16	-0.0010	0.0038	0.0014	-0.0019	0.0014	-0.0040	0.0008	-0.0030	-0.0003	0.0001
t-stat						*-0.58*	*0.12*	*-0.53*	*-0.05*	*0.02*
2002-Jun-20	-0.0053	-0.0017	-0.0050	-0.0018	-0.0023	-0.0027	0.0012	0.0000	-0.0011	-0.0007
t-stat						*-0.4*	*0.18*	*0.00*	*-0.21*	*-0.12*
2002-Jul-07	-0.0020	-0.0033	-0.0018	-0.0023	0.0012	-0.0021	-0.0039	-0.0025	-0.0013	-0.0026
t-stat						*-0.32*	*-0.61*	*-0.48*	*-0.25*	*-0.49*
2002-Jul-15	-0.0104	-0.0014	-0.0055	-0.0110	-0.0044	-0.0039	-0.0022	-0.0030	-0.0048	-0.0005
t-stat						*-0.61*	*-0.35*	*-0.57*	*-0.92*	*-0.10*
2002-Jul-25	-0.0101	-0.0115	-0.0139	-0.0043	0.0009	-0.0038	0.0011	-0.0030	-0.0037	0.0053
t-stat						*-0.59*	*0.17*	*-0.57*	*-0.70*	*0.99*
2003-Dec-15	-0.0187	-0.0050	-0.0098	-0.0111	0.0001	-0.0118	-0.0051	-0.0061	-0.0061	-0.0028
t-stat						*-2.18* **	*-0.93*	*-1.37*	*-1.35*	*-0.63*

Panel C	Hong Kong Non-banking Portfolio					Hong Kong Non-banking Portfolio				
Event date	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
2000-Mar-28	-0.0260	-0.0216	-0.0205	-0.0126	0.0053	-0.0269	-0.0337	-0.0277	-0.0070	-0.0042
t-stat						*-1.41*	*-1.78 **	*-1.79 **	*-0.45*	*-0.27*
2001-Feb-06	0.0087	-0.0030	0.0011	0.0020	0.0003	0.0044	0.0035	0.0035	0.0023	0.0072
t-stat						*0.33*	*0.26*	*0.32*	*0.21*	*0.65*
2001-Jul-12	-0.0142	-0.0184	-0.0179	-0.0113	-0.0094	-0.0157	-0.0161	-0.0154	-0.0122	-0.0075
t-stat						*-1.60*	*-1.64*	*-1.91 **	*-1.52*	*-0.93*
2001-Sep-17	-0.0371	-0.0188	-0.0246	-0.0151	-0.0120	-0.0219	-0.0076	-0.0164	-0.0115	-0.0065
t-stat						*-2.19 ***	*-0.77*	*-2.02 ***	*-1.39*	*-0.8*
2001-Oct-01	-0.0029	0.0078	0.0036	0.0033	-0.0085	-0.0119	0.0004	-0.0108	-0.0016	-0.0204
t-stat						*-1.13*	*0.04*	*-1.26*	*-0.19*	*-2.37 ***
2002-Mar-16	-0.0408	-0.0401	-0.0341	-0.0312	-0.0272	-0.0399	-0.0378	-0.0317	-0.0268	-0.0275
t-stat						*-3.82 ***	*-3.62 ***	*-3.71 ***	*-3.1 ***	*-3.19 ***
2002-May-16	0.0068	-0.0007	0.0051	-0.0019	0.0010	0.0056	-0.0026	0.0022	0.0009	0.0005
t-stat						*0.50*	*-0.23*	*0.24*	*0.10*	*0.06*
2002-Jun-20	-0.0302	-0.0139	-0.0262	-0.0021	-0.0143	-0.0274	-0.0110	-0.0212	-0.0013	-0.0127
t-stat						*-2.58 ***	*-1.04*	*-2.44 ***	*-0.14*	*-1.47*
2002-Jul-07	-0.0163	-0.0097	-0.0100	-0.0178	-0.0022	-0.0153	-0.0084	-0.0092	-0.0160	-0.0038
t-stat						*-1.41*	*-0.77*	*-1.03*	*-1.8 **	*-0.42*
2002-Jul-15	-0.0090	0.0047	-0.0025	-0.0082	-0.0048	-0.0025	0.0041	-0.0001	-0.0023	-0.0012
t-stat						*-0.23*	*0.38*	*-0.01*	*-0.26*	*-0.14*
2002-Jul-25	-0.0162	-0.0095	-0.0136	-0.0180	-0.0037	-0.0118	0.0011	-0.0042	-0.0180	-0.0006
t-stat						*-1.07*	*0.10*	*-0.47*	*-1.99 ***	*-0.06*
2003-Dec-15	-0.0019	0.0162	0.0087	-0.0111	0.0240	0.0068	0.0182	0.0138	-0.0037	0.0247
t-stat						*0.64*	*1.73 **	*1.60*	*-0.43*	*2.85 ***

Panel D	China Financial Institutions Portfolio					China Financial Institutions Portfolio				
Event date	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
2000-Mar-28	-0.0176	0.0080	0.0005	-0.0074	0.0038	-0.0197	-0.0120	-0.0113	-0.0136	-0.0050
t-stat						*-1.87 **	*-1.14*	*-1.31*	*-1.59*	*-0.58*
2001-Feb-06	-0.0081	-0.0140	-0.0141	-0.0155	-0.0049	-0.0035	0.0024	-0.0015	-0.0030	0.0014
t-stat						*-0.44*	*0.30*	*-0.23*	*-0.46*	*0.21*
2001-Jul-12	-0.0049	-0.0080	-0.0047	-0.0059	-0.0031	-0.0040	-0.0027	-0.0006	-0.0031	-0.0025
t-stat						*-0.74*	*-0.51*	*-0.14*	*-0.71*	*-0.58*
2001-Sep-17	-0.0041	-0.0189	-0.0077	0.0197	-0.0091	0.0020	-0.0034	0.0000	0.0202	0.0032
t-stat						*0.40*	*-0.66*	*0.01*	*4.56 ***	*0.76*
2001-Oct-01	0.0047	-0.0048	0.0061	-0.0094	-0.0020	0.0095	0.0068	0.0090	0.0056	0.0065
t-stat						*1.68 **	*1.20*	*1.93 **	*1.19*	*1.42*
2002-Mar-16	0.0194	0.0032	0.0062	0.0174	0.0073	0.0050	0.0171	0.0066	0.0037	0.0063
t-stat						*0.67*	*2.34 ***	*1.09*	*0.62*	*1.05*
2002-May-16	-0.0111	-0.0225	-0.0123	-0.0135	-0.0182	0.0020	0.0032	0.0011	0.0001	0.0008
t-stat						*0.27*	*0.42*	*0.17*	*0.01*	*0.12*
2002-Jun-20	0.0238	-0.0072	0.0080	0.0413	0.0028	-0.0030	-0.0067	-0.0063	-0.0098	-0.0048
t-stat						*-0.34*	*-0.82*	*-0.91*	*-1.37*	*-0.71*
2002-Jul-07	-0.0033	-0.0025	-0.0033	-0.0117	-0.0013	-0.0068	-0.0093	-0.0072	-0.0079	-0.0024
t-stat						*-0.77*	*-1.05*	*-1.00*	*-1.09*	*-0.32*
2002-Jul-15	-0.0051	-0.0079	-0.0036	0.0028	-0.0060	-0.0027	-0.0048	-0.0023	0.0018	-0.0033
t-stat						*-0.31*	*-0.54*	*-0.32*	*0.25*	*-0.45*
2002-Jul-25	-0.0106	-0.0069	-0.0077	-0.0043	0.0016	-0.0059	-0.0029	-0.0037	-0.0033	0.0064
t-stat						*-0.66*	*-0.33*	*-0.51*	*-0.45*	*0.88*
2003-Dec-15	-0.0123	0.0034	-0.0028	-0.0138	0.0091	-0.0093	0.0042	0.0000	-0.0081	0.0094
t-stat						*-1.1*	*0.49*	*0.01*	*-1.17*	*1.35*

Table A-3 (Continued) Portfolio returns for each event related to the privatization (as listed in Table A-2) are given below. Two portfolios are used here, one is one being the rival financial institutions listed on the Hong Kong Stock Exchange, and the other formed by rival financial institutions listed on the two stock exchanges in Mainland China. The ordinary least squares estimates of abnormal returns to a portfolio of firms for an event, based on a single market index model, are obtained using the following equation: $R_{it} = \alpha_1 + \beta_{i1} R_{mt} + \beta_{i2} R_{mt-1} + \beta_{i3} R_{mt+1} + \tau_1 I_t^U + \lambda_i D_t + e_{it}$, where R_{it} is the rate of stock return to a portfolio of firms and R_{mt} is the rate of return on the relevant market index for period t. The dummy variable D_t takes the value of one during the event period for which the abnormal return is being determined and zero otherwise. The market index is the Hang Seng Stock Index for the Hong Kong portfolio, and the average of the Shanghai A-share index and the Shenzhen A-share index for the Mainland China portfolio. The daily abnormal stock return to a portfolio of rival firms i over the event period is given by λ_i. The raw daily portfolio returns are also given in the table in order to make the comparison. Five different event periods are used for estimation: 0 to +1, –1 to 0, –1 to +1, 0 to +2, and –2 to 0 relative to the press date of the announcement as given in Table A-2. The equations are estimated for the period t = –250 to the latest event period.

t-statistics are italicised and given below the portfolio returns.

*, ** represent 10 percent and 5 percent significant levels, respectively.

Relative to the market index, the first important event (announcement of restructure) generated a significant 1.49% daily loss over the –1 to +1, three-day event window for the bank and other non-banking financial institutions portfolios (significant at the 10% level). The bank portfolio in Hong Kong does not provide any significant results for the first event, even the sign of the parameter is negative for four out of five events windows. The non-banking financial institutions portfolio has a 3.37% daily loss and a 2.77% daily loss over the –1 to 0 and –1 to +1 windows respectively, which are both significant at the 10% level (all five event windows provide negative signs). The financial institutions portfolio in Mainland China also provides a negative sign for all the event windows, and the 0 to +1 window is significant at the 10% level.

For the portfolio of bank and other non-banking financial institutions in Hong Kong, reactions to the China WTO accession conclusion are all negative, and results from four out of five event windows show significant t-values. However, the financial institution portfolio in Mainland China has four out of five positive results, the 0 to + 2 event window has a 2.02% daily gain, which is significant at the 5% level. The results show that Mainland China's accession to the WTO is negative news to the Hong Kong financial services industry, since the Hong Kong financial institutions

could eventually lose their competitive edge as the intermediary between Mainland China and the international capital market[73].

For the announcement of detailed listings, although the Hong Kong banks portfolio has a negative sign in three out of the five event windows, none is significant. The Hong Kong non-banking financial institutions portfolio shows 5% significant negative results over all the event windows, and the daily losses are between 2.68% to 3.99%. The Mainland China financial institutions portfolio shows positive signs over all the event windows, and the daily gain over the –1 to 0 window is 1.71%, which is at the 5% significance level.

In summary, some of the banks and non-banking financial institutions reacted negatively to the partial privatization announcements of the BOCHK. Most of the banks and non-banking financial institutions in Hong Kong reacted negatively to the conclusion draft of China's entry into the WTO. Most of the financial institutions in Mainland China reacted positively to the announcements of the privatization of the BOCHK and China's entry to the WTO.

These empirical results indicate that the banks in Hong Kong are not significantly impacted by the privatization of the BOCHK. However, non-banking financial institutions show significant negative reaction to the privatization. Based on the high non-performing loan level and a number of other problems faced by the BOCHK, maybe the other banks expected that in the short-term, its privatization would not

[73] Based on the empirical results reported in Table A-3, the following three events appeared to be considered by the financial institutions as significant events for the partial privatization of the BOCHK: the announcement of the restructuring plan to merge 12 member banks of the BOC in Hong Kong into a single bank, the China WTO accession draft agreement conclusion, and the announcement of the final listing on the Hong Kong Stock Exchange. Therefore, these three events had an impact on the market, and on rival financial institutions' stock prices. Although the China WTO accession draft agreement conclusion is not directly related to the privatization of the BOCHK, one of the main reasons the government of China wanted to privatize the Bank is that because of its new membership of the WTO, China has to open its financial sector to foreign financial institutions. In order to make the domestic banks and non-bank financial institutions more competitive, the government hopes the partial privatization of some of the major banks will provide a competitive environment for the domestic financial institutions.

change the industry structure, especially considering that it is only partially privatized. However, as indicated in the recent financial statement of the BOCHK, after the restructuring and privatization, the Bank is planning to involve itself in more other non-banking financial business areas rather than competing in traditional banking business, such as loans and deposits. The size and market power of the BOCHK is obviously going to have a major impact on that part of the financial services industry. However, this news is positive for the financial institutions listed on the two stock exchanges in China. For the banks and non-banking financial institutions in China, privatization not only has the potential to create a more efficient competitor, but more importantly is also a signal or an indication that the government of China is going to further deregulate the whole financial services industry. As mentioned in the earlier part of this paper, the partial privatization of the BOCHK could be argued to be consistent with the study by Perotti (1995) which found that the initial percentage change to partially privatized ownership of a firm may well be considered by the market as a positive signal for further privatization and also a sign of commitment to foreign shareholders wealth. Although the sizes of the listed financial institutions in Mainland China used in this study, are smaller relative to the four major banks in China, they are normally more profitable and efficient. Their goal is more market-driven and compared with the other state-owned financial institutions, they are forerunners in applying modern corporate governance structure. Along with the lifting of more regulatory restrictions, they will be able to attract more high-quality customers in the major cities and get involved in different financial business areas, which could improve their profitability. At least in the near future, further reform in the financial sector of Mainland China has the potential to bring about more development opportunities to these smaller financial institutions. However, whether the small financial institutions in Mainland China are going to be able to compete with the large foreign financial institutions in the future will remain an empirical question. At this stage, suffice it to say that the process of privatization should ideally be applied to all four major banks in Mainland China and the share owned by the private sector in these four banks should substantially increase, if China's financial services industry intends to compete with foreign financial institutions.

ii) Empirical Results of Each Rival Financial Institution's Response to Key Events

For each of the 23 rival financial institutions, Equation (A.1), using SUR, is used for the estimation of the three important events prior to the IPO of the BOCHK, (i.e., the announcement of the restructuring plan to merge 12 member banks of the BOC in Hong Kong into a single bank, the China WTO accession draft agreement conclusion, and the announcement of the final listing on the Stock Exchange of Hong Kong) identified in the previous subsection as those which were statistically significant. The results for these events are reported in panels A, B, and C of Table A-4.

For most financial institutions, the reaction to the restructuring announcement of the BOCHK is negative, but not statistically significant. A reasonable explanation could be that the market expected to see more details of the restructuring plan of the Bank.

Individual financial institution's responses to the news of China's accession to the WTO are divided. Most of the Hong Kong firms had negative reactions, and all the Chinese financial institutions provide positive gain over the 0 to +2 event window, and the daily return is from 1.36% to 2.91% which are all statistically significant at the 5% level.

Three non-banking financial institutions in Hong Kong had significant negative reactions to the announcement of the detailed listing of the BOCHK, which are China Everbright, Celestial Asia, and Tai Fook Securities. Also four out of five banks and non-banking financial institutions in Mainland China reacted positively to the announcement.

HSBC, the largest bank in Hong Kong, had no significant reaction to the restructuring announcement and the listing announcement of the BOCHK, however, it had a negative reaction to the announcement of China's accession to the WTO (1.57% daily loss over the –1 to 0, and 1.46% daily loss over the –2 to 0 window, both significant at the 5% level). As the HSBC is such an international financial institution, and its

profit is generated globally, the results here are not surprising. The Hang Seng Bank, the third largest bank in Hong Kong, had a 1.59% (at the 10% significance level) loss after the announcement of the Bank of China Hong Kong listing over the 0 to 1 event window.

Table A-4: Returns to individual financial institutions around important privatization events

Panel A	Event Date: 2000-Mar-28									
Company Name	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
HSBC HDG.	-0.0134	0.0054	0.0000	-0.0117	0.0119	-0.0077	-0.0027	-0.0025	0.0006	0.0062
t-stat						*-0.98*	*-0.34*	*-0.39*	*0.09*	*0.96*
HANG SENG BANK	-0.0165	0.0055	-0.0049	-0.0097	0.0098	-0.0074	-0.0016	-0.0061	0.0059	0.0053
t-stat						*-0.69*	*-0.15*	*-0.7*	*0.66*	*0.6*
BANK OF EAST ASIA	-0.0014	-0.0044	-0.0010	0.0067	-0.0019	0.0065	-0.0148	-0.0040	0.0226	-0.0102
t-stat						*0.42*	*-0.97*	*-0.32*	*1.78 **	*-0.81*
DAH SING FINANCE HDG.	0.0000	0.0145	0.0037	0.0036	0.0228	0.0042	0.0025	-0.0007	0.0165	0.0132
t-stat						*0.16*	*0.1*	*-0.03*	*0.77*	*0.62*
WING LUNG BK.	-0.0070	0.0044	-0.0035	-0.0012	0.0088	-0.0064	-0.0038	-0.0077	0.0059	0.0034
t-stat						*-0.48*	*-0.28*	*-0.71*	*0.54*	*0.32*
CITIC INTL.FINL.HDG.	-0.0392	-0.0055	-0.0189	0.0000	0.0000	-0.0355	-0.0169	-0.0244	0.0135	-0.0075
t-stat						*-1.39*	*-0.66*	*-1.16*	*0.63*	*-0.36*
WING HANG BK.	-0.0243	-0.0025	-0.0112	-0.0224	0.0000	-0.0201	-0.0109	-0.0135	-0.0108	-0.0067
t-stat						*-1*	*-0.54*	*-0.83*	*-0.66*	*-0.41*
ICBC (ASIA)	-0.0178	-0.0106	-0.0119	-0.0143	-0.0094	-0.0157	-0.0227	-0.0175	-0.0047	-0.0192
t-stat						*-0.55*	*-0.8*	*-0.75*	*-0.2*	*-0.82*
LIU CHONG HING BANK	-0.0112	0.0075	0.0025	-0.0049	0.0075	-0.0069	0.0029	0.0020	0.0045	0.0042
t-stat						*-0.52*	*0.22*	*0.18*	*0.41*	*0.39*
HK CHINESE LTD.	-0.0234	-0.0116	-0.0156	-0.0136	-0.0077	-0.0197	-0.0175	-0.0180	-0.0042	-0.0119
t-stat						*-0.94*	*-0.84*	*-1.05*	*-0.24*	*-0.69*
INTL.BANK OF ASIA	-0.0200	-0.0132	-0.0155	-0.0133	0.0000	-0.0144	-0.0217	-0.0181	-0.0004	-0.0064
t-stat						*-0.72*	*-1.08*	*-1.1*	*-0.02*	*-0.39*
ASIA FINANCIAL	0.0147	0.0111	0.0098	0.0049	0.0124	0.0175	0.0099	0.0110	0.0076	0.0094
t-stat						*0.95*	*0.54*	*0.73*	*0.51*	*0.63*
CHINA EVERBRIGHT	-0.0236	0.0039	-0.0080	-0.0052	0.0106	-0.0211	-0.0063	-0.0121	0.0040	0.0014
t-stat						*-0.63*	*-0.19*	*-0.44*	*0.15*	*0.05*
CELESTIAL ASIA SECS.	-0.0382	-0.0303	-0.0255	0.0097	-0.0202	-0.0439	-0.0447	-0.0366	0.0117	-0.0335
t-stat						*-0.89*	*-0.91*	*-0.91*	*0.29*	*-0.83*
ALLIED GROUP	-0.0426	-0.0256	-0.0351	-0.0397	-0.0035	-0.0398	-0.0386	-0.0417	-0.0292	-0.0144

t-stat						*-1.26*	*-1.22*	*-1.62*	*-1.13*	*-0.56*
SUN HUNG KAI & CO.	-0.0332	-0.0059	-0.0202	-0.0222	0.0163	-0.0344	-0.0140	-0.0262	-0.0181	0.0099
t-stat						*-1*	*-0.41*	*-0.93*	*-0.64*	*0.35*
E2-CAPITAL (HDG.) LTD.	-0.0307	-0.0668	-0.0464	-0.0224	0.0320	-0.0271	-0.0780	-0.0515	-0.0148	0.0246
t-stat						*-0.5*	*-1.44*	*-1.16*	*-0.33*	*0.55*
TAI FOOK SECURITIES GP.	0.0122	-0.0050	0.0123	0.0041	-0.0034	0.0074	-0.0143	0.0060	0.0030	-0.0114
t-stat						*0.28*	*-0.55*	*0.28*	*0.14*	*-0.54*
SHAI.PUDONG DEV.BK.	-0.0141	-0.0003	-0.0043	-0.0068	-0.0002	-0.0122	-0.0077	-0.0076	-0.0074	-0.0010
t-stat						*-1.21*	*-0.75*	*-0.91*	*-0.89*	*-0.11*
SHN.DEV. BANK	-0.0080	0.0052	-0.0002	-0.0039	0.0014	-0.0034	-0.0020	-0.0024	-0.0020	0.0003
t-stat						*-0.26*	*-0.15*	*-0.22*	*-0.19*	*0.03*
HONGYUAN SECS.CO.	-0.0262	0.0017	-0.0065	-0.0136	-0.0085	-0.0261	-0.0234	-0.0206	-0.0203	-0.0195
t-stat						*-1.45*	*-1.28*	*-1.39*	*-1.38*	*-1.3*
SHAANXI INTL.TRUST	-0.0418	0.0228	0.0013	-0.0197	0.0195	-0.0449	-0.0029	-0.0133	-0.0280	0.0088
t-stat						*-2.64 ***	*-0.16*	*-0.92*	*-1.99 **	*0.61*
ANSHAN TST.&INV.	0.0018	0.0103	0.0120	0.0071	0.0069	0.0009	-0.0070	0.0020	0.0019	0.0007
t-stat						*0.06*	*-0.45*	*0.16*	*0.15*	*0.05*

Panel B	**Event Date: 2001-Sep-17**									
Company Name	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
HSBC HDG.	-0.0257	-0.0243	-0.0140	-0.0085	-0.0204	-0.0098	-0.0157	-0.0067	-0.0057	-0.0146
t-stat						*-1.25*	*-2.06 ***	*-1.05*	*-0.88*	*-2.32 ***
HANG SENG BANK	-0.0209	-0.0032	-0.0087	-0.0021	-0.0085	-0.0125	0.0039	-0.0039	-0.0004	-0.0074
t-stat						*-1.22*	*0.39*	*-0.47*	*-0.05*	*-0.90*
BANK OF EAST ASIA	-0.0201	-0.0182	-0.0194	-0.0166	-0.0061	-0.0149	-0.0103	-0.0177	-0.0197	-0.0061
t-stat						*-1.38*	*-0.99*	*-2.04 ***	*-2.22 ***	*-0.70*
DAH SING FINANCE HDG.	-0.0630	-0.0308	-0.0382	-0.0567	-0.0262	-0.0492	-0.0264	-0.0328	-0.0552	-0.0230
t-stat						*-2.93 ***	*-1.6*	*-2.40 ***	*-4.00 ***	*-1.68 **
WING LUNG BK.	-0.0162	-0.0171	-0.0108	-0.0157	-0.0161	-0.0135	-0.0137	-0.0105	-0.0189	-0.0157
t-stat						*-1.31*	*-1.36*	*-1.26*	*-2.23 ***	*-1.88 **
CITIC INTL.FINL.HDG.	-0.0381	-0.0372	-0.0213	-0.0218	-0.0172	-0.0303	-0.0281	-0.0172	-0.0236	-0.0129
t-stat						*-1.92 **	*-1.81 **	*-1.34*	*-1.81 **	*-1.00*

WING HANG BK.	-0.0063	-0.0277	-0.0077	-0.0063	-0.0022	0.0012	-0.0226	-0.0060	-0.0096	0.0035
t-stat						*0.07*	*-1.44*	*-0.46*	*-0.72*	*0.27*
ICBC (ASIA)	-0.0345	-0.0390	-0.0230	-0.0056	-0.0118	-0.0308	-0.0298	-0.0208	-0.0094	-0.0097
t-stat						*-1.94 **	*-1.92 **	*-1.62*	*-0.72*	*-0.75*
LIU CHONG HING BANK	-0.0222	-0.0111	-0.0124	-0.0174	-0.0025	-0.0179	-0.0068	-0.0118	-0.0218	0.0011
t-stat						*-1.31*	*-0.51*	*-1.07*	*-1.95 **	*0.10*
HK CHINESE LTD.	-0.0400	-0.0079	-0.0215	-0.0467	0.0053	-0.0413	-0.0026	-0.0230	-0.0546	0.0072
t-stat						*-1.52*	*-0.10*	*-1.04*	*-2.44 ***	*0.33*
INTL.BANK OF ASIA	-0.0617	-0.0316	-0.0302	-0.0356	-0.0018	-0.0547	-0.0290	-0.0288	-0.0396	0.0017
t-stat						*-2.18 ***	*-1.17*	*-1.41*	*-1.91 **	*0.08*
ASIA FINANCIAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0054	0.0053	0.0040	0.0025	0.0059
t-stat						*0.30*	*0.30*	*0.27*	*0.17*	*0.40*
CHINA EVERBRIGHT	-0.0552	-0.0444	-0.0368	-0.0044	-0.0252	-0.0328	-0.0299	-0.0254	0.0005	-0.0175
t-stat						*-1.50*	*-1.40*	*-1.44*	*0.03*	*-0.98*
CELESTIAL ASIA SECS.	-0.0750	-0.0505	-0.0581	-0.0597	-0.0389	-0.0537	-0.0337	-0.0471	-0.0573	-0.0275
t-stat						*-2.13 ***	*-1.37*	*-2.31 ***	*-2.76 ***	*-1.34*
ALLIED GROUP	-0.0395	-0.0132	-0.0178	-0.0263	-0.0044	-0.0311	-0.0032	-0.0131	-0.0272	-0.0048
t-stat						*-1.91 **	*-0.20*	*-0.99*	*-2.04 ***	*-0.36*
SUN HUNG KAI & CO.	-0.0527	-0.0050	-0.0351	0.0000	-0.0034	-0.0403	0.0027	-0.0285	0.0036	0.0000
t-stat						*-1.91 **	*0.13*	*-1.67 **	*0.20*	*0.00*
E2-CAPITAL (HDG.) LTD.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0193	0.0110	0.0092	0.0046	0.0093
t-stat						*0.75*	*0.44*	*0.44*	*0.22*	*0.44*
TAI FOOK SECURITIES GP.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0055	0.0052	0.0054	0.0067	-0.0007
t-stat						*0.32*	*0.31*	*0.39*	*0.48*	*-0.05*
SHAI.PUDONG DEV.BK.	-0.0056	-0.0168	-0.0074	0.0132	-0.0112	0.0017	-0.0021	0.0012	0.0146	0.0012
t-stat						*0.23*	*-0.27*	*0.19*	*2.31 ***	*0.19*
SHN.DEV. BANK	-0.0118	-0.0236	-0.0132	0.0127	-0.0168	-0.0053	-0.0072	-0.0051	0.0136	-0.0048
t-stat						*-0.65*	*-0.89*	*-0.78*	*2.02 ***	*-0.72*
HONGYUAN SECS.CO.	-0.0039	-0.0197	-0.0088	0.0165	-0.0106	0.0056	0.0000	0.0015	0.0183	0.0039
t-stat						*0.65*	*0.00*	*0.22*	*2.61 ***	*0.56*
SHAANXI INTL.TRUST	0.0046	-0.0132	-0.0020	0.0270	-0.0003	0.0094	0.0006	0.0042	0.0274	0.0099
t-stat						*1.23*	*0.08*	*0.68*	*4.31 ***	*1.60*
ANSHAN TST.&INV.	-0.0035	-0.0213	-0.0070	0.0293	-0.0068	0.0015	-0.0083	-0.0006	0.0291	0.0042

t-stat						*0.16*	*-0.89*	*-0.08*	*3.67* **	*0.56*

Panel C	**Event Date: 2002-Mar-16**									
Company Name	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**	**(0, 1)**	**(-1, 1)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
HSBC HDG.	0.0081	0.0027	0.0036	-0.0055	0.0045	0.0072	0.0046	0.0049	-0.0009	0.0028
t-stat						*1.01*	*0.65*	*0.85*	*-0.15*	*0.47*
HANG SENG BANK	-0.0153	-0.0125	-0.0093	-0.0092	-0.0028	-0.0159	-0.0114	-0.0085	-0.0070	-0.0036
t-stat						*-1.95* *	*-1.39*	*-1.26*	*-1.04*	*-0.53*
BANK OF EAST ASIA	-0.0049	-0.0114	-0.0076	-0.0066	-0.0098	-0.0048	-0.0095	-0.0060	-0.0031	-0.0101
t-stat						*-0.55*	*-1.1*	*-0.85*	*-0.44*	*-1.43*
DAH SING FINANCE HDG.	0.0085	-0.0070	-0.0047	-0.0019	0.0000	0.0078	-0.0054	-0.0045	-0.0003	-0.0006
t-stat						*0.45*	*-0.32*	*-0.32*	*-0.02*	*-0.04*
WING LUNG BK.	0.0000	-0.0008	-0.0011	0.0006	0.0000	0.0009	0.0002	0.0002	0.0043	-0.0006
t-stat						*0.10*	*0.02*	*0.03*	*0.56*	*-0.08*
CITIC INTL.FINL.HDG.	0.0102	-0.0101	-0.0034	0.0068	-0.0133	0.0086	-0.0088	-0.0030	0.0081	-0.0142
t-stat						*0.57*	*-0.58*	*-0.24*	*0.65*	*-1.15*
WING HANG BK.	0.0131	0.0009	0.0043	0.0088	0.0101	0.0138	0.0017	0.0056	0.0130	0.0093
t-stat						*0.97*	*0.12*	*0.48*	*1.11*	*0.79*
ICBC (ASIA)	0.0065	0.0065	0.0043	-0.0022	0.0065	0.0047	0.0069	0.0044	-0.0011	0.0051
t-stat						*0.35*	*0.51*	*0.4*	*-0.1*	*0.46*
LIU CHONG HING BANK	-0.0031	-0.0062	-0.0041	-0.0021	-0.0021	-0.0032	-0.0041	-0.0028	0.0008	-0.0014
t-stat						*-0.25*	*-0.32*	*-0.27*	*0.08*	*-0.13*
HK CHINESE LTD.	0.0000	0.0000	0.0000	-0.0046	0.0000	0.0040	0.0061	0.0057	0.0016	0.0048
t-stat						*0.07*	*0.11*	*0.13*	*0.04*	*0.11*
INTL.BANK OF ASIA	0.0000	-0.0256	-0.0171	-0.0035	-0.0171	-0.0022	-0.0247	-0.0176	-0.0031	-0.0187
t-stat						*-0.09*	*-1.04*	*-0.90*	*-0.16*	*-0.95*
ASIA FINANCIAL	0.0000	0.0000	0.0000	-0.0056	0.0000	0.0027	-0.0019	0.0003	0.0006	-0.0041
t-stat						*0.14*	*-0.09*	*0.02*	*0.03*	*-0.25*
CHINA EVERBRIGHT	-0.0076	-0.0597	-0.0415	-0.0034	-0.0428	-0.0090	-0.0541	-0.0384	0.0008	-0.0408
t-stat						*-0.45*	*-2.78* **	*-2.41* **	*0.05*	*-2.55* **
CELESTIAL ASIA SECS.	-0.1627	-0.0912	-0.1085	-0.1242	-0.0608	-0.1584	-0.0882	-0.1043	-0.1143	-0.0627
t-stat						*-6.47* **	*-3.50* **	*-5.06* **	*-5.58* **	*-3.01* **

ALLIED GROUP	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0007	0.0021	0.0016	0.0020	0.0004
t-stat						*-0.04*	*0.11*	*0.11*	*0.13*	*0.03*
SUN HUNG KAI & CO.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012	-0.0005	0.0011	0.0050	-0.0028
t-stat						*0.05*	*-0.02*	*0.06*	*0.25*	*-0.14*
E2-CAPITAL (HDG.) LTD.	0.0149	0.0000	0.0049	0.0000	0.0000	0.0160	0.0018	0.0071	0.0041	-0.0002
t-stat						*0.47*	*0.05*	*0.26*	*0.15*	*-0.01*
TAI FOOK SECURITIES GP.	-0.0895	-0.0895	-0.0597	-0.0597	-0.0597	-0.0905	-0.0901	-0.0599	-0.0613	-0.0613
t-stat						*-4.44* **	*-4.41* **	*-3.54* **	*-3.62* **	*-3.61* **
SHAI.PUDONG DEV.BK.	0.0202	0.0067	0.0077	0.0135	0.0142	0.0079	0.0190	0.0081	0.0022	0.0143
t-stat						*0.89*	*2.16* **	*1.11*	*0.31*	*2.00* **
SHN.DEV. BANK	0.0249	0.0102	0.0082	0.0152	0.0102	0.0125	0.0223	0.0099	0.0050	0.0084
t-stat						*1.55*	*2.82* **	*1.51*	*0.76*	*1.28*
HONGYUAN SECS.CO.	0.0159	0.0021	0.0065	0.0225	0.0062	0.0007	0.0168	0.0074	0.0082	0.0044
t-stat						*0.07*	*1.68* *	*0.9*	*1.00*	*0.54*
SHAANXI INTL.TRUST	0.0179	0.0186	0.0146	0.0145	0.0174	0.0039	0.0316	0.0151	0.0011	0.0160
t-stat						*0.32*	*2.70* **	*1.56*	*0.12*	*1.66* *
ANSHAN TST.&INV.	0.0179	-0.0215	-0.0058	0.0211	-0.0114	0.0028	-0.0034	-0.0057	0.0041	-0.0111
t-stat						*0.19*	*-0.24*	*-0.48*	*0.35*	*-0.95*

Returns, including average daily raw returns, for important events identified from Tables A-2 and A-3 are given below. The financial institutions are the banks and non-banking financial institutions listed on the Stock Exchange of Hong Kong and the two stock exchanges in Mainland China.

Seemingly unrelated regression estimates of abnormal returns to the rival financial institutions are obtained based on a single market index model given by the equation in Table A-3. Five different event periods are used for estimation: 0 to +1, –1 to 0, –1 to +1, 0 to +2, and –2 to 0 relative to the press date of the announcement as given in able A-2. The equations are estimated for the period t = –250 to the latest event period.

t-statistics are italicised and given below the individual returns.

*, ** represent 10 percent and 5 percent significant levels, respectively.

8. Is Partial Privatization Beneficial?

As this section of the paper intends to analyze issues related to the effects seen after the partial privatization of the BOCHK, one may argue that the outcome of the privatization could better unfold over a relatively long period of time and hence any assessment of the BOCHK's performance and profitability since July 2002 could be premature. One should also note that in the case of the BOCHK, only 25 percent of its shares are privatized[74] and hence one could again argue that the full potential benefits of privatization cannot be realised, although as mentioned earlier, there are researchers who argue that the optimal outcome of privatization may well be found in a balance between public and private ownership. The other issues that should be considered are that it is possible that the Bank of China could add more assets into the listed company (i.e., the BOCHK) and at the same time, issue new shares and hence continue to remain the majority shareholder.

In this study, the event study method (market model) is used to estimate the abnormal returns of the BOCHK following its IPO. Since the BOCHK does not have any market prices data before its IPO, the regression parameters of the Hang Seng Bank are used instead to estimate the BOCHK's expected returns as the Hang Seng Bank has the closest market capitalization and asset base to the BOCHK. An estimation window from day –270 to day –30 is used in the market model, and the market index used in the regression is the Hang Seng Stock Index. Another method used here is to calculate the industry-adjusted abnormal returns for the BOCHK as the difference between the returns of the BOCHK and the returns of the financial industry index in Hong Kong. The paper also compares the cumulative abnormal returns of the BOCHK over the cumulative abnormal returns of portfolios of rival financial institutions both in Hong Kong and in Mainland China. CAR (1, 6), CAR (1, 12) and CAR (1, 18) are calculated here.

[74] Another 10% of shares of BOCHK are sold on December 2003, which is nearly one and half year after the IPO.

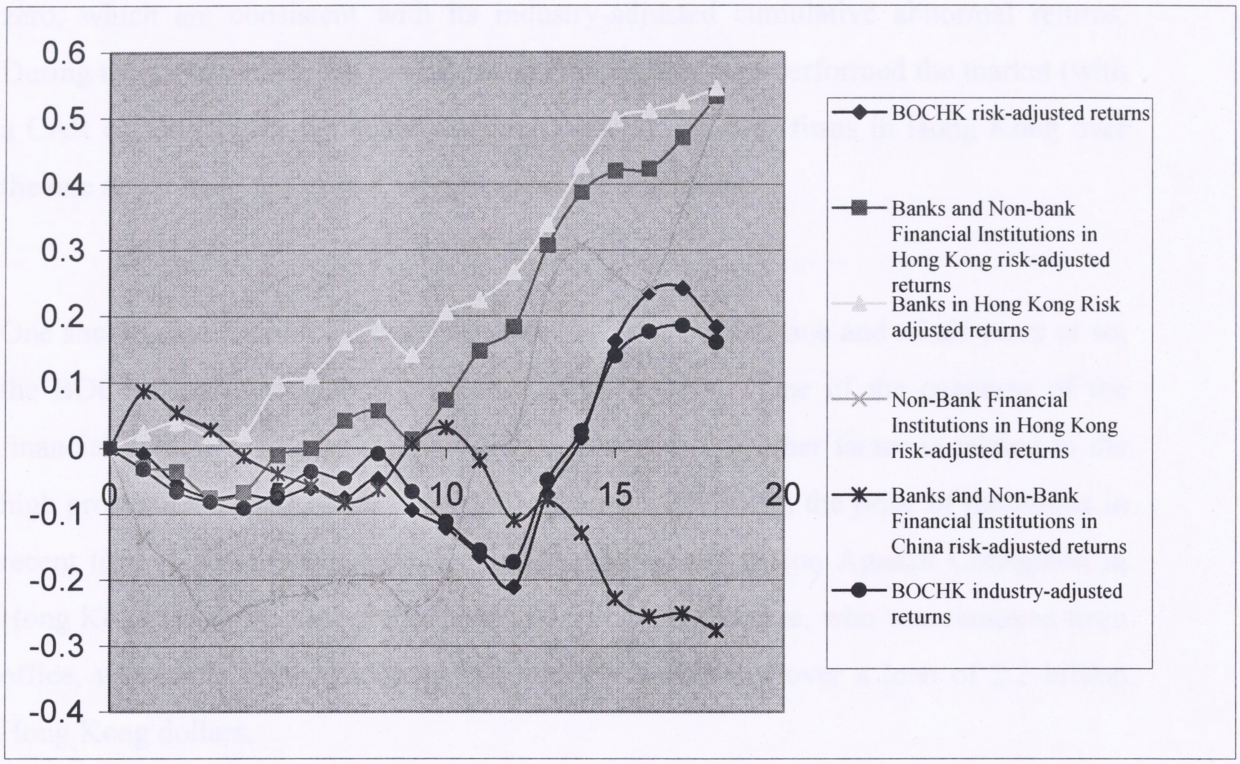
Table A-5: Cumulative returns over the market return of the Bank of China Hong Kong and rival financial institutions

	BOCHK - Market adjusted	Financial Institutions in Hong Kong	Difference		
CAR (1-6)	-0.0615	-0.0004	-0.0611		
	-0.51	*0.00*	*-0.79*		
CAR (1-12)	-0.2108	0.1835	-0.3943		
	-1.25	*1.36 **	*-3.70 ***		
CAR (1-18)	0.1833	0.5335	-0.3502		
	0.88	*3.22 ***	*-2.34 ***		
		Banks in Hong Kong	**Difference**	**Non-banking financial institutions in Hong Kong**	**Difference**
CAR (1-6)		0.1088	-0.1703	-0.2187	0.1572
		1.01	*-2.56 ***	*-1.29*	*0.95*
CAR (1-12)		0.2668	-0.4776	0.0169	-0.2277
		*1.77 ***	*-4.89 ***	*0.07*	*-1.06*
CAR (1-18)		0.5454	-0.3622	0.5095	-0.3263
		*2.96 ***	*-2.40 ***	*1.76 ***	*-1.11*
		Financial Institutions in Mainland China	**Difference**		
CAR (1-6)		-0.0574	-0.0041		
		-0.44	*-0.03*		
CAR (1-12)		-0.1092	-0.1016		
		-0.60	*-0.56*		
CAR (1-18)		-0.2763	0.4596		
		-1.24	*1.92 ***		
	BOCHK - Industry adjusted				
CAR (1-6)	-0.0358				
	-0.25				
CAR (1-12)	-0.1729				
	-0.96				
CAR (1-18)	0.1607				
	0.59				

t-statistics are italicised and given below the returns.

*, ** represent 10 percent and 5 percent significant levels, respectively.

Figure A-1: Cumulative returns of the Bank of China Hong Kong and its rival financial institutions over the market return.



The market-adjusted and industry adjusted cumulative abnormal returns are presented in Table A-5. These results clearly indicate that during the first one and a half years of post privatization, the BOCHK did not over-perform the market index and the financial industry index in Hong Kong.

The month-by-month market-adjusted cumulative abnormal returns of the Bank of China Hong Kong and other rival financial institutions' portfolios after the initial public offering of the BOCHK are presented graphically in Figure A-1.

The results show that the BOCHK did not over-perform the local market in Hong Kong. An under-performance can be observed when we compare the BOCHK with equal-weighted portfolios of rival banks and non-banking financial institutions in Hong Kong. The Bank's market-adjusted cumulative abnormal returns are –6.15% over the six-month period after its IPO and –21.08% over the one-year after its IPO, and the market-adjusted cumulative abnormal returns of the BOCHK become positive fourteen

months after the IPO. However, all these results are not significantly different from zero, which are consistent with its industry-adjusted cumulative abnormal returns. During the same period, the rival firms in Hong Kong over-performed the market (with a CAR of 53.33% for the equal-weighted portfolio of rival firms in Hong Kong over the one and a half year period, significant at the 5% level).

One should also take into account the fact that over the last one and a half years or so, the BOCHK has been facing a number of challenges. One of the concerns of the financial market is its persistently high debt level. The other factor is related to the high proportion of real estate in its portfolio and a decline in the price of properties in recent times. During this year, the Independent Commission Against Corruption in Hong Kong also investigated this bank and its chief executive, who was removed from office, was under investigation by the Chinese authorities over a loan of 2.2 billion Hong Kong dollars.

The key question to be asked is whether the actual partial privatization of the BOCHK or any other major banks in China would make these financial institutions more efficient and competitive or whether one has to also look at other changes that should also take place as the process of financial services reform is taking place. To answer this question, this part of the paper will simply discuss some of the ingredients that could assist the financial institutions in China as they consider undergoing reform of their industry.

The study by Groves et al. (1994) indicates that in China the methods of selecting a manager and linking their pay to the firm performance do have an influence on the efficiency and productivity of the firm. In the case of the BOCHK where its CEO has been subject to bad publicity and consequently been arrested may well have had some negative effects on the bank's recent performance. Nevertheless, according to the latest interim annual report of the BOCHK (2003) the bank is committed to good corporate governance and grants incentives for its employees, including its CEO.

At the same time, due to the nature of the current economic system in China and the lack of independent shareholders who can monitor the performance of the companies in China, as Lin et al. (1998) argued it is possible that the independent CEOs may reduce the firms' value. In other words, in the case of the medium to long term effects of the partial privatization of the BOCHK or any other major banks in China, one should also take into account the nature of the shareholders in China in their overall assessment of the potential performance of the majority privately owned financial institutions if other necessary reforms are not taking place in China.

The study by Groves et al. (1994) also indicates that the reforms in the SOEs in China resulted in an increase in productivity of the workers in these reformed enterprises. Their study focuses on the manufacturing sectors such as textiles, chemicals and electronics and indicates that the worker's productivity in these sectors have increased and overall the industry reform is heading in the right direction. In the case of the financial services industry, one could assume that as the pace of reform and privatization increases, human resources in the financial services of China will improve. The previous studies of comparative advantage in financial services such as Moshirian (1993, 1994) indicate that financial institutions do demonstrate the same characteristics that the successful manufacturing sectors have demonstrated. In other words, labor productivity and human capital as well as technology and economies of scale are amongst those qualities that make some financial institutions more successful and more efficient than others. The partial privatization of the BOCHK and possibly other banks in the future may well indicate that labor productivity in financial services will increase as China reforms all facets of her economy and increasingly allows market forces to determine the prices, consumer choice and financial products. Furthermore, the recent studies by Moshirian et al. (2003) and Moshirian (2004) demonstrate the significance of education in finance as one of the major contributors to the comparative advantage of certain financial institutions. According to the World Competitiveness Yearbook (2003) China's education in finance is ranked number 30 (while Taiwan is ranked number 15 and Russia is ranked number 18) and hence while

the partial privatization of the financial services industry should accelerate in China, there is also a need for more qualified personnel in the financial services industry that could contribute to the competitiveness of the Chinese financial services industry and their ability to be cope with the presence of foreign financial institutions in China.

Various studies have highlighted the significance of the legal system and an effective regulation system to protect the foreign investors. The study by La Porta et al. (1998) also highlights the importance of the quality of the accounting standard as one of the positive contributors to the attractiveness for foreign investors. One of the challenges facing China and its financial services industry is that, as part of reform and bringing the industry up to the international standard expected by the WTO, is to improve the quality of accounting standards and thus enhance the quality of China's financial institutions and their ability to compete with the foreign banks in China.

In addition to the above issues, one should also view the privatization policy in China holistically. The reform of the financial services industry requires further reform in the agriculture and manufacturing sectors as well as reform of the labor market and those factors that inhibit the free flow of resources in the Chinese economy and therefore, the continuous policy of reform in the SOEs should now be integrated into the services_sector including the reform and liberalisation of the financial services sector. A holistic_approach would contribute to more effective and more beneficial privatization of the banking sector in China.

9. Short and Long Term Abnormal Returns of Rival Firms as a Result of Privatization

In this section, rival firms' size, profitability, financial leverage level, location and industry are used to explain their short-term abnormal returns following the Bank of China Hong Kong's privatization announcements and their long-term average cumulative abnormal returns following the BOCHK's partial privatization.

$$\overline{AR}_{i,t} = \alpha + \beta_1 \ln(MV_{i,t-1}) + \beta_2 ROE_{i,t-1} + \beta_3 DE_{i,t-1} + \beta_4 D_{Loc,i} + \beta_4 D_{Industry,i} + e_{i,t-1}, \quad \text{(A.2)}$$

where $\overline{AR}_{i,t-1}$ is the short-term abnormal returns during the events period, or the average cumulative abnormal returns over the post-period of the BOCHK listing; $MV_{i,t-1}$ is the market capitalization of firm i, which serves as a proxy for firm size; $ROE_{i,t-1}$ is the return on equity of firm i, which is a proxy for the firm's profitability; $DE_{i,t\ 1}$ is the debt-to-equity ratio of firm i, a proxy for the firm's financial risk level; $D_{Loc,i}$ is the location dummy variable that equals one if the firm is located in Hong Kong, and zero if the firm is listed in Mainland China; and $D_{Industry,i}$ is the industry dummy variable that equals one if the firm is a bank, and zero if the firm is a non-banking financial institution.

Table A-6: Regression of rival firms' abnormal return on firm specific variables

Panel A	**Event Date: 2000-Mar-28**				
Parameter	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
Intercept	-0.0107	-0.0237	-0.0114	-0.0227	0.0100
	-0.55	*-1.10*	*-0.6*	*-1.87 **	*0.61*
ln (Market Cap.)	-0.0033	0.0011	-0.0013	0.0016	-0.0039
	-0.76	*0.24*	*-0.28*	*0.52*	*-1.12*
ROE	0.0575	0.0648	0.0614	0.0514	0.0589
	1.70	*2.61 ***	*1.95 **	*1.65*	*2.42 ***
DE Ratio	0.0004	-0.0014	-0.0003	-0.0018	0.0013
	0.14	*-0.55*	*-0.10*	*-1.07*	*0.65*
Location Dummy	-0.0015	-0.0154	-0.0104	0.0049	0.0028
	-0.10	*-1.27*	*-0.83*	*0.59*	*0.33*
Industry Dummy	0.0194	0.0285	0.0194	0.0222	-0.0012
	0.98	*1.53*	*0.99*	*2.18 ***	*-0.09*
Adjust R square	0.0988	0.2174	0.1699	0.2856	-0.1074

Panel B	**Event Date: 2001-Sep-17**				
Parameter	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
Intercept	0.0054	0.0048	0.0031	0.0093	0.0214
	0.26	*0.33*	*0.22*	*0.68*	*2.83 ***
ln (Market Cap.)	-0.0030	-0.0016	-0.0021	0.0018	-0.0024
	-0.80	*-0.52*	*-0.81*	*0.74*	*-1.59*
ROE	0.0747	0.0041	0.0450	0.0596	-0.0050
	*2.03 **	*0.10*	*1.34*	*1.46*	*-0.24*
DE Ratio	0.0015	0.0007	0.0009	-0.0006	-0.0003
	0.58	*0.33*	*0.53*	*-0.26*	*-0.35*
Location Dummy	-0.0206	-0.0059	-0.0138	-0.0376	-0.0133
	-1.45	*-0.65*	*-1.39*	*-2.83 ***	*-2.18 ***

Industry Dummy	-0.0084	-0.0080	-0.0027	-0.0086	0.0065
	-0.36	*-0.53*	*-0.17*	*-0.36*	*0.75*
Adjust R square	0.1223	-0.1247	0.0687	0.3639	0.1101

Panel C	**Event Date: 2002-Mar-16**				
Parameter	**(0, 1)**	**(-1, 0)**	**(-1, 1)**	**(0, 2)**	**(-2, 0)**
Intercept	0.0230	0.0243	0.0218	0.0189	0.0103
	0.71	*0.98*	*0.99*	*0.89*	*0.63*
ln (Market Cap.)	0.0011	0.0004	-0.0001	0.0013	0.0003
	0.20	*0.09*	*-0.02*	*0.38*	*0.11*
ROE	0.1602	0.0737	0.1078	0.1217	0.0574
	*1.74 **	*1.48*	*2.08 **	*1.91 **	*1.84 **
DE Ratio	-0.0031	-0.0017	-0.0020	-0.0026	-0.0012
	-1.53	*-1.5*	*-1.77 **	*-1.78 **	*-1.64*
Location Dummy	-0.0636	-0.0606	-0.0493	-0.0490	-0.0373
	*-2.02 **	*-3.03 ***	*-2.74 ***	*-2.20 ***	*-2.84 ***
Industry Dummy	0.0441	0.0356	0.0310	0.0309	0.0259
	1.67	*1.55*	*1.70*	*1.69*	*1.64*
Adjust R square	0.3694	0.3582	0.4175	0.4008	0.3515

Panel D	**Event Date: IPO**		
Parameter	**(0, 6)**	**(0, 12)**	**(0, 18)**
Intercept	0.0027	0.0022	0.0029
	1.63	*1.01*	*1.34*
ln (Market Cap.)	-0.0001	-0.0002	-0.0005
	-0.52	*-0.92*	*-1.96 **
ROE	0.0045	-0.0039	-0.0012
	1.16	*-1.33*	*-0.46*
DE Ratio	-0.0003	-0.0002	-0.0001
	*-2.34 ***	*-1.36*	*-0.86*
Location Dummy	-0.0038	-0.0022	0.0002
	*-2.72 ***	*-1.06*	*0.10*
Industry Dummy	0.0046	0.0046	0.0030
	*2.05 **	*1.48*	*1.03*
Adjust R square	0.2148	0.1494	0.2439

Regression results of rival firms' short-term abnormal returns during the event period of the BOCHK privatization announcements and long-term average cumulative abnormal returns during post period of the BOCHK listing on firm specific variables are given below. $\overline{AR_{i,t}} = \alpha + \beta_1 \ln(MV_{i,t-1}) + \beta_2 ROE_{i,t-1} + \beta_3 DE_{i,t-1} + \beta_4 D_{Loc,i} + \beta_4 D_{Industry,i} + e_{i,t-1}$, where $\overline{AR_{i,t-1}}$ is the short-run abnormal returns during the events period, or the average cumulative abnormal returns over the post-period of the BOCHK listing; $MV_{i,t-1}$ is the market capitalization of firm i, which serves as a proxy for firm size; $ROE_{i,t-1}$ is the return on equity of firm i, which is a proxy for firm's profitability; $DE_{i,t-1}$ is the debt-to-equity ratio of firm i, a proxy for firm's financial risk level; $D_{Loc,i}$, the location dummy variable that equals to one if the firm is located in Hong Kong, and zero if the firm is listed in Mainland China; $D_{Industry,i}$, the industry dummy variable that equals to one if the firm is a bank, and zero if the firm is a non-banking financial institutions.

t-statistics are italicised and given below the parameters, and they are computed using the White (1980) heteroskedasticity-consistent estimate of the standard errors of the coefficients.

*, ** represent 10 percent and 5 percent significant levels, respectively.

The short-term regression results (as listed in Panel A, B, C of Table A-6) show that the rival firms' profitability is positively related with abnormal returns. This suggests that the rival firms, especially the ones with lower profitability, were more negatively affected by the BOCHK's privatization announcements. The relationship between financial leverage and short-term abnormal returns is negatively related, which indicates that the rival firms with high financial risk reacted more negatively to the BOCHK privatization announcements. The results of two dummy variables show that the rival firms in Hong Kong and non-banking financial institutions had larger negative abnormal returns in response to the announcements. These results are consistent with the ones listed in Table A-4.

The long-term regression results (as listed in Panel D of Table A-6) with the results listed in Table A-5 show that the long-term average cumulative abnormal returns during the post period of the BOCHK listing is larger for small firms, and the firms with higher financial leverage. During the first six months after the listing, the Hong Kong financial institutions performed relatively worse than the firms in Mainland China, which is possibly due to the direct competition from the BOCHK. During the same time period, the non-banking financial institutions experienced some negative impact, which is possibly due to the potential diversification of the business of the BOCHK. However, all these effects disappear over the one and a half year period.

10. Conclusion

The State Owned Enterprises (SOEs) of China have undergone some significant changes over the last two decades or so. The reform of the SOEs both in agriculture and manufacturing sectors have had mixed degrees of success. The recent studies such as Sun and Tong (2003) acknowledge some successes in the reform policy of the SOEs in China. While the world wide experiences of privatization of firms are mixed, there is more empirical evidence to suggest that the full or partial privatization of agriculture and manufacturing sectors have had positive effects on the overall economies of those countries that have experienced them. As a new member of the

WTO, China is now committed to the GATS and the issues related to trade in financial services. Therefore, the reform of the financial services industry in China and their ability to compete with the foreign banks in China are amongst the main challenges facing China in the 21st century. A large number of studies such as Beck and Levine (2002) and La Porta et al. (2002) indicate the significant role of efficient, competitive, legally binding and/or privately owned financial institutions as important ingredients for ensuring sustained and strong economic growth. To this end, reform including the privatization of the financial institutions in China could contribute to stronger and more sustained economic growth and make China become more globally competitive.

This study is an attempt to analyze and discuss the effects of the announcement of the partial privatization of the Bank of China Hong Kong (BOCHK), the first bank in China to become partially privatized, in July 2002, on its rival financial institutions. Furthermore, this study analyzes the effects of the partial privatization of the BOCHK on its efficiency and performance. To this end, the paper analyzes 23 banks and non-banking financial institutions in Mainland China and Hong Kong over the period March 1999 to January 2004. The empirical results indicate that some of the banks and non-banking financial institutions reacted negatively to the partial privatization announcements of the BOCHK. Most of the banks and non-banking financial institutions in Hong Kong reacted negatively to the conclusion draft of China's entry into the WTO. Most of the financial institutions in Mainland China reacted positively to the announcements of the privatization of the BOCHK. The empirical results also indicate that HSBC, the largest bank in Hong Kong, had no significant reaction to the restructuring announcement and the listing announcement of the BOCHK. However, the Hang Seng Bank, the third largest bank in Hong Kong, suffered a loss after the announcement of the BOCHK listing.

In order to find out the effects of the partial privatization of the BOCHK on its performance and efficiency, the paper compares the cumulative returns of the BOCHK over the Hong Kong financial industry index returns and compares the cumulative abnormal returns of portfolios of rival financial institutions both in Hong Kong and in

Mainland China with the cumulative abnormal returns of the BOCHK. The cumulative returns over the local market returns and over the local industry returns in Hong Kong clearly indicate that in the first one and a half years following the partial privatization, the BOCHK did not over perform the local market index or the local industry index. For the banks and non-banking financial institutions in China, the BOCHK over-performed them one year after its initial partial privatization. The empirical results of the short-term, and long-term abnormal returns of the rival firms reactions to the BOCHK's partial privatization show that the rival firms' profitability is positively related with abnormal returns. This suggests that the rival firms, especially the ones with lower profitability, were more negatively affected by the BOCHK's privatization announcements.

This paper argues that there are a number of issues that need to be addressed as China embarks on the partial and full privatization of all her four major banks. The reform in corporate governance and the separation of ownership and control, pay incentives, increase in education in finance, continued endeavours to attain international accounting standards, further market reforms, greater permission for foreign private shareholders and foreign banks to participate in the ownership and the control of the major Chinese banks could ensure the emergence of a viable and competitive financial services industry in China that has the capacity to host foreign financial institutions as well as being able to engage in trade in financial services.

Given the above results and analysis, one should note that more comprehensive analysis of the effects of privatization of banks in China will be possible as time passes and more data becomes available.

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