

# Chinese Capital Market: An Empirical Overview

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## Abstract

The Chinese capital market, despite its relative short history in its modern form, has experienced a tremendous growth and is now the second largest in the world. Due to China's tight capital controls, the development of its capital market has mostly been isolated from and hence not been well understood by the rest of the world. Yet, this state of isolation is bound to change substantially as China becomes more integrated into the global financial system. In this paper, we provide an empirical overview of the Chinese capital market: its structure, development and main empirical characteristics.

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Along with its economy, China’s capital market has experienced a fast growth in the past three decades. By market capitalization, it is now the second largest in the world. Table 1 describes the sizes of their capital markets for the five largest economies by GDP. However, due to China’s tight capital controls, the development of its capital market has mostly been isolated from and hence not been well understood by the rest of the world. But this state is quickly changing as China becomes more integrated into the global financial system and developments in its capital market are increasingly impacting global markets, either directly or indirectly.

Table 1: Capital Market Capitalization for the Five Largest Economies by GDP (2018)

US\$ in Trillions	GDP	Common Stocks	Corporate Bonds	Government Bonds
US	20.54	30.44	6.30	18.64
China	13.61	6.32	3.04	4.98
Japan	4.97	5.30	0.72	9.20
Germany	3.95	1.76	0.19	1.81
UK	2.86	3.15	0.51	2.63

Data sources: The GDP numbers are obtained from the annual statistics of the World Bank and the European Central Bank. Common stocks are the total market capitalization of listed domestic companies provided by the World Bank; Corporate bonds are the total non-financial corporations debt provided by the BIS; Government bonds are the total general government debt provided by the BIS.

In this paper, we provide a basic empirical review of the Chinese capital market: its developments, main empirical characteristics, and future challenges. The paper is organized as follows. In Section 1, we give a brief introduction to the Chinese capital market: its major components, their past growth, and their institutional context and structure. In Section 2, we report the return characteristics of major asset classes in their recent history, including government bonds, corporate credit bonds, large company stocks, and small company stocks. In Section 3, we examine the risk characteristics of these broad asset classes. In Sections 4 and 5, we further examine the size, value and momentum effects in the Chinese stock market. In Section 6, we compare the return characteristics and institutional features of the Chinese capital market with those of the U.S. In Section 7, we briefly discuss potential research questions through the development of the Chinese capital market and the related literature that is fast growing.

A few additional notes are in order. First, for terminology, such as those for instruments,

markets, regulatory bodies, we follow the official English terminology used by Chinese regulators rather than a translation of their Chinese terminology, either literally or adaptively. This is mainly to avoid possible confusion if readers attempt to refer to official sources. The names of many instruments in the Chinese market may not exactly match those for their corresponding parts in other markets. Such a gap, although somewhat cumbersome and sometimes awkward, may well be warranted since substantial differences often exist between these instruments.

Second, the data used in this paper comes from multiple sources. Descriptive data are mostly from official sources, which are given in the paper. Derived data such as returns on securities are from the Chinese Capital Market Database, which is developed by the authors. Great effort has been devoted to the development this database to correct errors in the raw data and more importantly compute the relevant quantities correctly.

Third, more details on the institutional background, data and empirical results presented in this paper can be found in 2017 Chinese Capital Market Yearbook (Wang, Hu, and Pan (2017)).

Fourth, given the size, richness and the fast evolution of the Chinese capital market, the overview this paper attempts to provide is bound to be limited and incomplete, in coverage, detail and depth. For interested readers, we refer to several other surveys focusing on different parts of the market for additional information and analysis.

Fifth, the main goal of this paper is to provide a primitive overview of the institutional and empirical “facts” about the Chinese capital market. These facts should be helpful in motivating and identifying related research topics. But these topics per se are not the focus of this paper. At the end of the paper, we will elude to some research questions emerged from the development of the Chinese capital market and refer to a growing literature exploring some of these questions.

## **1 A Brief Introduction of the Chinese Capital Market**

China had an active capital market in the 1920’s. At that time, Shanghai Huashang Security Exchange, which was founded in 1921, ranked the top in east Asia, in terms of facility and size (see, for example, Zhang (2001)). However, the development of China’s capital market

suffered from wars, economic upheavals and political instability in 1930's and 40's. It was suspended as China adopted a planned economy in 1949, after the founding of the People's Republic. Capital allocation was controlled by the government through administrative means. Banks served mainly as a vehicle to facilitate payments and credit allocations, and interest rates were set by the central government. When China began to transform into a more market-oriented economy after economic reforms started in 1978, the Chinese capital market began its revival. Despite rapid changes in the economy during the reform, the initial growth of the capital market was slow and lagging. The re-birth of the stock market in 1990 marked the beginning of China's capital market in its contemporary form. The market of government and corporate bonds also re-emerged in the 1980s and gradually grew in the 1990s. By the end of 2018, these markets have reached to a size that is comparable with China's economy, ranked the second largest globally by market capitalization, next only to the United States, as shown in Table 1.

The rapid growth of the Chinese capital market bears strong marks of "Chinese characteristics". In this introduction, we provide a brief overview of the market, including some important facts and characterizations. We focus primarily on common stocks, government bonds and corporate credit bonds, as they constitute the major parts of the market at this point.

## **1.1 Common Stocks**

### **A The Emergence of Common Stocks**

In May 1982, the State Commission for Restructuring the Economic Systems was established to reform China's economic system, whose initiatives included overhauling the state-owned enterprises (SOEs). The commission actively promoted the so-called joint-stock reform, which introduced non-state participation in (state-owned) firms. Ownership, or a claim on future earnings, by non-state entities including individuals was offered in exchange for capital or other forms of economic contributions. Some small state-owned enterprises and collective enterprises then began to restructure themselves into joint-stock firms, which led to an early form of stocks. Particularly, several enterprises in Beijing, Shanghai and Guangzhou were formally chosen to restructure into joint-stock firms. After December 1986 when the State Council

announced the “Regulations on Deepening Enterprise Reform and Enhancing the Vitality of Enterprises”, more enterprises, including some large state-owned enterprises, started to issue stocks, and the primary stock market began to emerge (see, e.g., “Twenty Years of China’s Capital Markets” by the China Securities Regulatory Commission). Using stocks as an alternative way to finance SOEs instead of solely relying on bank loans was a strong motivation in the development of China’s stock market, which has also influenced its path and shape.

In the early stage, most stocks had bond-like characteristics. For example, they had finite maturities, guaranteed par values and predetermined interests or dividends paid at maturity. In addition, most stocks were issued to employees and local citizens, and were self-issued without an underwriting process. Over time, the shares issued to the public took on a form similar to modern common stocks, with no fixed terms in maturity, par value or dividends. In addition, the pre-existing ownership of these firms, especially the SOEs, was regarded as a different form of shares from those issued to the public. This ambiguity or ambiguity in ownership rights led to the distinction between these two classes of shares, one was issued to the public and the other representing the pre-existing ownership, which often belongs to different parts of the government. The latter were often called government or legal-person shares. The co-existence of these two classes of shares is also referred to as the “split-share structure”, which still exists nowadays, although to a lesser extent.

## **B Two Major Exchanges**

As the number of stocks and investors rose in late 1980s , the need for secondary trading of stocks also increased. Under such circumstances, the central government approved the establishment of the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) in 1990, for the listing, issuance and trading of stocks. Both exchanges began to operate in December 1990.

Currently, a number of regional security exchanges also exist. But they have played only a relatively minor role in China’s overall stock market both in terms of total market capitalization and trading volume. We therefore will focus our analysis exclusively on the two major exchanges: the Shanghai and Shenzhen stock exchanges.

Shares, issued by listed companies to the general public, form the basis of “floating shares” ,

which can be invested by domestic investors, individual and institutional. In general, the legal-person shares, not listed nor traded on the exchanges, form the basis of “non-floating” shares. They are traded over-the-counter but infrequently.

### **Shanghai Stock Exchange**

The Shanghai Stock Exchange was founded on November 26, 1990, and formally started operation on December 19, 1990. Located in the Pudong New Area of Shanghai, it is directly administrated by the China Securities Regulatory Commission (CSRC). Today, it is the largest stock market in mainland China in terms of total market capitalization and trading volume. Trading in the Shanghai Stock Exchange is executed through a centralized electronic limit order book, based on the principle of price first and time first.

By the end of 2018, the total number of stocks listed on SSE reached 1,443, with only 54 stocks newly listed in 2018. The total market capitalization of listed companies is CNY 26.9 trillion and that of floating shares is CNY 23.1 trillion.<sup>1</sup> The total number of shares and floating shares listed on the SSE are, respectively, 3.8 trillion and 3.3 trillion by the end of 2018.

### **Shenzhen Stock Exchange**

Founded on December 1, 1990, the Shenzhen Stock Exchange is in the coastal city of Shenzhen, one of the designated Special Economic Zones meant to foster the opening of China’s economy in the 1980s. Since its founding, the Shenzhen Stock Exchange has quickly grown from a regional market to a nation-wide securities market. The Shenzhen Stock Exchange adopts a similar trading mechanism as the Shanghai Stock Exchange.

What distinguishes the Shenzhen Stock Exchange from Shanghai’s is its support for small enterprises. In May 2004, the Shenzhen Stock Exchange formally launched the Small and Medium Enterprises Board (SME Board) to list and trade shares of small- and medium-size firms. The firms listed on the SME Board typically have high growth and high profitability. In October 2009, to better support the financing of small enterprises, the Shenzhen Stock Exchange launched the Growth Enterprise Market. Compared with the Small and Medium Enterprise Board, the Growth Enterprise Market focuses more on even smaller firms and high-

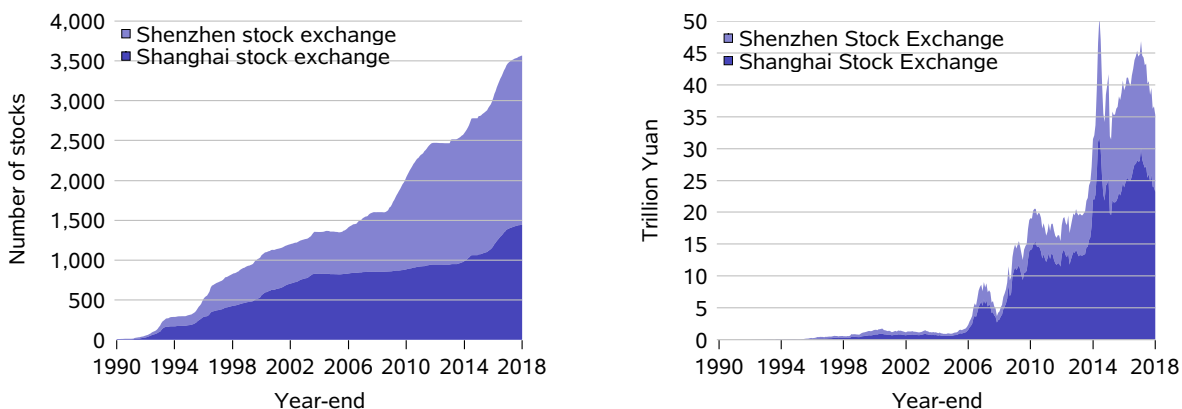
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<sup>1</sup>The Chinese currency is Renminbi or RMB, denominated in Yuan, which is also denoted by CNY or ¥, as in this article. On December 31, 2018, the exchange rate between CNY and US Dollar is CNY 6.88/USD.

tech firms. The Growth Enterprise Market also has different listing and trading rules from the Small and Medium Enterprise Board.

### C Stock Market Growth

Figure 1.1(a) shows how the number of listed firms on the two major stock exchanges increased since 1990. The dark-blue band represents the Shanghai Stock Exchange and the light-blue the Shenzhen Stock Exchange. As seen in the figure, the growth of China’s stock market experienced several phases. From 1990 to 1992, the initial “experimental phase”, only eight stocks were listed in Shanghai, the so-called “old eight.” Six were listed in Shenzhen in 1991. By the end of 1992, there were 53 stocks listed on the two exchanges combined. From 1993 to 1997, the market experienced a robust growth. The number of firms listed on the two exchanges more than doubled in 1993, reaching 177 by the end of the year. The total was 311 by the end of 1995, 514 by 1996, and 720 by 1997.



(a) Number of Listed Firms (Monthly)      (b) Floating Market Capitalization (Monthly)

Figure 1.1: Size of the Stock Market (1990-2018)

The growth, however, is not without glitches. In the early part of 1994, stock prices dropped substantially. After the market index plummeted 7.39% on July 28, 1994, the securities regulator halted new IPOs, from July 30, 1994 to the middle of 1995. The growth resumed afterward but at a slightly slower pace, reaching 1,060 in 2000, and 1,353 in 2004, with 827 on the Shanghai exchange and 526 in Shenzhen. New listings then slowed down substantially, especially for Shanghai. The number of stocks listed in Shanghai almost stayed flat, ranging between 827 and 860 from 2004 to 2009. It started to grow slowly again in 2010,

reaching 1,443 by the end of 2018.

Until 2004, the Shenzhen Stock Exchange had a similar growth path as Shanghai, with slightly fewer stocks and smaller sizes. However, after the launch of the Small and Medium Enterprise Board in 2004 and the Growth Enterprise Market in 2009, Shenzhen's growth picked up pace. The number of listed firms in Shenzhen has been increasing substantially since 2005 and more sharply since 2009. By the end of 2018, it has reached 2,124, significantly more than that in Shanghai.

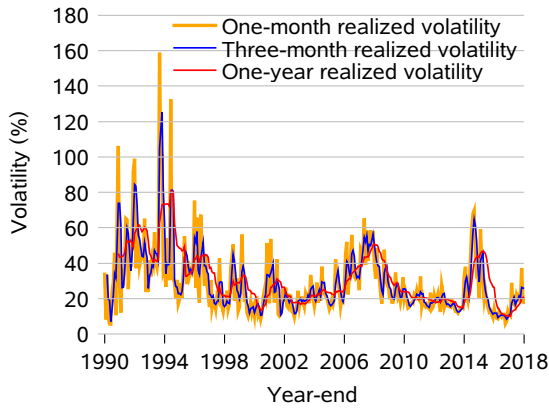
A more important measure of a stock market's size is the total market capitalization. Figure 1.1(b) shows a direct comparison of the total floating market capitalization of the two exchanges. Although the Shenzhen Stock Exchange has several different boards now and a larger number of listed stocks in total, especially more recently, its market capitalization is still less than that of the Shanghai Stock Exchange.

#### **D Stock Market Volatility and Turnover**

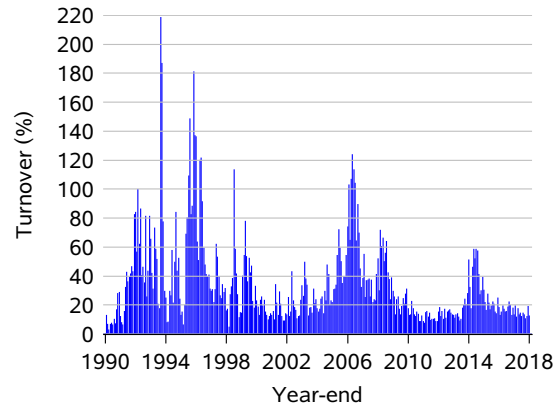
Over the years, the Chinese stock market has experienced substantial volatility. Figure 1.2(a) shows the annualized volatility of the stock market, measured over one-month, three-month and one-year periods. Here, the cumulative square of daily percentage changes of the total market capitalization is used to estimate the market volatility over a given measurement period. Clearly, the stock market volatility was very high in the early 1990s. Afterward, the volatility subsided to an average level of around 20% in 1998 and stayed relatively low until 2006. However, because of a bull market in 2007 followed by a bear market in 2008, the one-year volatility index climbed up to more than 50% and the volatility indexes using the one- and three-month returns were even higher. After 2008, the indexes dropped back to around 20%. Towards the end of June 2015, at the onset of the recent Chinese stock market turbulence, the volatility spiked up again, with the volatility indexes using the one- and three-month returns rose well above 60%.

Figure 1.2(b) shows the monthly turnover of the whole stock market. Here, the market-wide turnover is measured as the total number of shares traded divided by the total number of floating shares outstanding. Monthly turnover is simply the sum of daily turnover in a month. The high turnovers in the earlier years was mainly due to the limited number of stocks and the overwhelming enthusiasm in stock investment. The monthly turnover averaged around





(a) Stock Market Volatility (Monthly)



(b) Stock Market Turnover (Monthly)

Figure 1.2: Volatility and Turnover of the Stock Market (1990-2018)

20%, significantly higher than that in mature markets. In addition, the turnover exhibits substantial fluctuations over time, exceeding 120% in 1994, 1997 and 2007 while dropping below 10% in 2002, 2012 and 2013, but with no obvious time trend.

## E Stock Market Organization

### Different Types of Shares

The Chinese stock market is characterized by the co-existence of various types of shares, summarized briefly as follows.

- **A Shares** represent the shares listed on the two main stock exchanges that are denominated in Renminbi (RMB). In the following discussion of China's stock market, we will mainly focus on A shares, which comprise approximately 97% of all shares traded.
- **B Shares** were established in 1992 in both Shanghai and Shenzhen. Initially, the participants were exclusively foreign investors. Since February 19, 2001, however, this market was opened to domestic individual investors. On the Shanghai Stock Exchange, prices are denominated in U.S. dollars while on the Shenzhen Stock Exchange prices are denominated in Hong Kong dollars. By the end of 2018, there are 99 listed companies with B shares traded on the two exchanges, accounting for only a tiny proportion of the total market (see Monthly Statistical Report of CSDC, 2018-12).

- **H Shares** refer to shares of companies registered in mainland China but listed and traded on the Hong Kong Exchanges. Many companies issue their shares simultaneously on the Hong Kong Exchanges and one of the two stock exchanges in mainland China. Many empirical studies have shown that there are often substantial price discrepancies between H shares and their A-share counterparts issued by the same company. A shares are generally traded at a premium to H shares. Domestic investors are restricted from investing abroad and foreign investors are also restricted from investing in the A-share market in mainland China.

## Stock Investors

There are four major classes of investors in China's stock market:

- Domestic individual investors
- Financial intermediaries and financial service providers, including brokers, integrated securities companies, investment banks, and trust companies
- Domestic institutional investors
- Qualified foreign institutional investors (QFII).

In mainland China, commercial banks are forbidden by law from participating in security underwriting or investing business, except for QFIIs. Nor can banks lend funds to their clients for securities business. Insurance companies are permitted to invest in common stocks only indirectly, through asset management products operated by funds institutions.

## Regulation

The main regulator of the securities industry in China is the China Securities Regulatory Commission (CSRC). In October 1992, the State Council Securities Committee and its executive branch, the CSRC, were established to regulate China's stock and futures markets. In 1998, the State Council Securities Committee ceased operation and its functions were transferred to the CSRC, which became the sole regulator supervising nationwide securities and futures markets. Currently, the CSRC is a sub-institution of the State Council.

China's Securities Law, the nation's first comprehensive securities legislation, which took effect on July 1, 1999, grants the CSRC authority to manage a centralized and unified regula-

tion of the nationwide securities market to ensure their lawful operation. The CSRC oversees China's nationwide centralized securities supervisory system, with the power to regulate and supervise securities issuers, as well as to investigate, and impose penalties to illegal activities related to stock and futures markets. The CSRC is empowered to issue Opinions or Guideline Opinions, non-legally binding guidance for publicly traded companies.

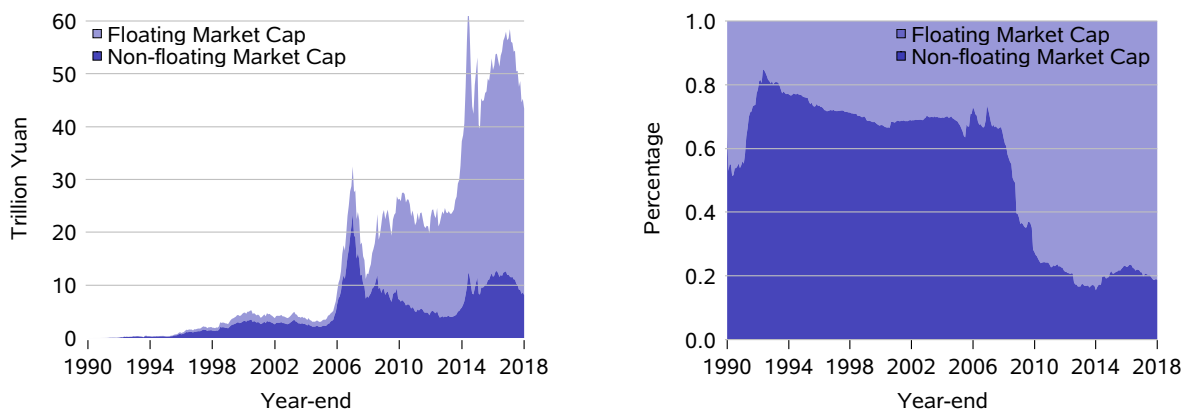
## **F Special Features of China's Stock Market**

### **The Split-Share Structure and Its Reform**

The presence of both floating and non-floating shares, i.e., the split-share structure, is unique to China's stock market. The origin and evolution of non-floating shares can be divided into the following three phases:

- **Phase I:** In the early days of China's securities market, the ownership of state-owned enterprises (SOEs) was transformed into equity shares, held by different government and semi-government entities. These shares form the basis of non-floating shares. They are different from the floating shares issued to the general public, which are listed and traded on exchanges. The non-floating shares were traded between government and semi-government entities and later other legal entities through negotiations, typically at book value. The presence of these two classes of shares reflects certain ambiguity in their respective ownership rights.
- **Phase II:** Attempts to reform the split-share structure were made to meet the needs of state-owned enterprises for funds, liquidity, better governance, and re-organization. From the second half of 1998 to the first half of 1999, the Chinese government started to reduce state-ownership in most SOEs and shift them toward a more market driven environment. However, due to the gap between the market expectation on the value of non-floating shares and their actual realization, the pilot program was soon suspended.
- **Phase III:** On January 31, 2004, the State Council announced its intent to "actively address the problem of split-share structure." On April 29, 2005, CSRC launched the Split Share Structure Reform. Through terms negotiated with the owners of floating shares, the non-floating shares were gradually converted into floating shares.

Figure 1.3(a) describes the total market capitalization of floating shares (light blue) and non-floating shares (dark blue). It is worth noting that here the value of non-floating shares is based on book value, while that of floating shares is based on market value. The total market capitalization of both floating and non-floating shares remained stable around CNY 4 trillion between 2000 and 2006, and abruptly climbed up in 2007 to around CNY 30 trillion. In the same year, the Shanghai Composite Index reached its historical high of 6124 point. Shortly after, as a result of the global financial crises, the market capitalization shrunk to only about one-third of its peak value. Since early 2009, the market capitalization of non-floating shares continued declining while that of floating shares reversed back to over CNY 20 trillion and remained relatively stable until the more recent stock market turbulence. From mid-2014 to early 2015, the market capitalization of floating shares increased rapidly from CNY 20 trillion to CNY 50 trillion and then crashed to around CNY 30 trillion in mid-2015. Similar pattern can be observed for the non-floating shares, although the rise and fall were not as dramatic.

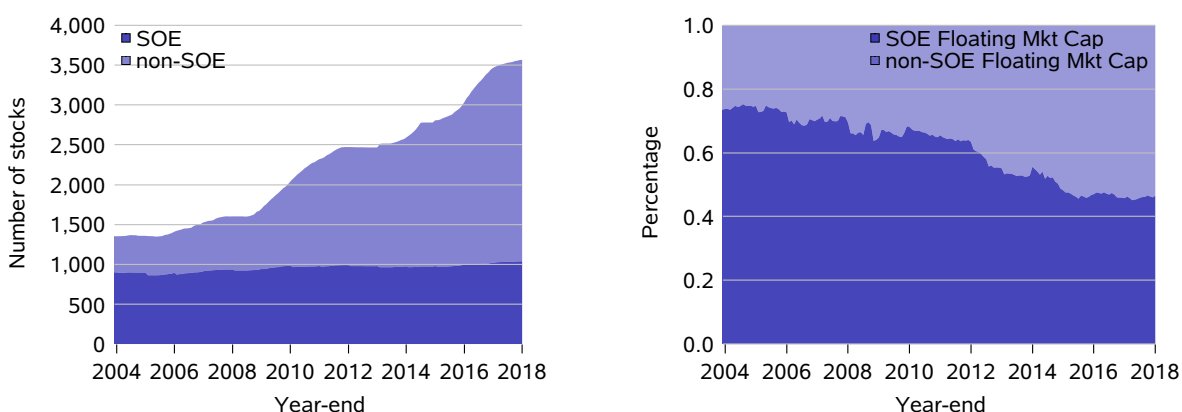


(a) Market Capitalization (Monthly)      (b) Share in Market Capitalization (Monthly)

Figure 1.3: Floating versus Non-Floating Shares (1990-2018)

Figure 1.3(b) shows the relative proportion of the total market capitalization of floating and non-floating shares across the two exchanges. Although the split-share structure reform started from 2005, the total market capitalization peaked in 2009, which was reflected as the sharp increase in the market capitalization of floating shares. By the end of 2018, the proportion of the market capitalization of non-floating shares dropped to around 20% from the peak of near 80% in early 1990's.

Figure 1.4 (a) shows the number of SOE and non-SOE stocks and Figure 1.4 (b) shows the relative proportion of the total floating market capitalization of SOE and non-SOE stocks listed on the two exchanges.<sup>2</sup> Since 2004, majority of the newly issued stocks are non-SOE stocks. The number of SOE stocks increases only slightly from 900 at 2004 to 1,038 by the end of 2018. By comparison, the number of non-SOE stocks has grown quickly from 453 at 2004 to 2,530 by the end of 2018. Due to the fast growth of non-SOE stocks, the proportion of the total floating market capitalization of non-SOE stocks has grown from 26% in 2004 to 53% in 2018.



(a) Number of Stocks (Monthly) (b) Share in Market Capitalization (Monthly)

Figure 1.4: SOE and non-SOE Stocks in China

## Trading Restrictions

**Daily Price Limit** A price limit is the maximum amount the price of stock is allowed to increase or decrease in any single trading day from the previous day's settlement price. In the early years of China's stock market, there were no daily price limits. Since December 26 of 1996, both the SSE and SZSE started to impose a daily price limit of 10%. The following circumstances, however, are exempted from this rule:

1. The IPO date.
2. The first trading date after the stock split-structure reform.

<sup>2</sup>We rely on the classifications provided by WIND to define SOE and non-SOE firms. WIND's classifications are based on firms' actual controllers and are only available after 2004.

3. The first trading date after seasonal offerings.
4. The first trading date after material assets restructuring.
5. The first re-listing date of de-listed stocks.

**T+1** The T+1 rule refers to a trading restriction which means that stocks bought on day  $t$  is settled on day  $t + 1$  and can therefore be sold on day  $t + 1$  at the earliest. In Shanghai and Shenzhen Stock Exchange, the trading of stocks and mutual fund products all adopt the T+1 rule.

### Special Treatment (ST)

Special Treatment or ST status refers to a listed company, which is faced with financial abnormality. Since April 22 of 1998, Shanghai and Shenzhen Stock Exchange announced that firms with financial abnormality will undergo special treatment with “ST” being added as prefix to its stock name.

According to the China Securities Regulatory Commission (CSRC), there are four types of ST stocks. ST refers to firms with losses for two consecutive years, \*ST refers to firms with losses for three consecutive years, SST refers to firms with losses for two consecutive years and the stock split-structure reform not completed, and S\*ST refers to firms with losses for three consecutive years and the stock split-structure reform not completed.

For ST stocks, the daily price limit is 5%, only half of that for normal stocks.

### Taxes

**Securities Investment Income Tax** Typically, taxes on returns from security investments take two forms: the capital gains tax and the dividend income tax. In China, there is no tax on capital gains on stock investments. However, tax is levied on dividend income. The tax rate was initially set at 20%, then reduced to 10% in June 2005. Since January 2018, a new differential dividend income tax policy has been applied. Under the new policy, dividend income tax varies with the time period that the dividend distributing security has been held. Specifically, if the security has been held for more than one year, the tax rate is 5%; for one month to one year, it is 10%; for less than one month, it is 20%. This policy is intended to lower the tax rate for long-term investors and restrain speculation on securities with high

dividend income.

**Stamp Tax on Stock Trading** Another tax feature of China’s stock market is the transactions tax, which is also referred as the stamp tax. Although the stamp tax has been recently reduced to a fairly low level, of 0.1% on the seller, it was rather high in the early days of the stock market compared with other markets.

Table 1.1: Stamp Tax on Stock Trading

Date	Change
1991/10/10	0.6% to 0.3%
1997/05/10	0.3% to 0.5%
1998/06/12	0.5% to 0.4%
2001/11/16	0.4% to 0.2%
2005/01/24	0.2% to 0.1%
2007/05/30	0.1% to 0.3%
2008/04/24	0.3% to 0.1%

On July 1, 1990, Shenzhen Stock Exchange started charging 0.6% stamp tax on the sell side of the traded value. On November 1990, it started charging 0.6% stamp tax on the buy side as well. Shenzhen Stock Exchange reduced the stamp tax to 0.3% on October, 1991. On October 3, 1991, Shanghai Stock Exchange also started charging 0.3% stamp tax on both the sell side and buy side. The stamp tax on both stock exchanges was then raised to 0.5% on May 10, 1997, and dropped to 0.4% on June 12, 1998. The stamp tax rate was further reduced to 0.2% on November 16, 2001, and 0.1% on Jan 24, 2005. On the night of May 29, 2007, the Ministry of Finance announced the increase of stamp tax to 0.3%; the stock market plunged sharply on the next day in response to this unforeseen rise in transaction cost. On April 24, 2008, the stamp tax was reduced back to 0.1%. Starting from September 19, 2008, the stamp tax is charged on the sell side only while before that the stamp tax was charged on both the buy and sell side. Table 1.1 exhibits changes in the stamp tax.

## 1.2 Government Bonds

By the issuers’ types, there are three major bond categories in China: government bonds, corporate credit bonds, and financial bonds. We summarize the characteristics of major bond categories in Table 1.2, including the issuers, regulatory agencies, depository institutions,

trading venues, and the outstanding amount in par values at 1998, 2008, and 2018.

In this section, we focus our discussions on government bonds. We discuss corporate credit bonds in Section 1.3, financial bonds and others in Section 1.4.

## **A History and Development**

Since the founding of the People's Republic of China, the history of China's government bond market can be divided into two periods: the first period is in the 1950s, during which the government bonds were issued six times, and the second period is since 1980. From 1959 to 1978, the issuance of government bonds was completely halted. After the reopening of the government bond market in 1981, the market has went through a period of fast growth, with significant improvements in market structure, trading mechanism, regulation, and supervision.

Depending on the issuing body, the Chinese government bonds take two main forms: Treasury bonds which are issued by the Ministry of Finance of the central government, and local government bonds which are issued by local governments. Before 2009, all government bonds issued in China were Treasury bonds. The total issuance amount of Treasury bonds increased from CNY 5 billion in 1981 to to CNY 1.4 trillion in 2009, and recently to CNY 3.5 trillion in 2018. The first local government bonds was issued in April 2009 by Xinjiang Uyghur Autonomous Region. Since then, the local government bond market has experienced tremendous growth, the issuance size has quickly increased from only CNY 200 billion in 2009 to CNY 4.2 trillion in 2018. By the end of 2018, the total government bonds deposited at China Central Depository & Clearing Co. (CCDC) reached CNY 32.4 trillion, of which CNY 14.4 trillion are Treasury bonds and CNY 18.1 trillion are local government bonds (see Monthly Statistical Report of CCDC, 2018-12: <http://www.chinabond.com.cn>.) Due to the short history of the local government bonds, our discussion in this paper will focus primarily on the Treasury bonds.

The Treasury bonds in China takes three forms: book-entry bonds, savings bonds and bearer-form bonds. Treasury bonds were mostly issued in the form of bearer-form bonds during the early years, and were gradually switched to book-entry bonds and savings bonds. Since 1998, no bearer-form bonds have been issued, and the Treasury bonds are issued in the form of either book-entry bonds or savings bonds. With book-entry bonds, ownership of bonds is recorded electronically and under general depository of the CCDC. Investors of book-



Table 1.2: Major Bond Types in China

Bond Type	Bond Name	Bond Issuer	Regulatory Agency	Depository Institution	Trading Venues	Out. Amt (Trillion)		
						1998	2008	2018
Government Bonds	Treasury Bonds	Central Gov	MoF	CCDC	IB/EX/OTC	0.52	4.88	14.36
	Local Gov Bonds	Local Gov	MoF	CCDC	IB/EX	0.00	0.00	18.07
Corporate Credit Bonds	Enterprise Bonds	Enterprise	NDRC	CCDC	IB/EX	0.01	0.68	3.11
	Corporate Bonds	Corporate	CSRC	CSDC	EX	0.00	0.00	6.33
	Medium-Term Notes	Non-Fin Ent	NAFMII	SHC	IB	0.00	0.17	5.52
	Short-Term Comm Papers	Non-Fin Ent	NAFMII	SHC	IB	0.00	0.42	0.49
	Super (ST) Comm Papers	Non-Fin Ent	NAFMII	SHC	IB	0.00	0.00	1.48
	Private Placement Notes	Non-Fin Ent	NAFMII	SHC	IB	0.00	0.00	1.90
	Policy Bank Bonds	Policy Banks	PBOC	CCDC	IB	0.51	3.67	14.52
Financial Bonds	Commercial Bank Bonds	Comm Banks	PBOC	CCDC	IB	0.00	0.39	3.81
	Non-Bank Financial Bonds	Non-Bank Fin	PBOC	CCDC	IB	0.00	0.03	0.42
	PBOC Bills	PBOC	PBOC	CCDC	IB	0.01	4.81	0.00
Others	Certificate of Deposits	Depository Ins	PBOC	SHC	IB	0.00	0.00	9.89

entry Treasury bonds were used to be limited to commercial banks and individual investors. Now, insurance companies, security firms and funds institutions also play an important role in this market. In addition, the market liquidity has improved significantly over time. With the implementation of a centralized market making and clearing system, the trading cost decreased while the market depth increased.

Savings bonds are issued to individual investors through commercial bank counters. Savings bonds have an important feature that they can only be held to maturity or be redeemed earlier, and can not be circulated in the secondary market. Saving bonds are issued either in the form of certificates or electronically, in which the electronic savings bonds are under general depository of the CCDC. Compared with book-entry bonds, the market size of savings bonds is relatively small. In 2018, the total issuance of electronic savings bonds is CNY 208 billion, only around 6% of the total CNY 3.3 trillion issuance of Treasury bonds in book entry forms.

In the early years, the maturity of Treasury bonds was limited to three to five years. In more recent years, the maturity expanded to 15, 20, 30 and even 50 years. In what follows, we will refer to bonds with maturities no greater than one year as short-term, bonds with maturity between two and five years as medium-term, and bonds with maturity more than five years as long-term. In terms of both the number of bonds and the amount outstanding, the medium- and long-term Treasury bonds dominate the current Treasury bond market.

Most of our analysis in this section are based on the statistics in the monthly reports of CCDC. Whenever possible, we cover the period up to the end of 2018. However, as CCDC has discontinued several statistics series since 2017, some of our analysis can only be extended to the end of 2016.

## **B Market Structure**

The secondary market for Treasury bonds consists of three components: the exchange market, the interbank market and the commercial bank over-the-counter (OTC) market. In this multi-part market structure, the interbank bond market is the largest in size, the exchange market is the most active in trading, and the commercial bank OTC market is only supplementary. Figure 1.5 illustrates the structure of the secondary market for government bonds:

The interbank bond market uses the primary depository structure, while the exchange bond market and commercial bank OTC market use the two-level depository structure. CCDC is

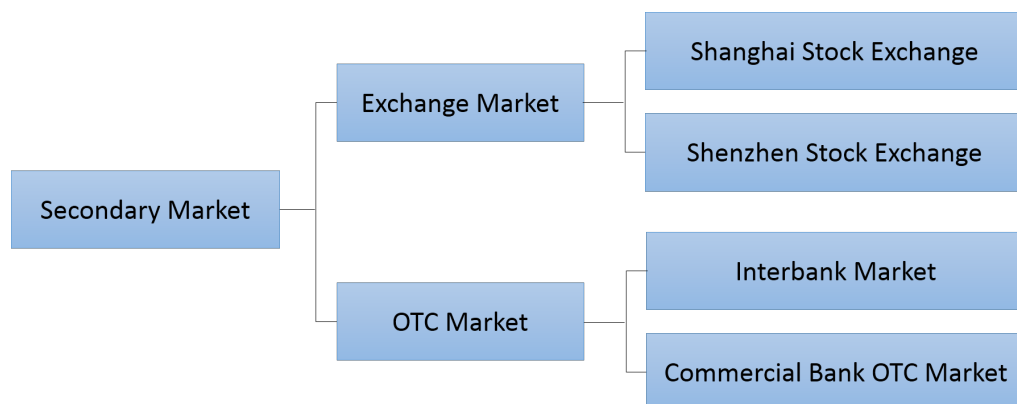


Figure 1.5: Structure of Secondary Bond Market

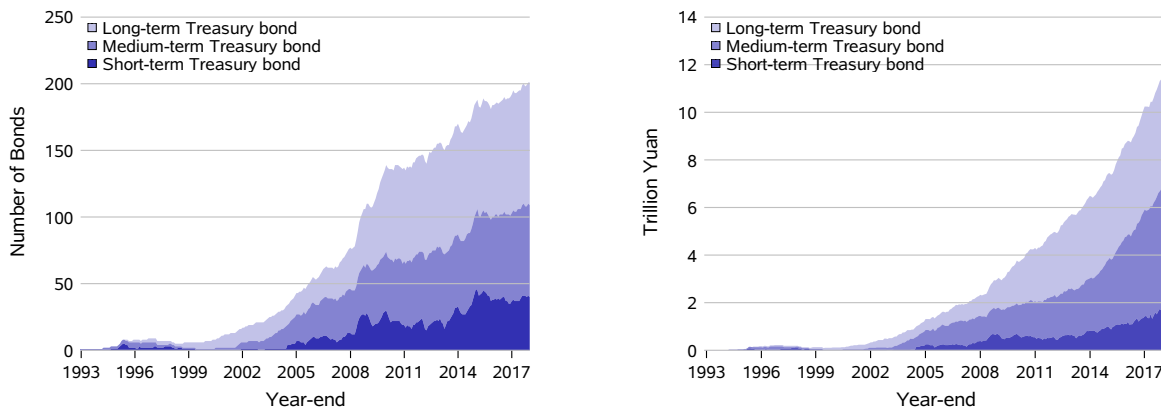
responsible for the overall bond depository in all bond markets and the primary depository in the interbank market. In the exchange bond market and the commercial bank OTC markets, CCDC is the primary depository and the China Security Depository and Clearing Co. (CSDC) and commercial banks themselves are the secondary depository, respectively.

### Exchange Market

A subset of book-entry Treasury bonds are listed and traded on the two main stock exchanges, in Shanghai and Shenzhen. Currently, the transaction volume of Treasury bonds on the Shanghai Stock Exchange far exceeds that on the Shenzhen exchange. Saving bonds, which are target for individual investors at the commercial bank OTC market, can not be listed or traded in the exchange market.

By the end of 2016, the par amount of book-entry Treasury bonds listed on the exchange market reached CNY 635 billion, making up 5.89% of the total amount outstanding (par value) of book-entry Treasury bonds. In 2016, the issuance size of book-entry Treasury bonds on the two exchanges was merely CNY 173 billion, making up 6.30% of the total issuance size of book-entry Treasury bonds in the year.

Figure 1.6 (a) shows the number of Treasury bonds traded on the Shanghai Stock Exchange and Figure 1.6 (b) shows the bonds total amount outstanding in par value for different maturities. Since many Treasury bonds listed on the Exchange are often traded in multiple markets, the amount outstanding in Figure 1.6 (b) measures their total amount outstanding in par-value across all markets, including exchanges, inter-bank market and the commercial



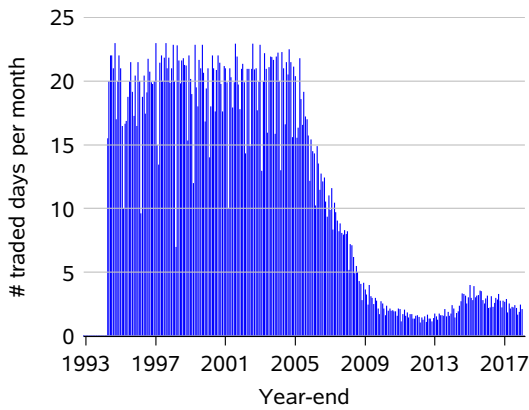
(a) Number of Bonds                      (b) Total Amount Outstanding in Par Value  
 Figure 1.6: Treasury Bonds on the Shanghai Stock Exchange

bank OTC market.<sup>3</sup> The number of Treasury bonds remained stable between 1993 and 2001, and began to increase since 2001. From 2003 to 2007, Treasury bond issuance increased at a high pace and the number of bonds listed on Shanghai reached above 50 by the end of 2007. After a stimulus package was released during the global financial crisis in 2008, a large amount of Treasury bonds were issued, which is reflected in both figures. The total number of bonds listed on Shanghai reached 110 by the end of 2009. Overall, the number of medium-term and long-term Treasury bonds exceeds that of short-term Treasury bonds.

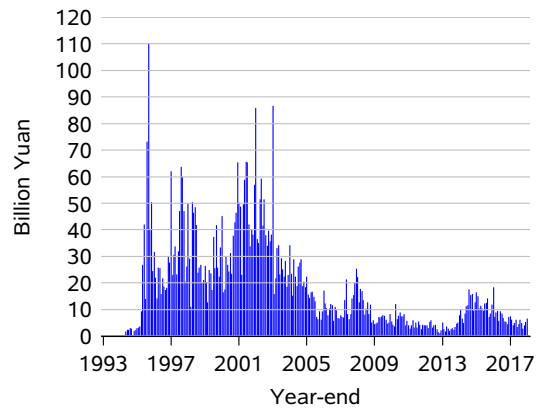
The Treasury bonds listed on the Shanghai Stock Exchange enjoy high levels of trading frequency and volume during the early period. Since 2005, trading in the Treasury bond market has gradually shifted to the interbank market. Figure 1.7 plots the average trading frequency and total trading volume for Treasury bonds traded on the Shanghai Stock Exchange. The trading frequency is the average number of traded days per month, equal weighted across all exchange listed Treasury bonds. The market-wide trading volume is measured as the total trading volume in par values within each month. From 1994 to 2005, the average trading frequency is mostly above 15 days per month. The average trading frequency has dropped significantly afterward to approximately 2 days per month at 2018. The monthly volume of Treasury bonds traded on Shanghai Stock Exchange decreases from approximately CNY 22 billion at 2005 to CNY 7 billion at 2018.

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<sup>3</sup>The data for the Treasury bonds traded on the exchanges is from WIND.



(a) Trading Frequency

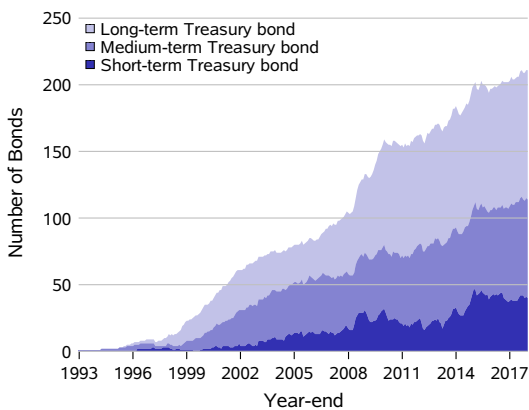


(b) Monthly Trading Volume

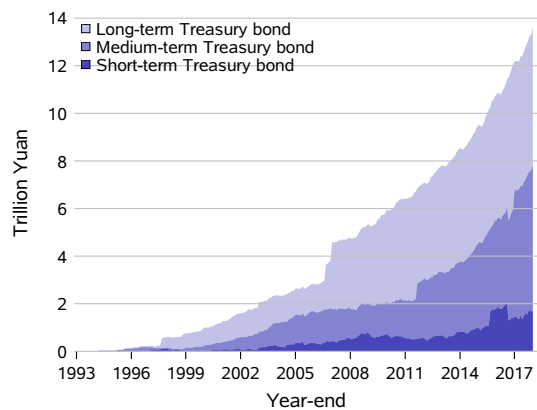
Figure 1.7: Liquidity of Treasury Bonds on the Shanghai Stock Exchange

### Interbank Market

The interbank bond market is a typical over-the-counter market. In 1997, the People’s Bank of China (PBOC) banned spot and repo transactions in Treasury bonds by all commercial banks on stock exchanges. Instead, they were permitted to use bonds deposited at CSDC, such as Treasury bonds, Central bank bills, and policy bank bonds, to conduct spot and repo transactions through the trading system of the National Interbank Funding Center, which later became the interbank bond market.



(a) Number of Bonds



(b) Total Amount Outstanding in Par Value

Figure 1.8: Size of Interbank Market for Treasury Bonds

By the end of 2016, book-entry Treasury bonds deposited at the interbank bond market

reached CNY 10.1 trillion, making up 94.08% of the total amount outstanding of all book-entry Treasury bonds. The new issuance size of book-entry Treasury bonds in the interbank market was CNY 2.6 trillion in 2016, making up 93.70% of the total issuance amount of book-entry Treasury bonds in the year. Saving bonds, which are target for individual investors at the commercial bank OTC market, can not be listed or traded in the interbank bond market.

Figure 1.8 (a) shows the number of book-entry Treasury bonds traded in the interbank market and Figure 1.8 (b) shows their outstanding amount in par value, by different ranges of remaining maturity.<sup>4</sup> Shortly after the interbank market was established, the number of Treasury bonds deposited at the interbank bond market was far less than that on the exchanges. However, it started to increase sharply since 1999. By the end of 2009, the number of short-term Treasury bonds reached around 30, and that of long- and medium-term Treasury bonds reached over 100 in total. The number of Treasury bonds soared since 2009, reached to approximately 200 by the end of 2018. It is also worth noting that the amount outstanding of the Treasury bonds abruptly increased at the second half year of 2007, from CNY 3 trillion to nearly CNY 4.5 trillion, largely due to the issuance of special government bonds in 2007.

Figure 1.9 shows the average maturity of Treasury bonds traded in the interbank bond market and on the Shanghai Stock Exchange. Here, only the equally-weighted average maturity for all the bonds outstanding is presented. The average maturity when weighted by total amount outstanding exhibits a similar pattern.

Apparently, the average maturity for Treasury bonds traded in the interbank market grew overall during the sample period, from the beginning of 1994 to the end of 2018. Up until 1997, the average maturity rarely exceeded four years. It then increased to close to eight years and stayed around six years until 2003. After dropping below six years in 2006, the average maturity of Treasury bonds started to climb again and reached to approximately eleven years in 2018. The maturity structure for the Treasury bonds traded on the Shanghai Stock Exchange experienced a similar evolution.

The trading frequency and volume for Treasury bonds traded in the interbank market are shown at Figure 1.10. The monthly trading volume of Treasury bonds gradually increases

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<sup>4</sup>The data for the Treasury bonds traded in the interbank market is from WIND.

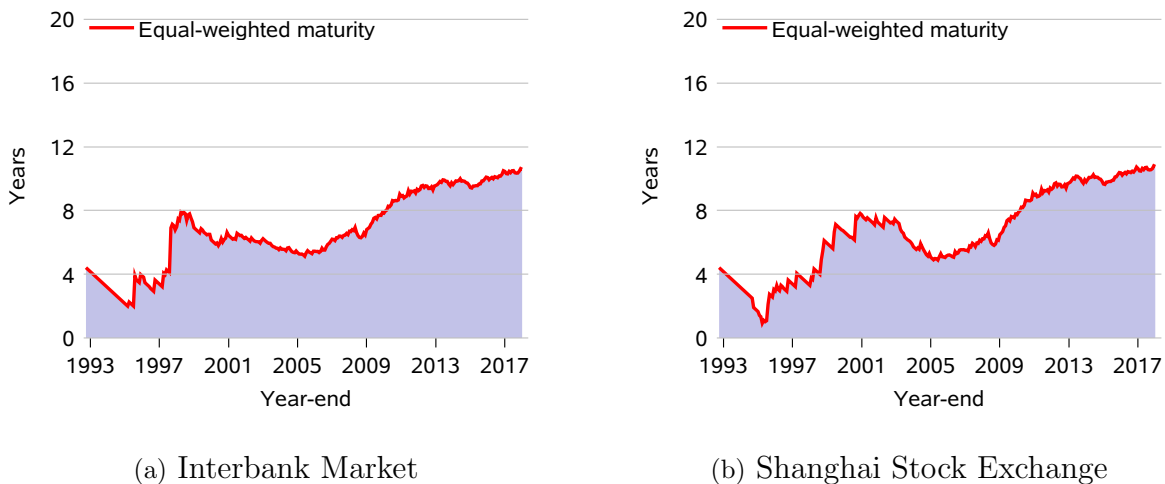


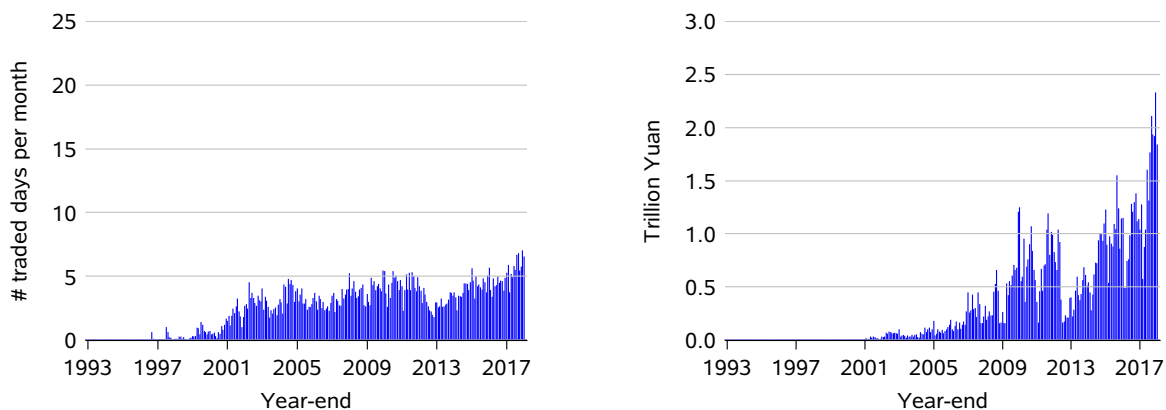
Figure 1.9: Maturity of Treasury Bonds

from approximately zero at late 1990s to above CNY 1 trillion at 2012. After dropping below CNY 500 billion for a short period of time in 2013, it starts to grow quickly and reaches approximately 2 trillion in recent period. At 2018, the monthly trading volume of Treasury bonds in the interbank market is CNY 1.8 trillion, substantially larger than the trading volume at the Shanghai Stock Exchange. Despite the significantly larger volume, the average trading frequency at the interbank market is comparable to those at the Shanghai Stock Exchange. Since early 2000s, the average trading frequency have been moving around 2 to 6 days per month at the interbank market. At 2018, the average number of traded days per month is 6.5 days at the interbank market, compared to the average of 2.1 days at the Shanghai Stock Exchange.

### Commercial Bank OTC Market

The commercial bank OTC market is another type of OTC market for government bonds, and the main participants are individual investors, who can trade Treasury bonds with commercial banks at their branches.

The market began in 2002, when the four state-owned commercial banks - the Agricultural Bank of China (ABC), the Industrial and Commercial Bank of China (ICBC), the Bank of China (BOC) and the Construction Bank of China (CBC) - were allowed to sell Treasury bonds at their branches. Later, they were also allowed to buy back these bonds. Now, it is only an extension of the interbank bond market to individual investors and small and medium



(a) Trading Frequency

(b) Monthly Trading Volume

Figure 1.10: Liquidity of Treasury Bonds in the Interbank Market

size institutional investors. The salient feature of this market is that participants are allowed to trade only with banks.

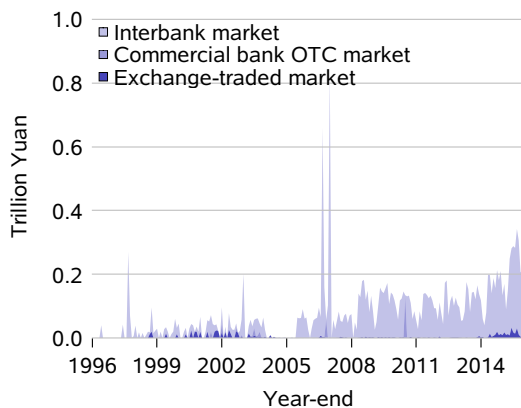
Majority of the bonds traded in the commercial bank OTC market are savings bonds. In the year 2015, the issuance size of book-entry Treasury bonds in the commercial bank OTC market was only CNY 0.1 billion, making up 0.01% of the total issuance of book-entry Treasury bonds in the year. In the year 2016, no book-entry treasury bond is issued in the commercial bank OTC market. By comparison, all of the CNY 199 billion savings bonds (in electronic form) are issued at the commercial bank OTC market. By the end of 2016, the book-entry Treasury bonds deposited at the commercial bank OTC market is merely CNY 2.6 billion, taking up only 0.02% of the total amount outstanding of all book-entry Treasury bonds. By comparison, all of the 0.7 trillion savings bonds (in electronic form) are deposited at the commercial bank OTC market.

### The Fortunes of the Three Markets

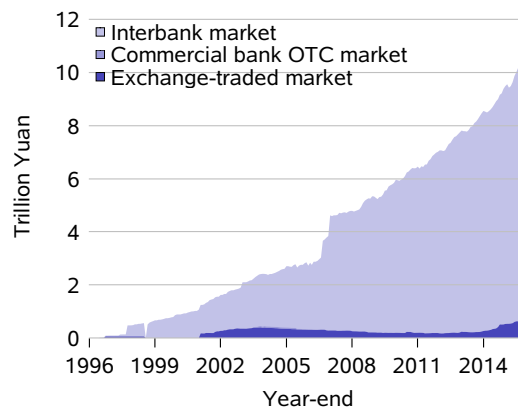
Figure 1.11 (a) shows the monthly issuance size and Figure 1.11 (b) shows the total amount outstanding in par value of all Treasury bonds, including both book-entry Treasury bonds and Savings bonds, by the three markets.

There are four peaks in Treasury bond issuance before 2008. The first occurred in the first half of 1998, when special Treasury bonds of CNY 270 billion were issued to raise capital for the four state-owned commercial banks, an amount high enough to meet the capital adequacy





(a) Monthly Issuance Size



(b) Total Amount Outstanding in Par Value

Figure 1.11: Monthly Issuance Size and Total Amount Outstanding of Treasury Bonds

ratio required by Basel II. The second spike happened in 2003, when the funds raised were mainly used to stimulate the weak economy as a result of the crisis surrounding the outbreak of Severe Acute Respiratory Syndrome (SARS). The last two spikes appeared in the second half year of 2007, when two special Treasury bonds, with total issuance size of CNY 1.5 trillion, were issued by the Ministry of Finance to fund the China Investment Corporation, making the total amount outstanding jump from approximately CNY 3 trillion to approximately CNY 4.5 trillion. To deal with the financial crisis at the end of 2008, the Chinese government started a stimulus package of CNY 4 trillion. As a result, the monthly issuance size of Treasury bonds often exceeded CNY 100 billion, showing periodic peaks.

It is also clear that most of the growth occurred in the interbank market, which dominated in terms of market size. The exchange market experienced modest growth until 2004, when it started to shrink in size. The commercial bank OTC market remained small until 2007, but has started a modest growth since 2008.

Although the three markets are mostly segregated by types of bonds and investors, there is limited space for cross-market depository transfer. For example, investors could transfer certain Treasury bonds originally deposited in the interbank bond market to exchanges or the commercial bank OTC market and vice versa. However, such transfers remain restricted to a given set of bonds.

## C Organization of Treasury Bond Market

### Treasury Bond Investors

The investors of government bonds vary across the three markets.

- **Exchange Market:** The participants in the exchange market are mainly medium and small size investors, including individual investors, non-financial firms as well as security firms, funds institutions and insurance companies.
- **Interbank Bond Market:** The participants in the interbank bond market are all large institutional investors, such as commercial banks, credit cooperatives, security firms, insurance companies and funds institutions.
- **Commercial Bank OTC Market:** In this market, the participants are mostly individual investors who trade with commercial banks.

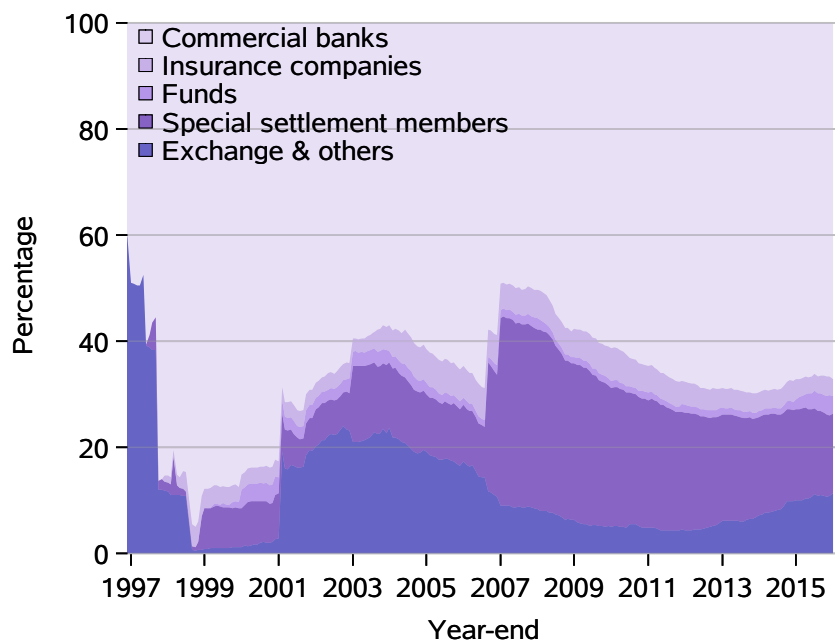


Figure 1.12: Treasury Bond Holdings

Figure 1.12 shows the breakdown of different classes of investors holding Treasury bonds, covering Treasuries with all maturities, depositories and markets, from late 1997 to the end

of 2016. At the end of 2016, of CNY 13.6 trillion Treasury bonds, commercial banks held 67.07%, special settlement members held 15.09% and insurance companies held 3.23%.<sup>5</sup> It is clear that the main holders of Treasury bonds are commercial banks, which typically hold over 60% of bonds, but the weight has varied substantially over time. At the beginning of our sample period, in late 1997, commercial banks held slightly below 50% of Treasury bonds, while the other half was deposited on exchanges. The holdings of commercial banks began to gain weight after 1998, half a year after the interbank market was established. It peaked over 90% in 1999, then steadily dropped to around 60% in 2004. At the same time, special settlement members took on more weight and reached nearly 40% at the end of 2007. The decline in holdings of commercial banks continued to about 50% in 2008 before it started to increase again until 2016.

Started in 1998, special settlement members increased their Treasury bond holdings, from close to zero to around 10% of the total market. The category stayed around that level until 2007 when it sharply increased holdings to more than 30%. It decreased slowly thereafter. But by the end of 2016, special settlement members still hold about 20% of the whole market.

Shown in the figure, Treasury bond holdings exhibit some abrupt changes, which are largely a result of institutional shifts. For example, at the end of 1997, right after the establishment of the interbank bond market, with commercial banks banned from exchanges, most of the Treasury bond holdings moved out of the exchanges.

Another important trend is the volatility and the significant decline in market share of the exchange market in recent years. In 1998, the market share was about 50% and dropped nearly to zero in 1999, because of the shift to the interbank market; it bounced back to more than 20% in 2003, then declined to approximately 5% by the end of 2012 and climbed up slightly in 2016 to approximately 10%. It is also worth noting that funds institutions held only a very small fraction of the government bonds, no greater than a few percentages, which in part reflects the low level of participation of individual investors in this market.

## Trading Mechanism

The exchange market and the interbank market also differ by trading mechanisms.

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<sup>5</sup>The special settlement members include PBOC, the Ministry of Finance, policy banks, exchanges, CCDC and CSDC. They hold government bonds mainly for liquidity management purposes.

- **Exchange Market:** The exchange market for Treasury bonds is an order-driven market, similar to stock trading. As mentioned before, the China Securities Depository and Clearing Corporation (CSDC) oversees bond registration, depository, and clearing for bonds traded on the stock exchanges. The exchange bond market adopts a system of centralized registration, two-level depository and net-clearing.
- **Interbank Market:** Compared with the exchange market, the interbank market is a wholesale, quote driven market. China Central Depository and Clearing (CCDC) oversees registration, depository and clearing for the interbank bond market. Different from the exchange market, all members of the interbank market directly open bond trading accounts with CCDC, which is directly involved in bond depository and clearing.

## Regulation

The regulatory framework consists of two parts: market regulation and institution supervision. The People’s Bank of China (PBOC) and China Securities Regulatory Commission (CSRC) are responsible for market regulation, covering the interbank market and the exchange market, respectively. For institution supervision, the China Banking Regulatory Commission (CBRC) supervises commercial banks and credit cooperatives; the China Securities Regulatory Commission (CSRC) handles security firms and funds institutions; and China Insurance Regulatory Commission (CIRC) oversees insurance companies.

## 1.3 Corporate Credit Bonds

### A History and Development

The corporate credit bonds in China have six main categories: enterprise bonds, corporate bonds, short-term commercial papers, super (short-term) commercial papers, medium-term notes, and private placement notes.<sup>6</sup> Though these six types of bonds are all issued by entities with corporate credit, they are under different regulatory authorities and are issued and traded in different markets. The issuance of enterprise bonds are approved by the National

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<sup>6</sup>Other corporate credit bonds include perpetual medium-term notes, collective notes of small and medium enterprises, asset back notes, project revenue notes, convertible corporate bond. These bonds, however, are less common, with total amount outstanding under 100 billion in 2018. We therefore focus primarily on the six main categories in this paper.

Development and Reform Commission (NDRC), which is a successor of the State Planning Commission (SPC). Enterprise bonds are issued and traded in both the interbank bond market and the exchange markets, and are under general depository of CCDC. Corporate bonds are regulated by the China Security Regulatory Commission (CSRC). Corporate bonds are issued and traded in the exchange bond market only and under depository of CSDC. Short-term commercial paper, super (short-term) commercial paper, medium-term notes, and private placement notes are regulated by the National Association of Financial Market Institutional Investors (NAFMII), which is a self-regulatory non-profit association of institutional investors in the inter-bank market in China with delegated power from and under the supervision of the People's Bank of China (PBOC). Short-term commercial paper, super (short-term) commercial paper, medium-term notes, and private placement notes are issued and traded in the interbank bond market and under the depository of Shanghai Clearing House (SHCH). Enterprise bonds and corporate bonds are long-term bonds; short-term commercial papers are within one year maturity; super (short-term) commercial papers are within 270 days; medium-term notes are with maturity ranging from one to ten years; private placement notes are with maturity from 6 months to 5 years.<sup>7</sup>

## **Enterprise Bonds**

The enterprise bonds are issued by enterprises, which include government agencies, enterprises under collective ownership, and state-owned enterprises, etc. During the early years, enterprises needed to first apply for the approval of SPC, and SPC then needed to submit the application to the State Council for review and approval. The redundancy and complexity of the process had curbed the growth of the enterprise bond market. In 2006 and 2007, only CNY 66 billion and CNY 172 billion of enterprise bond were issued, respectively. The issuance process was then significantly simplified in 2008, which led to the liberalization of the enterprise bond market. In 2008 and 2016, the issuance amount increased to CNY 237 billion and CNY 593 billion, respectively. The issuance amount has decreased recently, at CNY 373 billion in 2017 and CNY 241 billion in 2018.

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<sup>7</sup>Our analysis in this section are based on the annual and the monthly reports of CSDC, CCDC, and SHCH. Whenever possible, we cover the period up to the end of 2018. In the case that the most recent statistics are not available, our analysis focus on the period up to the end of 2016.

Majority of the enterprise bonds are issued by state-owned enterprises. Based on the bond issuers data from WIND, we estimate that approximately 90% of the enterprise bonds outstanding at the end of 2018 are issued by state-own enterprises. Moreover, a substantial portion of these state-owned enterprises are local government funding vehicles (LGFVs) which are set up to support infrastructure investment at the provincial and city level.

## **Corporate Bonds**

Corporate bonds are long-term bonds issued by listed companies and non-listed companies. Compared with enterprise bonds, the history of corporate bonds is rather short. Although the Company Act stated that listed companies are allowed to issue debt, it was never carried out until August 2007, when the CSRC starts approving issuance of two corporate bonds with total size of CNY 5 billion. Despite its short history, the corporate bond market has expanded quickly, especially after the CSRC adopted new regulations in 2015. Under the new policy, the issuing body of corporate bonds were expanded from only listed companies to include both listed and non-listed companies. In addition, the corporate bonds were also allowed to be privately placed, as well as public offering. As a result, the total issuance of corporate bonds jumped to 472 number of bonds with total size of CNY 1.0 trillion in 2015, a sharp increase from only 184 number of bonds with total size of CNY 282 billion in 2014. In 2018, the corporate bond market continues to grow fast, 1,585 number of bonds with total size of CNY 1.8 trillion are issued during the year.

## **Short-Term Commercial Papers**

Short-term commercial papers are issued by non-financial enterprises with legal person status. This instrument, similar to commercial papers in the U.S., is a direct financing tool with maturity not exceeding one year. Short-term commercial paper first appeared in China in 1989. During the early years, the issuance of short-term commercial paper were highly regulated and needed approval from the PBOC. Nevertheless, a number of scandals occurred, leading to the eventual halt of issuance of short-term commercial papers in 1997. It was until 2005 when the new regulation policy reopened the market. Under the new policy, the issuance of short-term commercial paper switched from the old approval system to the new registration system. In 2018, CNY 478.3 billion of short-term commercial papers were issued and the

total deposit amount reached CNY 487.0 billion(see Monthly Statistics Report (2018-12) of Shanghai Clearing House).

### **Super (Short-Term) Commercial Papers**

Similar to Short-term commercial papers, super (short-term) commercial papers are also issued by non-financial enterprises. Super (short-term) commercial papers have shorter maturities compared to short-term commercial papers, in the range from 7 days to 270 days. Unlike other types of corporate credit bonds, super (short-term) commercial papers are exempt from the regulatory rule that the total public bond issuance should be capped at 40% of companies' net assets. Super (short-term) commercial papers were first issued in December 2010 and have experienced rapid growth in recent years. In 2018, CNY 2.6 trillion of super (short-term) commercial papers were issued and the total deposit amount reached CNY 1.5 trillion.

### **Medium-Term Notes**

Medium-term notes, with maturity ranging from one to ten years, fill in the gap between short-term commercial papers and enterprise/corporate bonds. Similar to the short-term commercial papers, medium-term notes are also issued by non-financial enterprises with legal person status, and traded in the interbank bond market.

The first issuance of medium-term notes occurred on April 15, 2008, when the Ministry of Railways and other six companies issued CNY 119 billion of medium-term notes in total. Medium-term notes were used to be issued and deposited at the CCDC before June 17, 2013. Afterward, the newly issued medium-term notes are under depository of SHCH. In 2018, 1,397 medium-term notes were issued, with a total issuance value of CNY 1.7 trillion.

### **Private Placement Notes**

Private placement notes were introduced in 2011 as a financial instrument with mixed features of private debt and public bonds. Private placement notes are issued by non-financial enterprises to a small group of institutional investors, who then may trade these notes between themselves in the interbank market. Relative to bonds that are publicly placed, the registration and issuance procedures of private placement notes are significantly simplified. Issuers also need to disclose less information on their business and financial performance. In 2018,

764 private placement notes were issued, with a total issuance value of CNY 544.3 billion. The total deposit amount reached CNY 1.9 trillion in 2018.

## **B Market Structure**

China's corporate credit bond market, similar to the government bond market, consists of the exchange market and the interbank market. The issuance of corporate credit bonds in the commercial bank OTC market does occur but is quite rare compared with the other two markets. The total amount outstanding in par value is also small.

### **Exchange Market**

The exchange market includes the Shanghai Stock Exchange and the Shenzhen Stock Exchange, with the CSDC responsible for bond registration, depository and clearing and the CSRC for market regulation and supervision. Of the six types of corporate credit bonds that we discussed earlier, enterprise bonds and corporate bonds can be traded in the exchange market, while short-term commercial paper, super (short-term) commercial paper, medium-term notes, and private placement notes can only be traded in the interbank market.

In 2016, the issuance size of enterprise bonds in the exchange market was CNY 66.1 billion, making up merely 11.16% of the total issuance of enterprise bond in the year. By the end of 2016, enterprise bond deposited in the exchange market had reached CNY 945 billion, taking up about 26.68% of the total amount outstanding of enterprise bond.

For corporate bonds, the issuance size was CNY 1.8 trillion at the exchange market in 2016; while by the end of year 2016, 5,013 bonds were deposited at the exchange market, with the total par value of CNY 6.3 trillion.

### **Interbank Market**

Of the six types of corporate credit bonds, enterprise bonds, short-term and super (short-term) commercial papers, medium-term notes, and private placement notes can be traded in the interbank market, while corporate bonds can only be traded in the exchange market.

- Enterprise Bond: In 2016, the issuance size in the interbank market was CNY 526.5 billion, 88.84% of the total issuance size of enterprise bond. By the end of 2016, the total amount of enterprise bond deposited in the interbank market reached CNY 2.6 trillion,



making up 73.03% of the total amount outstanding for enterprise bond.

- Short-term commercial papers: In 2016, 688 number of short-term commercial papers were issued, with the total par value amount of CNY 608.3 billion. The total outstanding amount of short-term commercial paper is CNY 602.2 billion at the end of 2016. In 2018, 429 number of short-term commercial paper were issued, with the total par value amount of CNY 478.3 billion. The total outstanding amount of short-term commercial papers is CNY 487.0 billion at the end of 2018.
- Super (short-term) commercial papers: In 2016, 1,950 number of super (short-term) commercial papers were issued, with the total par value amount of CNY 2.7 trillion. The total outstanding amount of super (short-term) commercial paper is CNY 1.5 trillion at the end of 2016. In 2018, 2,490 number of super (short-term) commercial papers were issued, with the total par value amount of CNY 2.6 trillion. The total outstanding amount of super (short-term) commercial papers is CNY 1.5 trillion at the end of 2018.
- Medium-Term Notes: In 2016, 890 number of medium-term notes were issued in the interbank market, with the total par value amount of CNY 1.1 trillion. By the end of 2016, the total amount of medium-term notes deposited in the interbank bond market reached CNY 4.5 trillion, with CNY 3.4 trillion deposited at the Shanghai Clearing House and CNY 1.0 trillion deposited at the China Central Depository & Clearing. In 2018, 1,397 number of medium-term notes were issued in the interbank market, with the total par value amount of CNY 1.7 trillion. By the end of 2018, the total amount of medium-term notes deposited in the interbank bond market reached CNY 5.5 trillion, with CNY 5.3 trillion deposited at the Shanghai Clearing House and CNY 0.2 trillion deposited at the China Central Depository & Clearing.
- Private Placement Notes: In 2016, 746 private placement notes were issued, with the total par value amount of CNY 602.8 billion. The total outstanding amount of private placement notes is CNY 2.2 trillion at the end of 2016. In 2018, 764 of private placement notes were issued, with the total par value amount of CNY 544.3 billion. The total outstanding amount of private placement notes is CNY 1.9 trillion at the end of 2018.

Among the six types of bonds in the category of corporate credit bonds, enterprise bond is

the one with the largest size and the longest history. Our discussion below will focus primary on the enterprise bonds. Figure 1.13(a) illustrates the monthly issuance size of enterprise bonds in different markets from 1997 to 2016. Figure 1.13(b) depicts the total amount outstanding in par value of enterprise over the same period.<sup>8</sup> Before 2007, the monthly issuance size was quite small, mostly less than CNY 20 billion. However, since late 2007, it nearly tripled in average. The sharp increase largely resulted from the relaxation on administrative approval of enterprise bonds.

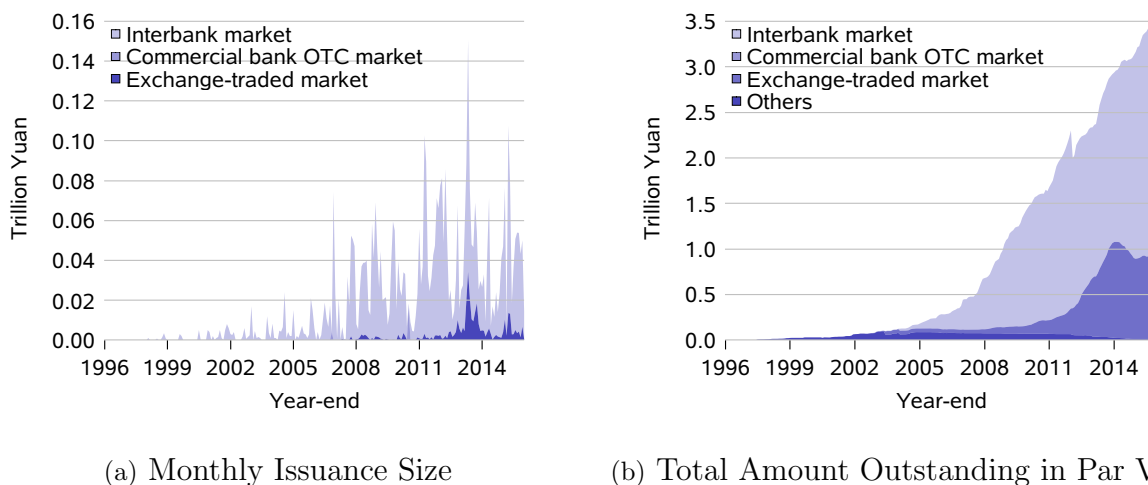


Figure 1.13: Monthly Issuance Size and Total Amount Outstanding of Enterprise Bonds

Figure 1.14 shows the maturity of long-term enterprise bonds traded in the interbank bond market and on the Shanghai Stock Exchange. (The data source for the maturity of enterprise bonds is from WIND.) For enterprise bonds in the interbank market, the average maturity stayed around eight years until 2008 and then started a steady decline. By the end of 2018, it has dropped to below four years. For enterprise in the exchange market, the average maturity was quite short initially, less than two years in 2000. It gradually increased to above eight years after 2003, but then started to decline in 2007. By the end of 2018, the average maturity for enterprise bonds in the exchange market fell to below four years.

## C The Organization of the Corporate Credit Bond Market

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<sup>8</sup> *Others* stands for enterprise bonds deposited in commercial banks. It was common before 2005.

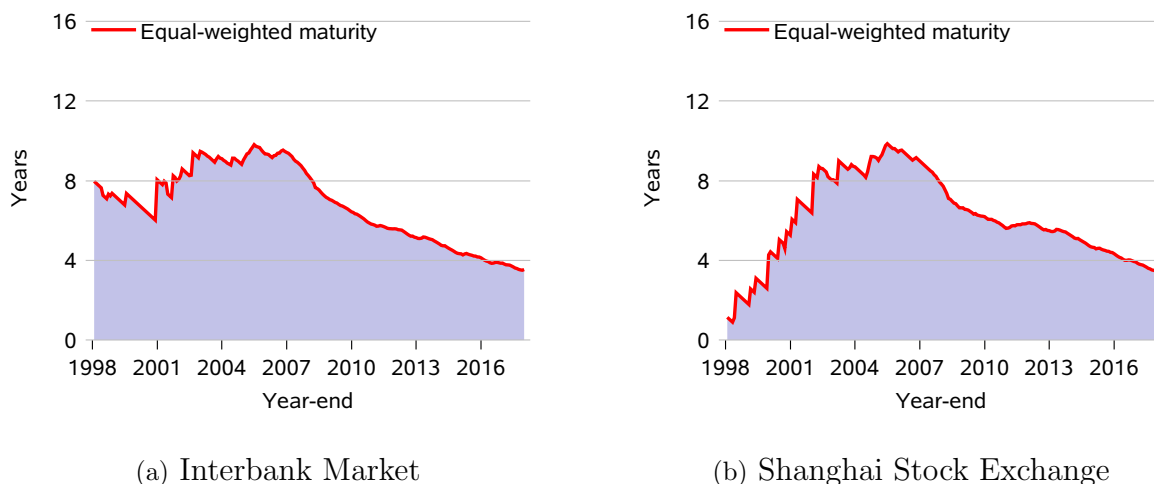


Figure 1.14: Average Maturity of Long-Term Enterprise Bonds

## Corporate Credit Bond Investors

The investors of enterprise bonds vary across markets.

- **Exchange Market:** The participants in the exchange market are mainly small and medium-size investors, including individual investors, non-financial firms as well as security firms, funds institutions and insurance companies.
- **Interbank Market:** Investors in the interbank bond market are mainly large institutions. For enterprise bond, of the total amount outstanding of CNY 3.5 trillion at the end of 2016, commercial banks held CNY 516 billion, insurance companies held CNY 174 billion, and funds institutions held CNY 1.7 trillion.

For medium-term notes, of the total amount of CNY 1.0 trillion deposited at China Central Depository & Clearing (CCDC) at the end of 2016, commercial banks held CNY 361 billion, insurance companies held CNY 95 billion and fund institutions held CNY 478 billion; of the total amount of CNY 3.4 trillion deposited at Shanghai Clearing House (SHCH), commercial banks held CNY 1.0 trillion, insurance companies held CNY 132 billion and fund institutions held CNY 2.1 trillion. At the end of 2018, of the total amount of CNY 5.3 trillion deposited at Shanghai Clearing House (SHCH), commercial banks held CNY 0.9 trillion, insurance companies held CNY 0.2 trillion and fund institutions held CNY 3.8 trillion.

For short-term commercial papers, of the total amount outstanding of CNY 487.0 billion deposited at Shanghai Clearing House at the end of 2018, commercial banks held CNY 91.1 billion, insurance companies held CNY 3.5 billion, and funds institutions held CNY 347.5 billion. For super (short-term) commercial papers, of the total amount outstanding of CNY 1.5 trillion deposited at Shanghai Clearing House at the end of 2018, commercial banks held CNY 366.2 billion, insurance companies held CNY 6.9 billion, and funds institutions held CNY 1.0 trillion.

For corporate bonds and private placement notes, we don't have detailed data on their investors' holdings.

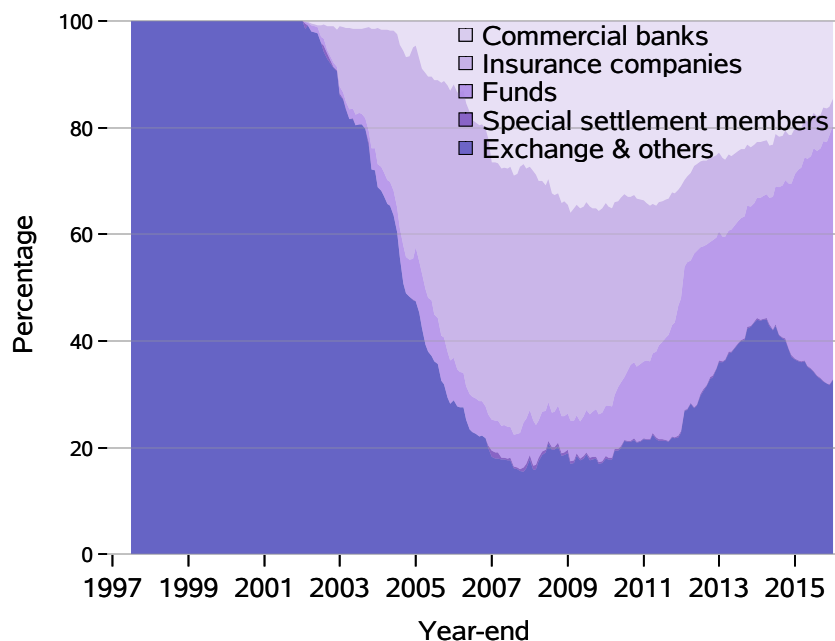


Figure 1.15: Enterprise Bonds Holding

Figure 1.15 shows the structure of investors in enterprise bonds for all maturities, depositories and markets, from late 2002 to the end of 2016. We observe several changes over time. First, enterprise bonds held through exchanges experienced a drastic decline, from almost 100% in 2002 to below 20% in 2010, which was because of the fast development of the interbank bond market. It had a modest climb back since 2012, exceeding 30% at the end of 2016. Another major shift is the holding of enterprise bonds by commercial banks. The

figure was close to zero at the beginning of the period, but increased to more than 30% in 2009. It stayed at that level for several years and started to decrease since 2011. Commercial banks hold approximately 15% of enterprise bonds at the end of 2016. Insurance companies' enterprise bond holdings experienced a large variation during this period. Negligible in 2003, it increased to more about 50% in the middle of 2007 and then dropped steadily to approximately 5% at the end of 2016. It is also worth noting that funds institutions have increased their enterprise bond holdings steadily during this period, starting from close to zero in 2003 and ending about 50% by 2016. Special settlement members' enterprise bond holdings is negligible, mostly below 1%. To the extent that enterprise bond holdings through the exchange market are dominated by individual investors, Figure 1.15 clearly shows a shift towards institutional investors in enterprise bond holdings.

## 1.4 Financial Bonds and Others

We discuss financial bonds in this section. We also briefly introduce two additional bond types: PBOC bills and certificates of deposit. Other bond types, such as government agency bonds, asset backed securities, green bonds, panda bonds, foreign bonds are omitted due to their relative small sizes.

### A Financial Bonds

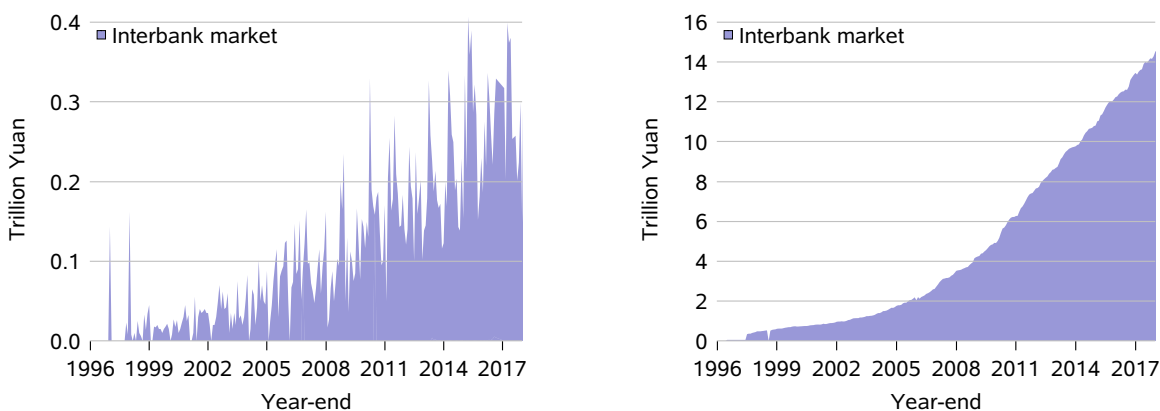
Financial bonds refer to bonds issued by policy banks, commercial banks and other financial institutions.

#### History of Development

**Policy Financial Bonds** Policy financial bonds are issued by three policy banks, the China Development Bank (CDB), the Export-Import Bank of China, and the Agricultural Development Bank of China. The three policy banks were established in 1994 as an innovation in the financial reform, to separate policy banking functions from commercial banks. Initially, lacking nationwide branches as existing commercial banks, the policy banks received their funds mainly from the PBOC and the Ministry of Finance, which were far from sufficient. To make up for the shortage, since 1998 the three policy banks began issuing policy bonds to the four largest state-owned commercial banks and other participants in the interbank bond

market. As the policy banks grew in size, so did the policy bond market. By the end of 2018, the total amount outstanding reached CNY 14.5 trillion, making it comparable to the size of the government bond market, which is CNY 32.4 trillion. Within the same year, the issuance size of policy financial bonds is CNY 3.4 trillion, exceeding the total issuance size of all other types of non-government bonds.

Figure 1.16(a) shows the monthly issuance size and Figure 1.16(b) shows the total amount outstanding in par value, from 1997 to 2018. This market has enjoyed a robust growth since its birth. Among the three types of financial bonds, policy financial bonds rank at the top in both issuance size and total amount outstanding.



(a) Monthly Issuance Size

(b) Total Amount Outstanding in Par Value

Figure 1.16: Monthly Issuance Size and Total Amount Outstanding of Policy Financial Bonds

**Commercial Bank Bonds** Three types of bonds are issued by commercial banks: general financial bonds, which are used for daily liquidity needs, subordinated bonds, and hybrid capital bonds. By the end of 2018, the total amount outstanding reached CNY 3.8 trillion, while within that year, CNY 916 billion of commercial bank bonds were issued.

**Non-Bank Financial Bonds** The issuance size and the total amount outstanding of non-banking financial bonds are comparatively small. For 2018, the issuance size was CNY 185 billion and the total amount outstanding was merely CNY 419.4 billion by the year end.

## Features

**Issuance Mechanism** When financial bonds emerged, the stock exchanges dominated both the primary and secondary market. The issuance of financial bonds was apportioned to state-owned commercial banks under the instruction of the PBOC. With the establishment of the interbank bond market, which is an OTC market dominated by institutional investors, the market-based mechanism for bond issuance was also established. Since 1998, the issuance process followed the typical underwriting procedure with book-building and bidding. The interest rates are then determined by the market supply and demand.

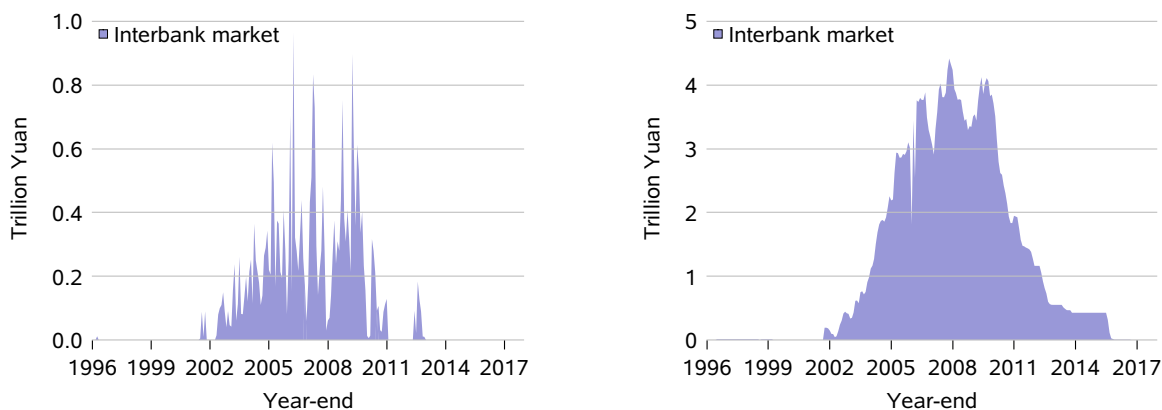
**High Credit Rating** The issuers of financial bonds are usually financial institutions with high credit standing, enabling the financial bonds to enjoy high credit ratings, especially policy financial bonds, which are backed by the central government. Currently, the credit ratings of all financial bonds are above AA.

**Long Maturity** In general, financial bonds issued by the policy banks are used to support long-term infrastructure projects. The subordinated and hybrid capital bonds issued by commercial banks are supplements of capital, with maturity of no less than five years, while the normal financial bonds are for short term liquidity, with maturity no longer than three years.

## B PBOC bills

PBOC bills are short-term debt certificates issued by the People's Bank of China to commercial banks, with maturity ranging from three months to three years. In June 2002, to expand the open market operation tools and enhance the efficiency of implementing monetary policy, especially to cope with the fluctuation in foreign exchange reserves, PBOC started issuing bills in the interbank bond market. By the end of 2002, the total amount outstanding reached CNY 149 billion.

Figure 1.17(a) shows the monthly issuance size of PBOC bills and Figure 1.17(b) shows the total amount outstanding in par value, from 1997 to 2018. Clearly, this market experienced a fast growth from 2004 to 2010, from CNY 1 trillion to over CNY 4 trillion. However, it began to shrink during 2010 and has dropped to zero by the end of 2016.



(a) Monthly Issuance Size

(b) Total Amount Outstanding in Par Value

Figure 1.17: Monthly Issuance Size and Total Amount Outstanding of PBOC bills

### C Certificates of Deposits

Certificates of Deposits are fixed-maturity deposits issued by depository institutions in the interbank market. Typical maturities include 1 month, 3 months, 6 months, 9 months, and 1 year for fixed-rate deposits and 1 year, 2 years and 3 years for floating-rate deposits. Certificates of Deposits are popular money market instruments, commonly issued by small commercial banks and urban credit unions. Investors include large state-owned banks and investment funds. Certificates of deposits have experienced a rapid growth since they were first launched at 2013. Of the total amount outstanding of CNY 9.9 trillion deposited at Shanghai Clearing House at the end of 2018, commercial banks held CNY 3.4 trillion and investment funds held CNY 5.0 trillion.

## 2 Historical Returns on Stocks and Bonds

China's capital market has experienced a phenomenal growth since its revival in the early 1990s. A study of its history can reveal the basic relationship between risk and return of the different asset classes in the market. It can also help shed light on how, over a relatively short period of time, it has become one of the most important capital markets in the world. Although what happened in this period are quite unique, given the political, economic and regulatory environment, we can still make useful inferences about the market and its future evolution. The goal of our study is to document the risk and return characteristics of the



major asset classes in China’s capital market and its evolution over time, including the capital markets’ responses to major events such as regulatory changes, market cycles, inflation and other factors that could affect asset returns.

## **2.1 Basic Return Series**

In the remainder of this paper, we study the statistical properties of basic return series on seven asset classes, namely, large company stocks, small company stocks, long-term Treasury bonds, medium-term Treasury bonds, short-term Treasury bonds, long-term enterprise bonds and a hypothetical asset returning the inflation rate.

Before we present the basic return and risk characteristics of different asset classes, we first provide the definitions of the basic return series of the assets and how they are constructed.

### **A Large Company Stocks and Small Company Stocks**

At the end of each year, from 1992 to 2017, we sort all A-share stocks listed on the main boards of Shanghai Stock Exchange and the Shenzhen Stock Exchange into ten equally populated groups or deciles, according to their floating market values. The stocks listed on the Shenzhen Small and Medium Enterprises Board and the Growth Enterprise Market are then assigned to the appropriate deciles according to their floating market capitalization in relation to the main board breakpoints. Our way of constructing the breakpoints avoid the potential bias that the small size deciles are too dominated by the stocks listed on the Small and Medium Enterprise board and the Growth Enterprise Market, which usually have tiny market capitalization compared with those listed on the main boards. The Large Company Portfolio and the Small Company Portfolio are the first decile and the last decile, respectively.

The portfolios are reformed at the end of each year, and use only stocks with valid market capitalization which is the product of the total floating A-shares and the close prices on the last trading day of the two exchanges during the year. Only floating A-shares are used to compute the total market value or market capitalization of a listed company, for two reasons. First, only floating A-shares are investable for general domestic investors, while non-floating shares or other types of floating shares such as B and H are not. Second, non-floating shares are not actively traded, and their transaction prices are not determined in the open market but through private negotiations, typically benchmarked against book value.

Section 4 contains more details on the construction of size portfolios and their returns.

## **B Long-term Treasury Bonds**

The annual returns on long-term Treasury bonds from 1997 to 2018 are constructed with data on Treasury bonds traded on the Shanghai Stock Exchange. To the greatest extent possible, a one-bond portfolio with remaining maturity of nearly 10 years and a reasonable current coupon is constructed each year. The bond is “held” for the calendar year and the return is computed accordingly.

It’s worth noting that the secondary bond market in China is highly segmented and involves multiple trading venues. In this paper, we construct bond indexes based on prices at the Shanghai Stock Exchange, considering the exchange’s superior trading liquidity over the time of our sample period. In terms of both trading volume and trading frequency, the Shanghai Stock Exchange market dominates other markets for the early period before 2002. Although the exchange’s trading volume has dropped substantially in recent years, its bond trading frequency remains comparable to those at the interbank market. Since the exchange market could offer reliable bond prices over a significantly longer sample period, we focus our discussions on exchange-based bond indexes in this paper. Recognizing the growing importance of the interbank market, we are investigating alternative bond indexes based on the interbank market prices in an ongoing project.

## **C Medium-term Treasury Bonds**

The annual returns on medium-term Treasury bonds from 1997 to 2018 are calculated with data on Treasury bonds traded on the Shanghai Stock Exchange. Similar to long-term Treasury bonds, one-bond portfolios are constructed to measure the medium-term Treasury bond returns. The bond selected each year is the bond with remaining maturity of no less than but closest to five years, and is “held” for a whole calendar year.

## **D Short-term Treasury Bonds**

The annual returns on short-term Treasury bonds from 1997 to 2018 are calculated with data on Treasury bonds traded on the Shanghai Stock Exchange. Prior to selecting the short-term benchmark bonds, we construct a monthly trading activity index that indicates the trading

frequency of each bond. The trading frequency in each month is computed as the percentage of trading days with positive trading volume within that month. In each month a one-bond portfolio is constructed by selecting a bond with trading frequency greater than 20% in the previous month and with remaining maturity closest to one year. To compute holding period returns of the portfolio, we use the bond's closing prices on the last trading day in the previous and current months. The annual return in a given year is the compounded monthly returns.

Traditionally, the return on short term Treasury bonds is regarded as a risk-free return for the corresponding horizon. However, because the Ministry of Finance rarely issues short-term Treasury bonds, we use the long- or medium-term Treasury bonds with the remaining maturity closest to one year instead.<sup>9</sup>

## **E Long-term Enterprise Bonds**

The annual returns on long-term enterprise bonds from 2000 to 2018 are constructed with data on enterprise bonds listed on the Shanghai Stock Exchange. At the beginning of each year, a portfolio is constructed with all AAA- and AA-rated enterprise bonds with remaining maturity of no less than seven years. Each bond in the portfolio is “held” for the calendar year and the portfolio return is calculated as the weighted average of individual bond returns in the portfolio. The portfolio weight of each bond is proportional to its outstanding amount in par value.

## **F Inflation**

The Consumer Price Index for All Urban Consumers, without seasonal adjustment, is used to measure inflation, which is the rate of change of consumer good prices. We use the monthly CPI to compute the hypothetical rate of change of consumer good prices. Monthly changes are then compounded to obtain the yearly CPI change. We will also treat inflation as an asset class, assuming a hypothetical investment that yields a return equal to the inflation rate.

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<sup>9</sup>An alternative is to use central bank bills with maturity of one year. This will give a risk-free return, at least in nominal terms. However, this choice has two drawbacks. First, central bank bills are mostly issued to commercial banks, not the general public. Second, they have an even shorter history. In addition, they have more volatile issuance patterns, which may lead to additional shocks to their prices.

## G Wealth Indexes

We consider a hypothetical investment of CNY 1.00 at the beginning of a period in a given asset class. We then compute the cumulative investment return over the given period, which gives us a wealth index associated with that asset class. Thus, the cumulative returns on the seven classes give us the time series of seven wealth indexes.

### 2.2 Historical Returns on Stocks, Bonds, and Inflation

Figures 2.1, 2.2, and 2.3 present the wealth indexes, i.e., the growth of CNY 1.00 invested in the seven asset classes from the beginning of 1993, 1997 and 2000 to the end of 2018. The reason that three graphs are displayed is that the starting point of data is different across the asset classes. For example, because stock data was available only after 1992, the starting point for large company stocks and small company stocks is January 1, 1993. The transaction data of Treasury bonds with satisfactory quality are not available until 1997. Thus, the starting point for Treasury bond returns is January 1, 1997. As for enterprise bonds, available data started from 2000. Therefore, different asset classes have different time spans. To make different asset classes comparable, returns are shown in three separate figures and the corresponding indexes are adjusted for the same time span.

Figure 2.1 displays the growth of CNY 1.00 invested in large company stocks, small company stocks, and a hypothetical asset that grows at the inflation rate over the period from the beginning of 1993 to the end of 2018. For CNY 1.00 invested in the small stock portfolio at the end of 1992, it will become CNY 57.88 by the end of 2018, while investment in the large stock portfolio will only yield CNY 4.08. Over the same period, if CNY 1.00 is invested in the inflation index, it will turn into CNY 2.73. It is also worth noting that over the 26 years from 1993 to 2018, the growth rate of the large company stock portfolio only narrowly beat the inflation.

In Figure 2.1, we find a significant co-movement between the value of a large-stock portfolio and that of a small-stock portfolio. Both series dropped in the middle of 1994. In the early 1990s, market reforms had significantly improved the life quality of average households. In the meantime, exuberant consumption demand pushed up the prices, resulting in high inflation. In October 1994, CPI increased by 27.5% on year-to-year basis, reaching the historical high

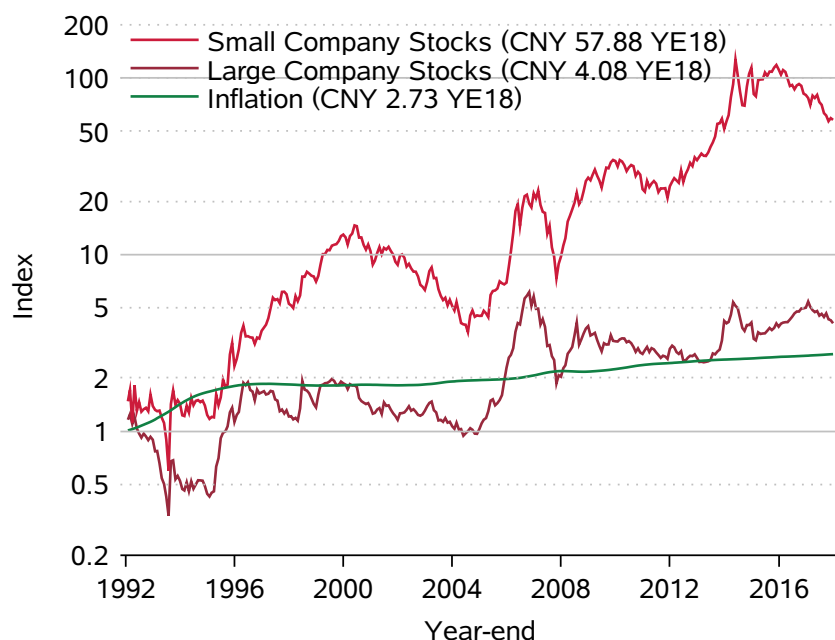


Figure 2.1: Wealth indexes of Investments in the Chinese Capital Market (Year-End 1992 = CNY 1.00)

point, which is also reflected in the inflation series. The one-year deposit rate climbing up to 10.98% at the same time. Investments were diverted out of the stock market, prompting a decline in the stock index from 833 point to 400 point in 1994. After struggling for nearly two years, large and small company indexes increase sharply during the second half of 1996, leading to the first bullish period in the history of China's stock market. Stimulated by the great enthusiasm of individual investors and pro-growth fiscal policy, the Shanghai Composite Index increased by 65.14% and the Shenzhen Component Index increased by 225.75% in 1996. To ease the market overreaction, the central government introduced several policies, including the increase on transactions tax, to cool down the market, which is reflected in the decrease in both indexes in 1997. Shortly afterward, the small company index bounced back and continued to increase till 2001 when it reached its first all time high. For CNY 1.00 invested in the small stock portfolio at the end of 1992, it would return approximately CNY 10.45 by 2001. After 2001, the stock market turned bearish. In 2005 and 2006, the small stock portfolio declined over 60% from its first peak. After reaching its lowest value in 2005, the small stock portfolio began to recover gradually. In 2007, the small-company index reached its second

peak, around CNY 22.19, and the large-company index reached its first historical high. In the same year, the Shanghai Composite Index soared up to 6124, the highest level in history. However, only half a year later, a huge plunge came as a result of the global financial crisis, wiping off nearly all the returns from the previous period. In 2010, the small stock portfolio reached its third peak in history. The large stock portfolio followed a similar pattern in return, except that after the market drop in 2007 and 2008, it recovered only partially, still far away from its highest level in 2007. In the period of 2014 to 2015, the stock market experienced another cycle, running up substantially, especially the small stocks, until the midyear of 2015 and then dropped substantially. From this figure, we also see that the small stock portfolio outperformed the large stock portfolio almost throughout the history of China's stock market.

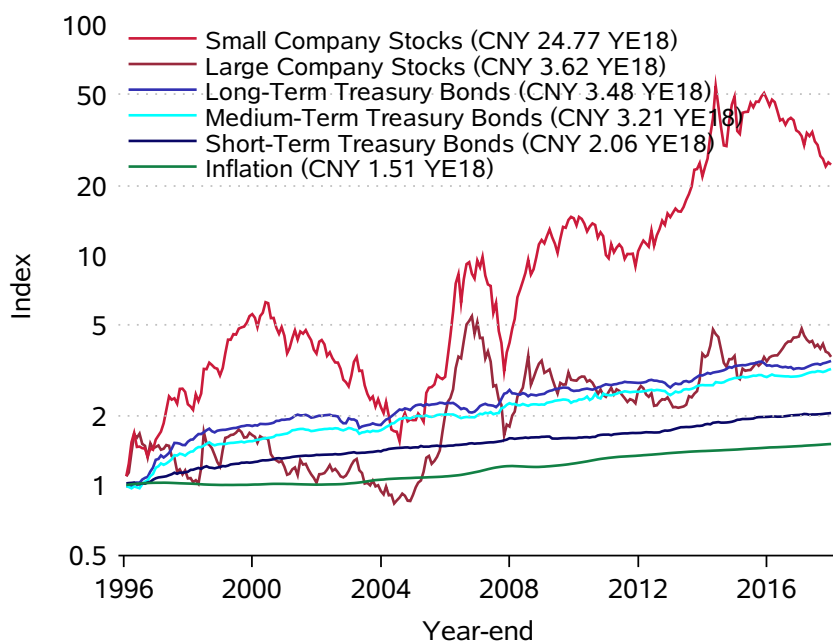


Figure 2.2: Wealth indexes of Investments in the Chinese Capital Market (Year-End 1996 = CNY 1.00)

Figure 2.2 illustrates the growth path of CNY 1.00 invested in large company stocks, small company stocks, long-term Treasury bonds, medium-term Treasury bonds, short-term Treasury bonds and a hypothetical asset that grows at the inflation rate from the beginning of 1997 to the end of 2018. Different from Figure 2.1, Figure 2.2 has included three more asset classes, the long-term Treasury bonds, the medium-term Treasury bonds, and the short-term

Treasury bonds. The starting year of Figure 2.2 is 1997, instead of 1993 in Figure 2.1. The reason is that before 1997, the number of Treasury bonds was quite small and the quality of data was poor. To make different asset classes comparable, we choose the same time span for all asset classes in Figure 2.2, from 1997 to 2018.

During this period, CNY 1.00 invested in long-term Treasury bonds at the beginning of 1997 grew to CNY 3.48 by the end of 2018, while CNY 1.00 invested in short-term Treasury bonds grew to CNY 2.06. During the same period, such investment in large company stocks and small company stocks grew to CNY 3.62 and CNY 24.77, respectively. Apparently, large company stocks' performance is only slightly above long-term Treasury bonds in this period. Furthermore, investment in these five asset classes all beat the inflation index in this period, which reached CNY 1.51. As Figure 2.1 shows, large and small company stocks experienced three bullish periods in 1996, 2007, and 2009, and two bearish periods in 2004 and 2008. Compared with the volatile stock indexes, both long- and short-term Treasury bond indexes followed a rather smooth growth path.

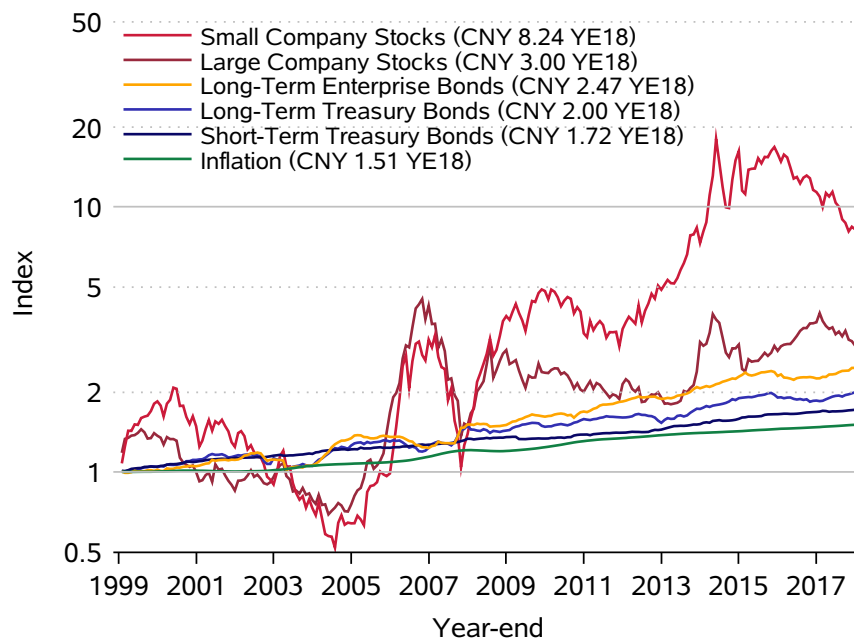


Figure 2.3: Wealth indexes of Investments in the Chinese Capital Market (Year-End 1999 = CNY 1.00)

Figure 2.3 presents the growth of CNY 1.00 invested in large company stocks, small

company stocks, long-term Treasury bonds, short-term Treasury bonds, long-term enterprise bonds and a hypothetical asset growing inflation from the beginning of 2000 to the end of 2018. Here, we have added long-term enterprise bonds and shortened the period to start in 2000, which is the first year of available enterprise bond data.

During this period, CNY 1.00 invested in short-term and long-term Treasury bonds at the end of 1999 grew to CNY 1.72 and CNY 2.00, respectively, by the end of 2018. CNY 1.00 invested in long-term enterprise bonds returned CNY 2.47, outperforming Treasury bonds. The growth for investments in large company stocks and small company stocks over the same period were CNY 3.00 and CNY 8.24, respectively, higher than enterprise and Treasury bonds. Furthermore, all of the above five asset classes outperformed inflation during this period, which reached CNY 1.51 by the end of 2018.

All the results above assume that reinvestment of dividends on stocks or coupons on bonds and taxes are exempted. In addition, transactions cost is not considered.

### **Returns on Large- and Small-Company Stocks**

As illustrated in Figure 2.1, the large company stock index, constructed on January 1, 1993, at CNY 1.00, grew to 4.08 by the end of 2018, yielding a compounded annual return of 5.56%. During the same period, the final value of inflation index is CNY 2.73. The inflation-adjusted gross return on large stocks from 1993 to 2018 is then CNY 1.50, reflecting a compounded real return of merely 1.56% per year.

Over these 26 years, small company stocks surpassed large company stocks and other assets. An CNY 1.00 investment in the small stock portfolio on January 1, 1993, increased to CNY 57.88 by the end of 2018, yielding a compounded annual return of 16.89%. Adjusted for inflation during this period, the gross real return on small stocks is CNY 21.22, reflecting a compounded real return of 12.47% per year.

### **Returns on Short-Term Treasury Bonds**

A CNY 1.00 investment in short-term Treasury bonds at the beginning of 1997, which is the starting point of our data on Treasury bonds, would return CNY 2.06 by the end of 2018, yielding a compounded annual return of 3.35. Adjusted for inflation during this period, the terminal value of this investment amounts to CNY 1.36, reflecting a compounded real return



of 1.42% per year from 1997 to 2018.

Over the same period, the large and small stocks grew from CNY 1.00 to CNY 3.62 and CNY 24.77, yielding 6.02% and 15.71% per year, respectively. The inflation-adjusted real returns on large and small stocks in the corresponding period are 4.04% and 13.54%, respectively. Clearly, from 1997 to 2018, stocks outperformed the short-term Treasury bonds.

### **Returns on Long-Term and medium-Term Treasury Bonds**

We now look at long-term and medium-term Treasury bonds, starting from CNY 1.00 at the beginning of 1997. The total return index for long-term Treasury bonds, constructed with bonds with maturity of 10 years, reached CNY 3.48 at the end of 2018. The compounded annual return for long-term Treasury bonds over the 22-year period is 5.83%. Adjusted for inflation, the annualized real return on long-term Treasury bonds over this period is 3.85%.

CNY 1.00 invested in medium-term Treasury bonds at the end of 1996 grew to CNY 3.21, a bit lower than CNY 3.48 for long-term Treasury bonds. The compounded annual total return for medium-term Treasury bonds is 5.44%, close to the realized return of long-term Treasury bonds. The real return on medium-term Treasury bonds over this period averaged to 3.47%.

Compared with the performance of stocks over the same period, the returns on long- and medium-term Treasury bonds are substantially below that of small stocks and only slightly lower than that of large stocks.

### **Returns on Long-Term Enterprise Bonds**

Long-term enterprise bonds outperformed both long- and short-term Treasury bonds from 2000 to 2018, with a compounded annual growth rate of 4.87%. CNY 1.00 invested in the long-term enterprise bond index at the beginning of 2000 led to CNY 2.47 by the end of 2018. Over the same period, an initial investment of CNY 1.00 returned CNY 8.24 on small stocks, with compounded annual returns for the period of 11.74%; CNY 3.00 on large stocks, with 5.94%; CNY 2.00 on long-term Treasury bonds, with 3.71%; CNY 1.72 on short-term Treasury bonds, with 2.88%; and CNY 1.51 on inflation index, with compounded annual returns of 2.18%. Clearly, long-term enterprise bonds underperformed large and small stocks over this period, but outperformed Treasury bonds and inflation. Because almost all long-term enterprise bonds examined here are issued by state and local government-owned enterprises or

agencies, the default risk is negligible. In addition, it is obvious that the stock indexes are far more volatile than fixed-income and inflation indexes, while the latter group generally follows a smoother upward trend.

## **Inflation**

The compounded annual inflation rate from 1993 to 2018 was 3.93%. The inflation index, starting from CNY 1.00 at the end of 1992, increased to CNY 2.73 by the end of 2018. It is worth noting that from 1993 to 1996, China went through a high inflation period, with the CPI for urban residents growing by 16% each year with a total increase of 80.1% during this period. However, since the late 1990s, China experienced two periods of moderate deflation, from 1998 to 2000 and 2001 to 2003, with relatively low and stable inflation in other periods in the 2000s.







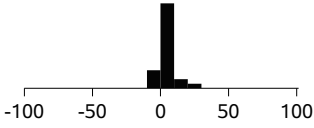
## **2.3 Summary Statistics of Total Returns**

Table 2.1 lists the summary statistics of annual returns on each of the seven asset classes from 1993 to 2018. Due to data availability, the actual time span for each asset class is different. The set of data for large and small stocks as well as inflation spans 26 years, from 1993 to 2018; data on Treasury bonds have a time span of 22 years, from 1997 to 2018; and data on enterprise bonds spans only 19 years, from 2000 to 2018. The statistics reported are based on the available data.

Table 2.1 reports the arithmetic and geometric means of annual returns on seven asset classes as well as their standard deviation. Obviously, the arithmetic means for stock and bond returns are always greater than or equal to their geometric means. Since the difference between the arithmetic mean and the geometric mean is related to the standard deviation of the series, implied by Jensen's inequality, the difference reflects the volatility of returns to a large extent.

The ranking of the arithmetic mean returns is also in line with the volatility of asset returns. In particular, the small stock index had an annual volatility of 66.34%, the large stock index had a slightly lower volatility of 57.22%. Both the long-term Treasury and enterprise bonds experienced substantial volatility, of 9.66% and 8.59%, respectively, but lower than the stocks. Medium- and short-term Treasury bonds had the lowest volatility of 6.11% and 2.01%,

Table 2.1: Summary Statistics of Yearly Returns (%) (1993 – 2018)

	Geometric Mean	Arithmetic Mean	Standard Deviation	Distribution (%)
Large Company Stocks	5.56	16.80	57.22	
Small Company Stocks	16.89	30.44	66.34	
Long-Term Enterprise Bonds	4.87	5.19	8.59	
Long-Term Treasury Bonds	5.83	6.23	9.66	
Medium-Term Treasury Bonds	5.44	5.61	6.11	
Short-Term Treasury Bonds	3.35	3.37	2.01	
Inflation	3.94	4.10	5.95	

respectively. Due to the high inflation rate in the early sample period, the overall volatility of inflation is quite substantial, reaching 5.95%.

Given the high volatility of wealth indexes, especially for stocks, their geometric means are substantially lower than their arithmetic counterparts. For small stocks, the geometric mean return is 16.89%, while for large stocks it is only 5.56%, which clearly shows the negative impact of high volatility on long-term stock investors over this period.

Table 2.2: Summary Statistics of Sub-period Yearly Returns

	1997-2018			2000-2018		
	Geometric Mean	Arithmetic Mean	Standard Deviation	Geometric Mean	Arithmetic Mean	Standard Deviation
Large Company Stocks	6.98	16.51	51.21	7.04	17.35	53.73
Small Company Stocks	16.21	30.52	68.69	12.49	28.39	73.56
Long-Term Enterprise Bonds	4.85	5.15	8.37	4.85	5.15	8.37
Long-Term Treasury Bonds	5.83	6.23	9.66	3.71	3.98	7.85
Medium-Term Treasury Bonds	5.44	5.60	5.97	4.10	4.20	4.80
Short-Term Treasury Bonds	3.40	3.42	1.98	2.96	2.98	1.66
Inflation	1.90	1.92	1.97	2.18	2.19	1.84

The statistics reported in Table 2.1 summarizes the performance of seven asset classes over the whole sample period from 1993 to 2018 whenever data is available, while in Table 2.2, we report statistics for the seven asset classes over different sub-periods. The left panel covers the period from 1997 to 2018 and the right panel from 2000 to 2018, when data on all seven asset classes are available. The basic pattern of returns and standard deviation is similar over these different periods. One significant difference is that average inflation is substantially lower over these later periods. Another observation is that realized annual returns on large stocks (the geometric mean return) over these two later periods remain comparable to those from long-term Treasury and enterprise bonds.

## 2.4 Inflation-Adjusted Returns on Stocks and Bonds

The wealth indexes presented in Figures 2.1, 2.2, and 2.3 are nominal. They do not adjust for the change in purchasing power along with the growth of nominal wealth. Figures 2.4, 2.5, and 2.6 present the inflation-adjusted wealth indexes, i.e., the growth of CNY 1.00 invested in the seven asset classes from the beginning of 1993, 1997, and 2000 to the end of 2018, adjusted for inflation during the same period.

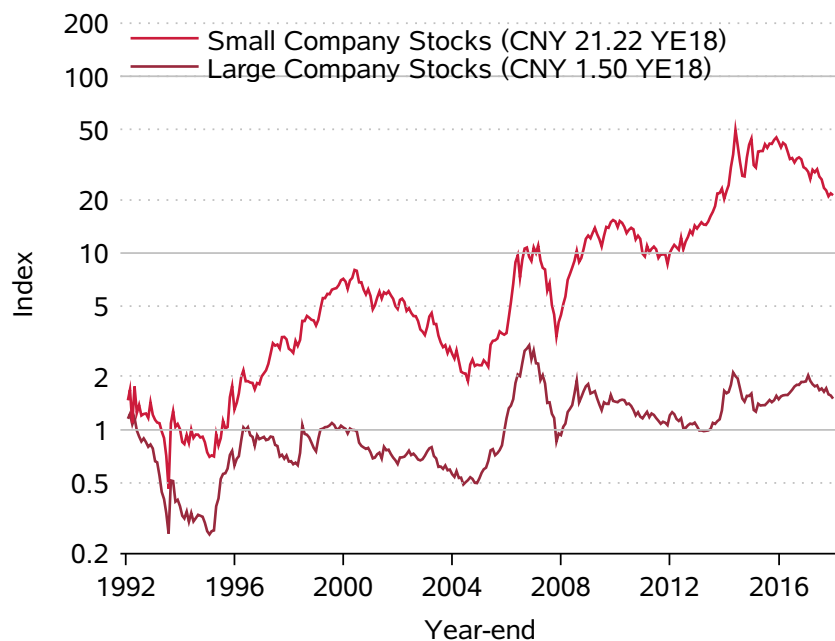


Figure 2.4: Inflation-adjusted wealth indexes of Investments in the Chinese Capital Market (Year-End 1992 = CNY 1.00)

Figure 2.4 plots the inflation-adjusted growth of CNY 1.00 invested at the beginning of 1993 in large and small company stocks, respectively, until the end of 2018. Over this 26-year period, the small company stocks experienced substantial growth in real terms. As mentioned before, CNY 1.00 invested in small company stocks at the beginning of 1993 grew to CNY 21.22 by the end of 2018 in real terms, i.e., in 1993 yuan (RMB). In comparison, large company stocks performed poorly – CNY 1.00 grew only to CNY 1.50 by the end of 2018 in real terms, yielding a total return of merely 1.56% over 26 years. It is also observed that similar to the nominal returns in large and small company stocks, their inflation-adjusted returns also experienced large up and down swings. In particular, the magnitude of these

swings is quite similar for large and small company stocks, indicating similar risks for these two asset classes.

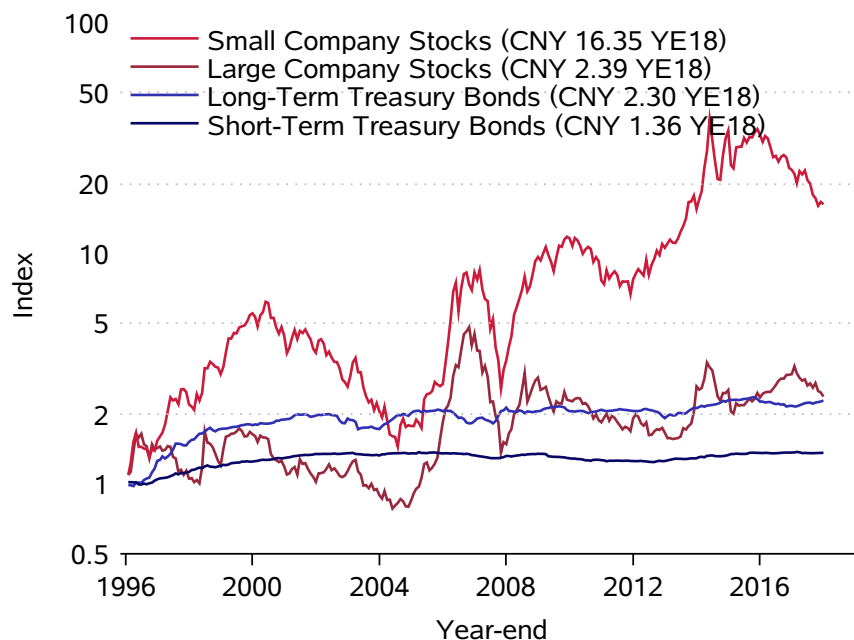


Figure 2.5: Inflation-adjusted wealth indexes of Investments in the Chinese Capital Market (Year-End 1996 = CNY 1.00)

Figure 2.5 plots the inflation-adjusted growth of CNY 1.00 invested in large company stocks, small company stocks, long-term Treasury bonds and short-term Treasury bonds from 1997 to 2018. We omitted the real growth of medium-term Treasury bonds as before since it is very close to that of long-term Treasury bonds. Over this period of 22 years, CNY 1.00 invested in the short- and long-term Treasury bonds at the beginning of 1997 grew to CNY 1.36 and CNY 2.30, respectively, by the end of 2018 in real terms. Over the same period, CNY 1.00 invested in the large- and small-company stocks grew to CNY 2.39 and CNY 16.35, respectively, in real terms.

Figure 2.6 presents the inflation-adjusted growth of CNY 1.00 invested in large company stocks, small company stocks, long-term Treasury bonds, short-term Treasury bonds, and long-term enterprise bonds from the beginning of 2000 to the end of 2018. Over this 19-year period, CNY 1.00 invested in the short- and long-term Treasury bonds and long-term enterprise bonds at the beginning of 2000 grew to CNY 1.14, CNY 1.33 and CNY 1.64,

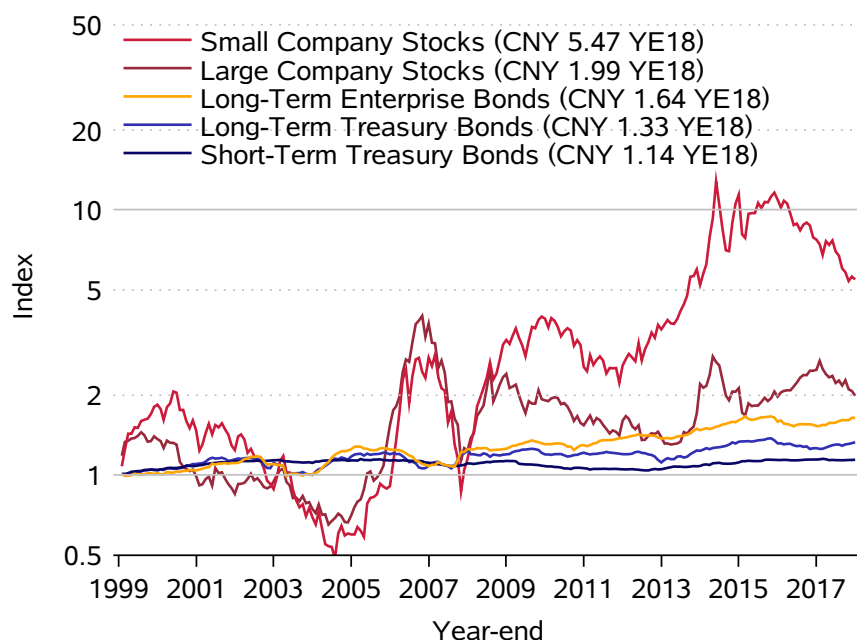


Figure 2.6: Inflation-adjusted wealth indexes of Investments in the Chinese Capital Market (Year-End 1999 = CNY 1.00)

respectively, by the end of 2018, in real terms. Over the same period, CNY 1.00 invested in the large and small company stocks grew to CNY 1.99 and CNY 5.47, respectively, in real terms.

Table 2.3 summarizes the inflation-adjusted returns or real returns on the six basic asset classes, over the periods where data is available. Compared with nominal returns described in Table 2.1, the real returns all have lower means. The differences are close to the average inflation rate. Although inflation does vary from year to year, it is in general relatively smooth over short horizons. Under this circumstance, its impact on the return volatility is limited. From the table we see that volatility of inflation-adjusted returns is similar in magnitude to the unadjusted returns.

In terms of the long-run performance, from 1993 to 2018, small company stocks did the best, yielding an average inflation-adjusted return of 12.46% per year (the geometric mean return). The large company stocks, however, only yielded an average inflation-adjusted return of 1.55% per year. This is only slightly higher the average return from short-term Treasury bonds, which is 1.42%, which is from 1997 to 2018. Over the same period, medium- and

Table 2.3: Summary Statistics of Yearly Real Returns

	Geometric Mean	Arithmetic Mean	Standard Deviation
Large Company Stocks	1.55	12.94	55.51
Small Company Stocks	12.46	26.06	65.44
Long-Term Enterprise Bonds	2.64	2.95	8.31
Long-Term Treasury Bonds	3.85	4.27	9.67
Medium-Term Treasury Bonds	3.47	3.66	6.41
Short-Term Treasury Bonds	1.42	1.46	2.99

long-term Treasury bonds yielded an average annual, inflation-adjusted return of 3.47% and 3.85%, respectively. Long-term enterprise bonds only yielded an average inflation-adjusted return of 2.64% per year, from 2000 to 2018.

In terms of average yearly returns (arithmetic mean), inflation-adjusted, small company stocks have the highest value of 26.06%, followed by large company stocks at 12.94%. The substantial difference between arithmetic and geometric mean returns for stocks is due to their high volatility. For bonds, their average yearly inflation-adjusted returns range from 1.46% for the short-term Treasury bonds to 3.66% and 4.27% for medium- and long-term Treasury bonds, respectively, and 2.95% for long-term enterprise bonds.

We also note that for large- and small- company stocks, the standard deviations become slightly lower after adjusting for inflation. On bond returns, inflation has a limited impact of their volatility with the exception of short-term Treasury bonds, for which return volatility increases after adjusting for inflation.

The volatility of inflation-adjusted returns for the six asset classes exhibits similar patterns and magnitudes as for their nominal returns. For the small- and large-company stocks, their yearly real returns have a volatility of 65.44% and 55.51%, respectively, which are very close. For short-, medium- and long-term Treasury bonds, the volatility of their yearly inflation-adjusted returns are 2.99%, 6.41% and 9.67%, respectively. For long-term enterprise bonds, their yearly real returns have a volatility of 8.31%.



## 2.5 Rolling Period Returns

The maximum and minimum annual returns on the basic return series, are shown for one-, five-, and ten-year holding periods in Table 2.4. The table also gives the number of years in which an asset had positive returns, and the number of years that an asset's return was the highest among all those studied. The number of years with a positive/highest return is compared with the total number of observations.

Table 2.4: Basic Series Maximum and Minimum Values of Returns for 1-, 5-, 10-Year Holding Periods Compound Annual Returns (%) (1993 – 2018)

Yearly Returns	Maximum Return	and Year	Minimum Return	and Year	Times Positive (out of 26 years)	Times High-est Return
Large Company Stocks	155.14	1996	-64.83	2008	11	5
Small Company Stocks	220.25	2007	-56.10	2008	15	10
Long-Term Enterprise Bonds	26.49	2005	-9.23	2007	15	5
Long-Term Treasury Bonds	29.34	1997	-6.48	2004	16	1
Medium-Term Treasury Bonds	19.47	1997	-3.24	2013	18	1
Short-Term Treasury Bonds	7.50	1997	-1.27	2010	21	1
Inflation	24.10	1994	-1.40	1999	22	3
5-year Rolling Period Returns	Maximum Return	and Years	Minimum Return	and Years	(22 overlapping 5-year periods)	Times High-est Return
Large Company Stocks	37.94	2003-2007	-12.76	2008-2012	18	3
Small Company Stocks	60.08	1996-2000	-19.11	2001-2005	19	15
Long-Term Enterprise Bonds	8.43	2008-2012	0.38	1996-2000	19	2
Long-Term Treasury Bonds	14.06	1997-2001	0.49	2009-2013	22	0
Medium-Term Treasury Bonds	10.86	1997-2001	1.62	2009-2013	22	1
Short-Term Treasury Bonds	5.62	1997-2001	1.46	1993-1997	22	1
Inflation	13.16	1993-1997	-0.38	1998-2002	21	0
10-year Rolling Period Returns	Maximum Return	and Years	Minimum Return	and Years	(17 overlapping 10-year periods)	Times High-est Return
Large Company Stocks	14.91	2006-2015	-1.44	2008-2017	16	0
Small Company Stocks	38.22	2006-2015	6.35	1999-2008	17	17
Long-Term Enterprise Bonds	6.92	2005-2014	0.58	1995-2004	17	0
Long-Term Treasury Bonds	8.52	1997-2006	2.94	2009-2018	17	0
Medium-Term Treasury Bonds	7.35	1997-2006	3.34	2004-2013	17	0
Short-Term Treasury Bonds	4.02	1997-2006	2.21	2003-2012	17	0
Inflation	6.17	1993-2002	0.92	1997-2006	17	0

For one-year holding period returns, listed in the top panel, the best year for large stocks was in 1996, while that for small stocks was in 2007. Both had their worst year in 2008. Long-term enterprise bonds received the highest return in 2005 and the lowest return in 2007. Treasury bonds tend to move together, earning the highest returns, ranging from 7.50% to 29.34%, in 1997. Short-term Treasury bonds had their lowest return in 2010; medium-term term Treasury bonds had their lowest return in 2013; and the long-term Treasury bonds had

their lowest returns in 2004. In over half of the sample periods, Treasury bonds had positive returns. Small stocks had more positive returns and large stocks had more years with the negative returns.

For returns on a five-year rolling period, in over 80% of the 22 (overlapping) sample periods, all assets had positive returns. Small stocks had 15 highest five-year returns out of 22. The returns on the ten-year period, exhibited in the bottom panel, have a similar pattern. Given the relative short time period, 17 years in total, the results for ten-year returns are subject to small sample problems.

### **3 Volatility and Correlations**

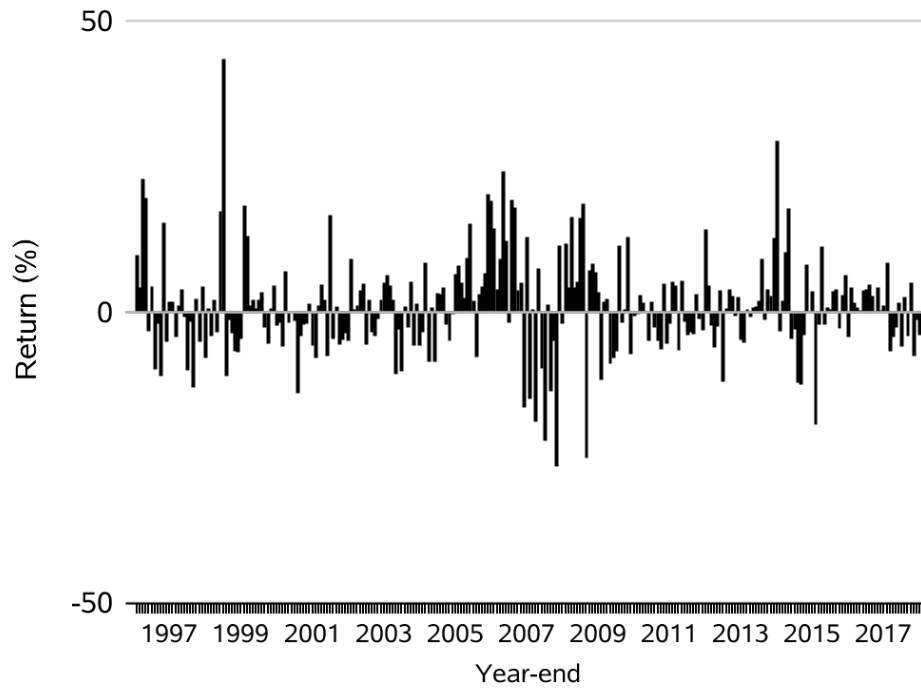
Statistical analysis of historical asset returns reflects characteristics that include the average return, risk as measured by return volatility, co-movement in asset returns. This section mainly examines the standard deviation, time series and cross section correlation of returns on the seven asset classes.

#### **3.1 Volatility of the Market**

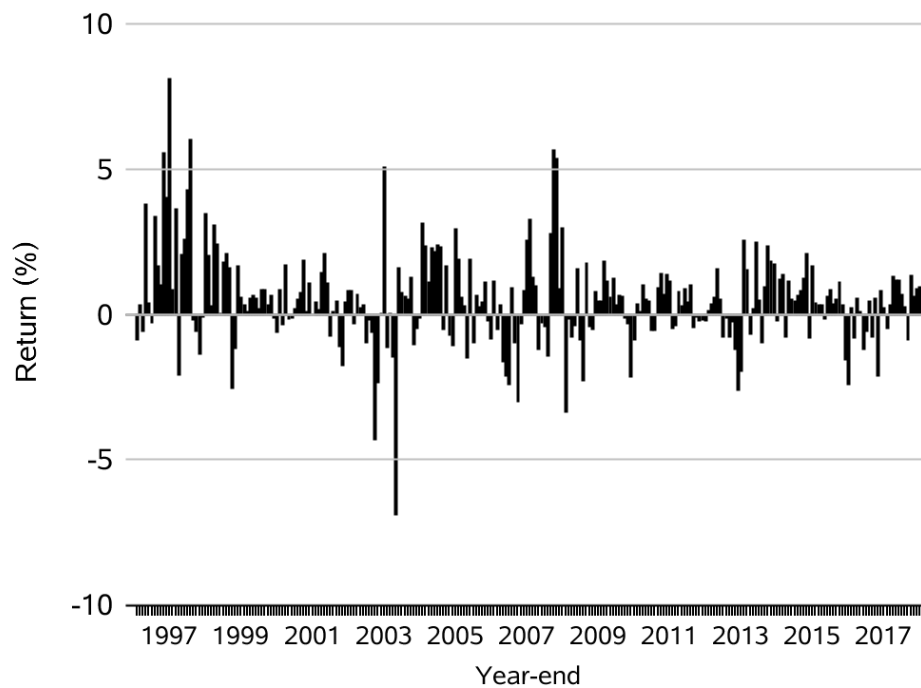
Figure 3.1 depicts the volatility of monthly returns of large-company stocks and long-term Treasury bonds. The history of large-company stocks is longer than that of long-term Treasury bonds. In the history of these two assets, in general, the return of large company stocks is much more volatile than that of long-term Treasury bonds. The volatility of large-company stocks was extremely high in the first few years, when only a small number of stocks were traded and there was no daily price change limit. It peaked at the end of 1994. During 2000 and 2004, the volatility is relatively moderate, while from 2006 to 2010, the volatility increased, but was still below the extreme level in early years.

The volatility of the bond market is generally milder. Long-term Treasury bonds were very volatile in 1997 and early 1998. Since 1999, however, the bond market was stable and volatility remained low. In the bearish period from 2008 to 2009, capital redirected to the bond market, resulting in more volatility during that period.

To calculate the monthly return of the whole market, we first calculate the return of individual stocks in each month, and then calculate the portfolio return according to the



(a) Large Company Stocks



(b) Long-Term Treasury Bonds

Figure 3.1: Month-by-Month Returns on Stocks and Bonds (%)

weight of each stock within the portfolio.

## 3.2 Serial Correlations

The predictability of an asset return series, classified as random, unpredictable, or subject to a certain trend and periodicity, can be reflected by its serial correlations or autocorrelations. From a theoretical perspective, a highly auto-correlated sequence, with the autocorrelation coefficient equal to 1, can be fully predicted, whereas a sequence with coefficients close to 0 is nearly random and cannot be predicted.

## 3.3 Summary Statistics of Basic Series

Table 3.1 summarizes the statistical characteristics of annual returns on the seven basic asset classes. For certain assets, total returns include both income and capital appreciation, which are also presented separately.

Table 3.1: Total Returns, Income Returns, and Capital Appreciation of the Basic Asset Classes: Summary Statistics of Annual Returns

Series	Geometric Mean	Arithmetic Mean	Standard Deviation	Serial Correlation
Large Company Stocks				
Total Returns	5.6	16.8	57.2	-0.06
Income	1.8	1.8	1.0	0.60
Capital Appreciation	3.8	14.9	56.6	-0.06
Small Company Stocks (Total Returns)				
	16.9	30.4	66.3	-0.12
Long-Term Enterprise Bonds (Total Returns)				
	4.9	5.2	8.6	-0.44
Long-Term Treasury Bonds				
Total Returns	5.8	6.2	9.7	0.03
Income	4.1	4.1	2.0	0.85
Capital Appreciation	1.7	2.0	8.2	-0.16
Medium-Term Treasury Bonds				
Total Returns	5.4	5.6	6.1	0.03
Income	4.4	4.5	2.2	0.79
Capital Appreciation	1.0	1.1	5.3	-0.22
Short-Term Treasury Bonds (Total Returns)				
	3.4	3.4	2.0	0.42
Inflation				
	3.9	4.1	5.9	0.78

Table 3.1 shows that from 1993 to 2018, large-company stocks exhibited tremendous risk, with standard deviation of annual returns reaching 57.22%. Their return was unimpressive, yielding only 5.56% per year for long-term investors. It consists of 1.79% from income and

3.76% from capital appreciation. We also note that annual returns on large company stocks exhibit a slightly negative serial correlation of -0.06, which is quite insignificant.

Small-company stocks are the riskiest asset class with an annual standard deviation of 66.34%, and provide the greatest rewards to long-term investors in return, with an arithmetic mean annual return of 30.44% and a geometric mean of 16.89%. The annual returns on small company stocks exhibit a negative serial correlation of -0.12.

Long-term enterprise bonds, long-term Treasury bonds, and medium-term Treasury bonds are all less risky, and they have lower average returns as a consequence. The standard deviation of annual returns on enterprise bonds is 8.59% and the arithmetic mean is 5.19%. For long- and medium-term Treasury bonds, annual returns have standard deviations of 9.66% and 6.11%, respectively. They have arithmetic mean return of 6.23% and 5.61%, respectively. Long-term Treasury bonds have a decomposition of income of 4.08% and capital appreciation of 1.74%; medium-term Treasury bonds have 4.45% and 0.97%.

We also note that annual returns on long-term enterprise bonds exhibit substantial negative serial correlation of -0.44, while returns on long- and medium-term Treasury bonds exhibit only slightly positive serial correlation of 0.03 and 0.03, respectively.

Short-term Treasury bonds are nearly riskless and have the lowest return of 3.35%. The standard deviation in their returns, 2.01%, reflects the time variation in short-term interest rates, rather than the risk in their returns. We also see strong positive serial correlation reflecting the persistence in short-term interest rates over time.

### **3.4 Correlations between Asset Returns**

Correlations among the returns of different assets represent the commonality in their risks. Common risks are of particular interest because they capture the systematic elements to which the risks the assets are exposed. It is widely believed that systematic risks are ultimately related to the expected returns on these assets.

Table 3.2 presents the cross-correlations between the annual returns on the seven asset classes. Despite diversification within each asset class (except Treasury bonds), the correlation in risks across asset classes is in general quite substantial.

Returns on large- and small- company stocks exhibit a correlation of 0.73. Somewhat sur-

Table 3.2: Basic Series: Serial and Cross Correlations of Historical Annual Returns

Series	Large Stocks	Small Stocks	LT Ente Bonds	LT Tres Bonds	MT Tres Bonds	ST Tres Bonds	Inflation
Large Co Stocks	1.00						
Small Co Stocks	0.73	1.00					
LT Ente Bonds	-0.51	-0.39	1.00				
LT Tres Bonds	-0.28	-0.19	0.91	1.00			
MT Tres Bonds	-0.27	-0.21	0.86	0.98	1.00		
ST Tres Bonds	-0.15	0.02	0.36	0.74	0.73	1.00	
Inflation	-0.17	-0.12	0.12	-0.01	-0.05	-0.15	1.00
Serial Correlations	-0.06	-0.12	-0.44	0.03	0.03	0.42	0.78

prisingly, they both exhibit significant negative correlation with returns on enterprise bonds, -0.51 and -0.39, respectively. Stocks also exhibit substantial negative correlation with Treasury bonds. Returns on large-company stocks exhibit negative correlation with long- and medium-term Treasury bonds of -0.28 and -0.27. Small-company stocks exhibit similar negative correlation with long- and medium-term Treasury bonds, with slightly smaller magnitude. Both large- and small-company stocks also have non-trivial negative correlation with inflation of -0.17 and -0.12.

The correlation between returns on long-term enterprise bonds and long-term Treasury bonds 0.91, meaning strong co-movement between these two assets. This is not surprising. Since enterprise bonds are highly rated, there is limited credit risk, which makes them close substitutes to Treasury bonds and mostly driven by interest rates. The correlation between long-term enterprise bonds and medium-term Treasury bonds is at a similar level, at 0.86. The correlation between enterprise bonds and short-term Treasury bonds remains significantly positive, but smaller in magnitude, which is 0.36.

The correlations among Treasury bonds across three maturity ranges are all quite high. The correlation between long- and medium-term Treasury bonds is as high as 0.98.

If inflation is unanticipated, it should have a negative effect on fixed income securities. Surprisingly, long-term enterprise bond returns are positively correlated with inflation at 0.12. On the other hand, short-, medium-, and long-term Treasury bond returns are negatively correlated with inflation.

The annual cross-correlations and serial correlations of the four risk premium series and

the inflation rate are presented in Table 3.3.

Table 3.3: Risk Premia and Inflation: Serial and Cross Correlations of Historical Annual Returns

Series	Large Stock Premia	Small Stock Premia	Default Premia	Term Premia	Inflation
Equity Risk Premia	1.00				
Small Stock Premia	-0.16	1.00			
Default Premia	-0.37	0.15	1.00		
Term Premia	-0.31	0.13	0.03	1.00	
Inflation	-0.07	0.16	-0.11	0.03	1.00
Serial Correlations	-0.14	0.06	0.05	-0.08	0.78

We observe that large stock premia is negatively correlated with small stock premia as well as default premia and term premia. Its correlations with default and term premia are quite substantial, at -0.37 and -0.31, respectively. Small stock premia, however, exhibit positive correlation with default and term premia as well as inflation.

Table 3.4 presents annual cross-correlations and serial correlations of the inflation-adjusted asset return series. It is interesting to see how the relationship between the asset returns change after they are adjusted for inflation. In general, the cross-correlations between asset classes become smaller in magnitude when one accounts for inflation. The serial correlations in inflation-adjusted annual returns also become somewhat smaller in magnitude when compared with nominal returns.

### 3.5 Changes in the Risk of Assets Over Time

Investors are also concerned about the change in risk, indicated by the standard deviation or volatility of the return series over different periods. In this section, we examine how volatility of the basic and derived returns series varies over time.

#### A Annualized Monthly Volatility by Five-Year Periods

Table 3.5 reports the annualized monthly standard deviations of the basic data series by five years sub-periods starting from 1990, reflecting differences and changes in volatility of returns over time.

In terms of overall levels, we find that the volatility of stock returns is consistently much

Table 3.4: Inflation-Adjusted Series: Serial and Cross Correlations of Historical Annual Returns

Series	Inflation-Adjusted						
	Large Stocks	Small Stocks	LT Ente Bonds	LT Tres Bonds	MT Tres Bonds	ST Tres Bonds	Inflation
Large Co Stocks	1.00						
Small Co Stocks	0.73	1.00					
LT Ente Bonds	-0.46	-0.34	1.00				
LT Tres Bonds	-0.24	-0.13	0.91	1.00			
MT Tres Bonds	-0.22	-0.13	0.85	0.97	1.00		
ST Tres Bonds	-0.03	0.14	0.32	0.65	0.72	1.00	
Inflation	-0.24	-0.21	-0.10	-0.22	-0.36	-0.75	1.00
Serial Correlations	-0.07	-0.11	-0.42	0.18	0.24	0.62	0.78

Table 3.5: Annualized Monthly Standard Deviation by 5-year periods (%)

	1993-1997	1998-2002	2003-2007	2008-2012	2013-2018
Large Company Stocks	62.34	29.44	27.79	32.61	24.07
Small Company Stocks	87.97	29.53	42.68	38.59	40.71
Long-Term Enterprise Bonds	.	2.88	6.25	5.42	3.81
Long-Term Treasury Bonds	.	5.17	6.45	5.18	3.98
Medium-Term Treasury Bonds	.	3.85	3.53	5.46	3.47
Short-Term Treasury Bonds	.	2.06	1.33	1.56	1.36
Inflation	2.02	0.29	0.51	0.77	0.16

higher than that of bond returns and the inflation rate. Within stocks, small-company stocks are more volatile than that of large companies, as expected. Clearly, asset volatility varied substantially in the period we examine, from 1993 to 2018. The volatility of stocks was extremely high during the first a few years, for both large and small stocks. It then decreased over time. But in the period containing the sharp down turn in 2007 in China's stock market, the global financial crisis and then the turbulent period around 2015, stock market volatility went up substantially.

The volatility of bond returns also exhibits a similar pattern in time variation: initially high, decreased during the first half of 2000s, then increased during the second half of 2000s, and fell to a lower level in more recent years.

The volatility of inflation rate followed a similar path, high in the 1990s, dropped signifi-



cantly in the first half of 2000s, increased during the second half of 2000s, and then returned to a lower level more recently.

## B Rolling Period Standard Deviations

Rolling period standard deviations are derived by rolling the fixed-length window along each time series and computing the standard deviation of the asset class in each period. It is a useful tool in examining the volatility or riskiness of assets with holding periods similar to those actually faced by investors. Since the volatility is reported by the end date of the rolling window, it represents the realized volatility during the window, up to the end date.

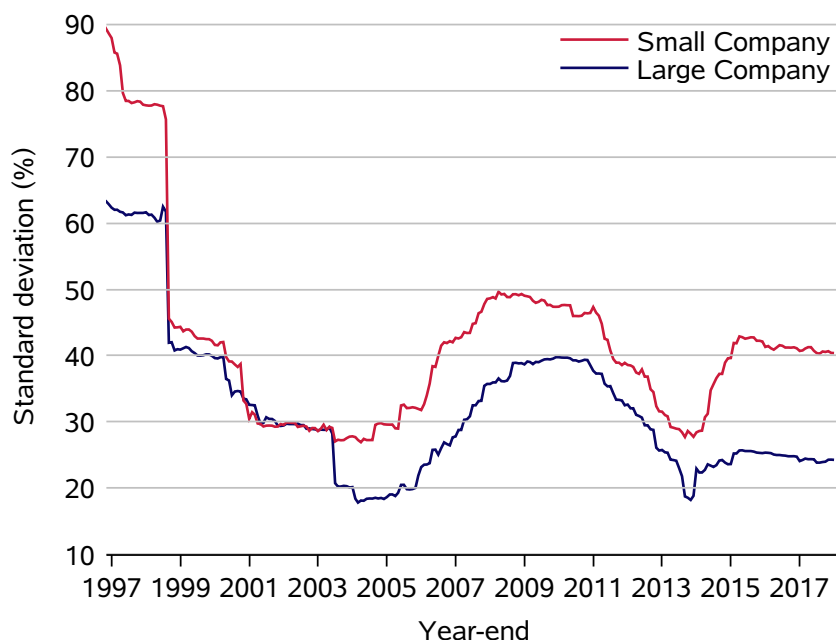


Figure 3.2: Rolling 60-Month Standard Deviation (%) for Large and Small Company Stocks

Figure 3.2 presents the rolling window volatility for large- and small- companies. The data of the monthly horizon are used to enlarge the number of data points in computation.

It is clear that the rolling window standard deviations were relatively large for small- and large- company stocks from 1997 to 1998, and were low from 2001 to 2005. The volatility increases again after 2006 and peaked in 2009. Afterward, the volatility had shown a steady decline trend until the first half year of 2015, and then switched to an upward trend since the market turmoil in the second half of 2015.

Figure 3.3 plots the rolling window volatility for long-term, medium-term and short-term Treasury bonds. Monthly data from 1997 to 2018 are used to enlarge the number of data points in computation. Compared with small- and large- company stocks, the rolling window volatility of Treasury bonds is much smaller, ranging from 0 to 7%.

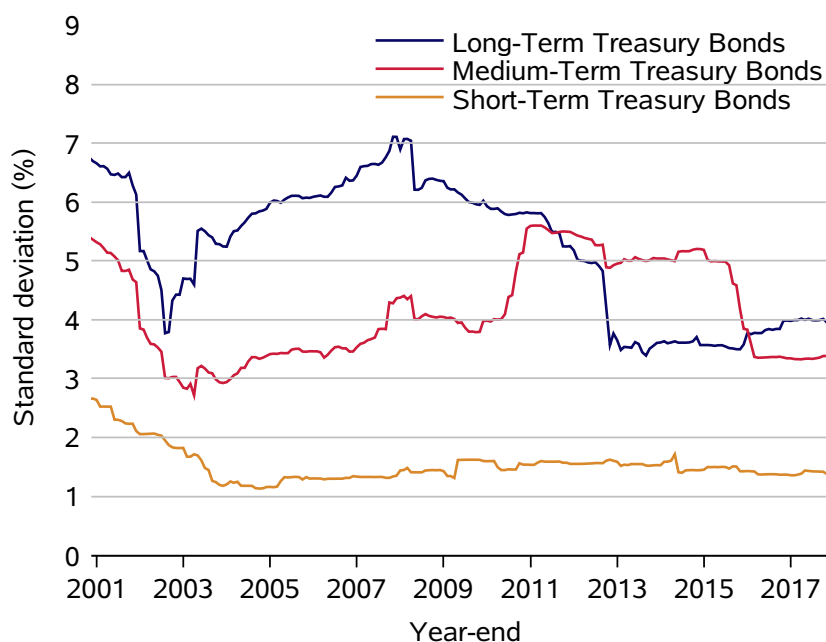


Figure 3.3: Rolling 60-Month Standard Deviation (%) for Treasury Bonds

### C Rolling Period Correlations

Rolling period correlations are derived by rolling the fixed-length window along each time series and computing the cross-correlation between the two asset classes in each period. It is a useful method in examining how asset classes vary with each other in holding periods similar to those actually faced by investors. Data of monthly horizon are used to enlarge the number of data points in computation.

Figure 3.4 shows the cross-correlation between two asset classes with a rolling period of 60 months. The first rolling period is from January 1997 to December 2001, so the time axis starts at December 2001. The red line shows the correlation between large company stocks and long-term Treasury bonds, which ranges widely between -0.6 to 0.3 over the past 18 years. The blue line reflects the correlation between short-term Treasury bonds and inflation rate,

which fluctuates around zero for most of the time period, except from 2002 to 2005 when it was significantly negative.

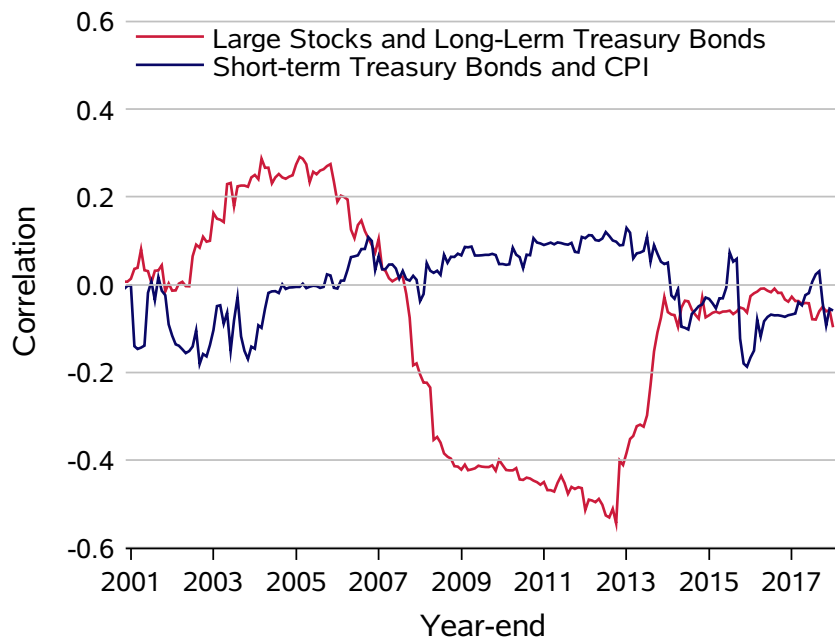


Figure 3.4: Rolling 60-Month Correlations (%) between Stocks and Bonds

## 4 Firm Size and Return

The relationship between firm size and stock return is one of the most notable findings in modern finance (see, for example, Banz (1981) and Fama and French (1992)). On average, stocks of small companies have higher returns than those of large ones. This phenomenon is also confirmed in previous chapters for the small stocks traded on the Shanghai and Shenzhen Stock Exchanges. The relationship between firm size and return spreads across the entire size spectrum. In this section, returns across the entire range of firm sizes are examined.

The firm size phenomenon is illustrated in the following several ways. Firstly, the greater systematic risk of small-company stocks does not fully explain their higher returns in the long run. In the Capital Asset Pricing Model, only systematic, or beta risk, is rewarded. However, empirical tests show that, small-company stocks have returns in excess of those implied by the betas of small stocks.

Secondly, the difference in annual returns between small- and large-company stocks is serially correlated, implying that annual returns in the past may be valuable in predicting those in the future. Such serial correlation, or autocorrelation, is empirically insignificant in large-company stocks and most other capital markets.

In addition, the firm size effect is seasonal. For example, small-company stocks outperform large-company stocks in February, March, July, August, September and November, but it is the other way around in June and December.

These aspects of the firm size effect, namely, long-term returns in excess of risk, serial correlation and seasonality, will be analyzed after the data are presented.

## 4.1 Construction of Size Portfolios

To construct the ten size deciles, we use the breakpoints based on the market capitalization of stocks that are listed on the main boards of Shanghai and Shenzhen exchanges at the end of each calendar year. We then assign all A share stocks into ten deciles according to the breakpoints. The portfolios are re-balanced yearly according to their closing market value of the last trading day in the year. In this paper (and this section), decile 1 portfolio represents the largest stocks and decile 10 portfolio represents the smallest.

Appropriate adjustments are made to stock prices to account for corporate events including dividends, rights offerings, and the Split-Share Structure Reform. The return on a portfolio for one month is calculated as the value-weighted average of the returns for the individual stocks in the portfolio. Annual portfolio returns are calculated by compounding the monthly portfolio returns.

Table 4.1 shows the market share of the decile portfolios. It reveals that at the end of 2018, stocks in the top three deciles take up most of market value (nearly 79%), with 232 stocks in the first decile alone taking up nearly one half of the total capitalization. On the contrary, the 495 stocks in the smallest decile represents only 1% of the total market value.

The data in the second column of Table 4.1 are averaged across 26 years. Of course, the proportions represented by the various deciles vary from year to year. The number of companies and market capitalization, listed in the third and fourth columns, gives a snapshot of the structure of each decile at the end of 2018.

Table 4.1: Size-Decile Portfolio of Bounds, Size, and Composition

Decile	Historical Average Percentage of Total Capitalization	Recent Number of Companies	Recent Decile Market Capitalization (in Thousands)	Recent Percentage of Total Capitalization
1-Largest	45.8%	232	CNY 20,896,869,928	59.7%
2	13.3	267	4,115,519,536	11.8
3	9.37	295	2,576,887,725	7.37
4	7.31	316	1,842,901,847	5.27
5	5.96	360	1,535,730,346	4.39
6	5.07	352	1,155,270,163	3.30
7	4.30	414	1,048,682,824	3.00
8	3.60	407	794,185,155	2.27
9	3.00	411	595,659,392	1.70
10-Smallest	2.30	495	418,576,284	1.20
Large-Cap 1-3	68.5	794	27,589,277,189	78.9
Mid-Cap 4-7	22.6	1442	5,582,585,180	16.0
Small-Cap 8-10	8.90	1313	1,808,420,831	5.17

Decile	Recent Market Capitalization (in Thousands )	Company ID	Company Name
1-Largest	CNY 1,426,248,604	601398	Industrial and Commercial Bank of China Limit
2	21,654,413	600109	Sinolink Securities Co., Ltd.
3	11,288,000	603198	Anhui Ying Jia Distillery Co.,Ltd.
4	6,984,235	000006	Shenzhen Zhenye(Group) Co.,Ltd.
5	4,950,868	600366	Ningbo Yunsheng Co.,Ltd.
6	3,688,817	600240	Beijing Huaye Capital Holdings Co.,Ltd
7	2,908,466	300661	Sg Micro Corp
8	2,199,062	002406	Xuchang Yuandong Drive Shaft Co.,Ltd.
9	1,708,362	603987	Shanghai Kindly Enterprise Development Group
10-Smallest	1,166,004	603650	Red Avenue New Materials Group Co., Ltd.

The bottom part of the Table 4.1 shows the largest firm in each decile and its market capitalization, at the end of 2018.

## 4.2 Returns on Size Portfolios

Summary statistics of annual returns of the 10 deciles and size groupings from 1993-2018 are presented in Table 4.2.

Table 4.2: Size-Decile Portfolio of Summary Statistics of Annual Returns

Decile	Geometric Mean	Arithmeric Mean	Standard Deviation	Serial Correlation
1-Largest	5.6	16.8	57.2	-0.06
2	6.0	17.4	58.8	-0.08
3	8.2	19.6	58.8	-0.12
4	7.4	18.8	58.4	-0.07
5	9.3	21.1	59.6	-0.11
6	9.5	20.4	58.5	-0.10
7	11.5	23.5	61.5	-0.13
8	14.2	26.6	62.3	-0.12
9	15.5	27.0	60.0	-0.09
10-Smallest	16.9	30.4	66.3	-0.12
Large-Cap 1-3	6.1	16.9	56.3	-0.08
Mid-Cap 4-7	9.2	20.4	58.4	-0.10
Small-Cap 8-10	15.6	27.9	62.1	-0.11
All	7.8	18.1	55.1	-0.09

It is clear that the geometric/arithmetic mean return tends to increase when moving from the largest decile to the smallest one. The total risk, or standard deviation of annual returns, also declines with firm size in general. It is also worth noting that while the largest stocks exhibit little serial correlation in their annual returns, medium to small size portfolios do exhibit weakly negative autocorrelation.

For easy comparison, we also group several decile portfolios into portfolios with different size ranges. By pooling together stocks in decile portfolios 1, 2, and 3, we obtain the large-capitalization portfolio. Decile portfolios 4, 5, 6 and 7 form the middle-cap portfolio and decile portfolios 8, 9 and 10 form the small-cap portfolio. The returns characteristics of these three portfolios are reported in Table 4.2 as well. The positive relation between size and mean return as well as volatility remains, although the magnitude is smaller.

The last row of Table 4.2 gives the statistical properties of the market return. It has a geometric mean of 7.80%, an arithmetic mean of 18.11%, and standard deviation of 55.09%.

### 4.3 Long-Term Returns in Excess of Risk

Given that small company stocks tend to be riskier, their higher returns can be at least in part compensation for risk. A benchmark model for the risk premium of an asset as compensation for its risk is the Capital Asset Pricing Model (CAPM). The systematic risk of an asset is measured by its beta with respect to the market. The beta greater than 1 indicates that the security is riskier than the market.

According to CAPM, investors are compensated for bearing additional systematic risk. The CAPM model is used to calculate return in excess of the risk-free rate and to compare this estimate with historical performance. According to CAPM, the return of a security consists of the risk-free rate and the excess return. The excess return is computed as multiplying  $\beta$  by the equity risk premium, which is the compensation that investors receive for taking on market risk. The difference between the excess return predicted by the CAPM and the realized excess return is the size premium.

Table 4.3 shows the returns in excess of the risk-free rate over the sample period for different size portfolios traded on the Shanghai and Shenzhen stock exchanges. We find that the size premium, which could not be explained by CAPM model, is high for both mid- and small-capitalization stock portfolios. In other words, based on historical return of the Shanghai and Shenzhen portfolios, returns of smaller deciles are not fully explainable by CAPM model. The residual in excess of CAPM is especially pronounced for small-cap stocks in decile 8-10. This size-related phenomenon has prompted a revision to the CAPM that the size premium should be taken into account.

Table 4.3: Size-Decile Portfolios of Long-Term Returns in Excess of CAPM

Decile	Beta	Arithmetic Mean Return (%)	Actual Return in Excess of Riskless Return(%)	CAPM Return in Excess of Riskless Rate (%)	Size Premium (Return in Excess of CAPM)
Mid-Cap, 4-7	1.09	20.42	16.32	13.90	2.42
Small-Cap, 8-10	1.11	27.91	23.81	14.19	9.62

This phenomenon can also be shown graphically, as depicted in Figure 4.1. It is clear

that investing in small-capitalization stock portfolio would receive more than in mid- and large-capitalization stock portfolio.

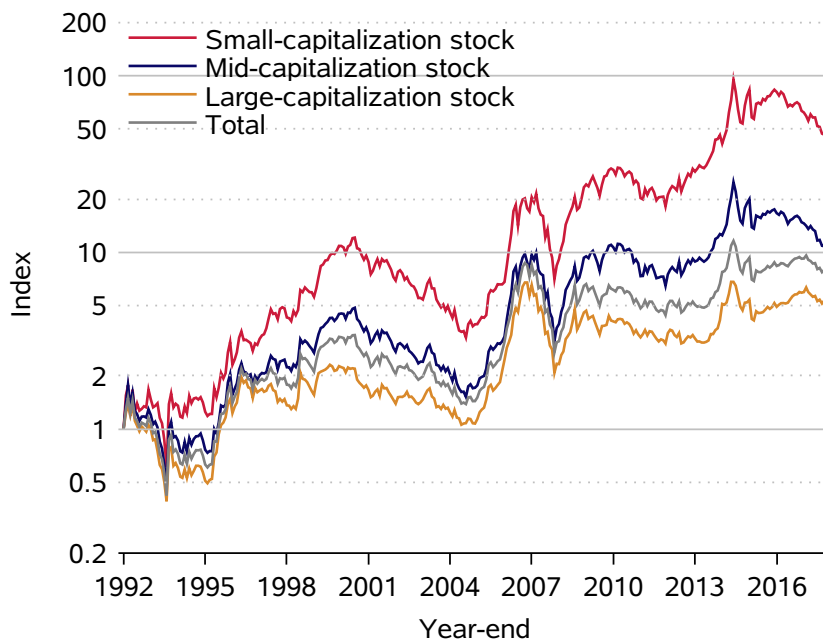


Figure 4.1: Size-Decile Portfolios: Wealth indexes of Investments in Small-, Mid-, Large-, and Total Capitalization Stocks. Index (Year-End 1992 = CNY 1.00)

## 5 Value and Momentum Investing

In addition to the size premium discussed in the previous chapter, value premium is another widely studied phenomenon in asset pricing (see, for example, Fama and French (1992)). Value (growth) firms, though with various definitions, refer to firms with high (low) fundamental value relative to their market value. Extensive research has shown that value firms have higher average returns than growth firms in the U.S. and many international stock markets. In this section, we examine returns of value and growth stocks in the Chinese market.

On average, value stocks outperform growth stocks from 1993 to 2018. However, a closer look reveals that this out-performance is largely driven by the strong performance of only a couple of years. Considering the relative short history of the capital market in China, it is unclear whether the value premium is robust for the Chinese stock market.

Lastly, we examine the return of the popular momentum strategy. Surprisingly, we find



no momentum effect in the Chinese stock market. Controlling for firm size, loser stocks with low past returns don't yield different returns from winner stocks with high past returns.

## 5.1 Construction of the Growth and Value Portfolios

Following the classic Fama-French methodology, we use book-to-market equity ratio (B/M) to define growth and value firms. Considering that Chinese-listed firms often have multiple share classes and domestic investors can publicly trade only floating A shares, we define book-to-market equity ratio as the fraction of book value of equity per share and floating A-share price at the end of December. The numerator is calculated as the total book value divided by the total number of shares, which represents the book value for one unit of floating A shares. Companies with low book-to-market ratios are defined as growth firms, and those with high book-to-market ratios are defined as value firms.

We match B/M ratios for all Chinese firms listed on Shanghai and Shenzhen Exchanges in calendar year  $t - 2$  (1991-2016) with the returns from January to December in year  $t$  (1993-2018). The accounting data needed for the calculation of B/M ratios are extracted from the firms' annual reports. Because all listed firms end their fiscal year in December and are required by law to submit their annual reports no later than the end of April, the lags between accounting data and market returns ensures that book-to-market ratios are publicly available and that the embedded information has been reflected in market prices.

At the end of December of year  $t - 1$ , two size portfolios are formed by dividing all stocks on the Shanghai and Shenzhen exchanges into two groups according to their floating A-share market capitalization. The breakpoints for the two size portfolios are the median of the floating A-share market capitalization of all A share stocks listed on the main boards of Shanghai and Shenzhen exchanges. The three B/M portfolios are formed by dividing all stocks into three groups by their book-to-market ratios: low, medium, and high. The three subgroups represent the bottom 30%, middle 40%, and top 30%, respectively. The book-to-market ratios are calculated as the ratio of book value per share and floating A-share price at the end of year  $t - 2$ . The intersection of the two size and the three B/M groups produces six portfolios. The monthly return of each portfolio is calculated as the value-weighted average return of its individual stocks' monthly returns. Portfolios are then held for 12-months and re-formed

at the end of year  $t$ . Annual portfolio returns are calculated by compounding the monthly portfolio returns over the year, from the beginning of January to the end of December.

We consider only four portfolios in the low and high B/M subgroups, namely, large value, large growth, small value and small growth. By double-sorting stocks by their market capitalization and book-to-market ratios, we can ensure that the size effect on returns is properly controlled and results are purely driven by value and growth. In the discussion below, we will focus on comparing the returns of large value stocks against large growth stocks, and the returns of small value stocks against small growth stocks.

## 5.2 Historical Returns of the Growth and Value Portfolios

Table 5.1 summarizes annual returns of the four growth and value series. The geometric and arithmetic mean returns suggest that value stocks on average outperform growth stocks. Comparing the two portfolios with large size stocks, the geometric mean of annual return of large value stocks is 9.34%, 6.92 percentage points higher than the mean return of large growth stocks. The arithmetic mean of annual return of large value stocks is 21.37%, 9.73 percentage points higher than the mean return of large growth stocks. In addition, large value stocks have larger standard deviation (62.51%) than large growth stocks (49.66%). The average return pattern is similar for small stocks. Small value stocks have better returns than small growth stocks, 4.38 percentage points higher in terms of geometric mean and 2.19 percentage points higher in terms of arithmetic mean. The return standard deviation of the small growth stocks is 69.33%, slightly higher than the return standard deviation of the small value stocks of 65.59%.

Although Table 5.1 shows that the returns of value stocks outperform the growth stocks on average, the results are largely driven by a few years in the early period when the Chinese stock market were extremely volatile. For example, the geometric mean of annual return of a portfolio that longs the large value stocks and shorts the large growth stocks drops to only 4.22% for the period from 1997 to 2018, 2.39 percentage points lower than the geometric mean of the portfolio for the period from 1993 to 2018. Similarly, the arithmetic mean of annual return of this portfolio drops to only 6.97% for the period from 1997 to 2018, 2.76 percentage points lower than the arithmetic mean of the portfolio for the period from 1993

to 2018. Considering the short history of the Chinese stock market and the large standard deviations of stocks' returns, it is unclear that the value premium is robust in the Chinese market. In fact, adjusted for volatility, the value premium is not statistically significant for the whole sample period. For more detailed discussion on the value premium, readers can refer to Hu, Chen, Shao, and Wang (2019).

Table 5.1: Growth and Value Series: Annual Returns (%), 1993 through 2018

	#Years	Geometric Mean	Arithmetic Mean	Standard Deviation
FF Large Growth Stocks	26	2.4	11.6	49.7
FF Large Value Stocks	26	9.3	21.4	62.5
FF Small Growth Stocks	26	10.5	25.5	69.3
FF Small Value Stocks	26	14.8	27.7	65.6

Figure 5.1 gives a graphic presentation of the performance of the four value and growth return series. It plots the accumulated payoff of a hypothetical CNY 1.00 invested at the end of December 1992 in each value and growth portfolio. The payoff for the large value and large growth portfolio moves almost in tandem for most of the period between January 1993 and the end of 1995. The two series start to diverge from the beginning of 1996, as the payoff for the large value stocks climbs at a faster rate than that of the large growth stocks. After 1996, the figure shows that investing in the large value portfolio always gives a better return than the large growth portfolio. Similarly, the two small size portfolios have similar payoffs until the end of 1995, and the small value portfolio started to yield better payoff relative to the small growth portfolio after 1996.

### 5.3 Momentum

Lastly, we consider the returns of the popular momentum strategy (see, for example, Jagadeesh and Titman (1993)). We construct six monthly portfolios as the intersections of two portfolios formed on size and three portfolios formed on the prior return. The two size portfolios, small and large, are formed from all A share stocks on the Shanghai and Shenzhen exchanges, based on the median of floating A share market capitalization of stocks listed on the main boards of the two exchanges at the end of month  $t - 1$ . The three prior return portfolios, down, medium, and up, are formed based on the breakpoints of the 30th and the 70th percentiles of

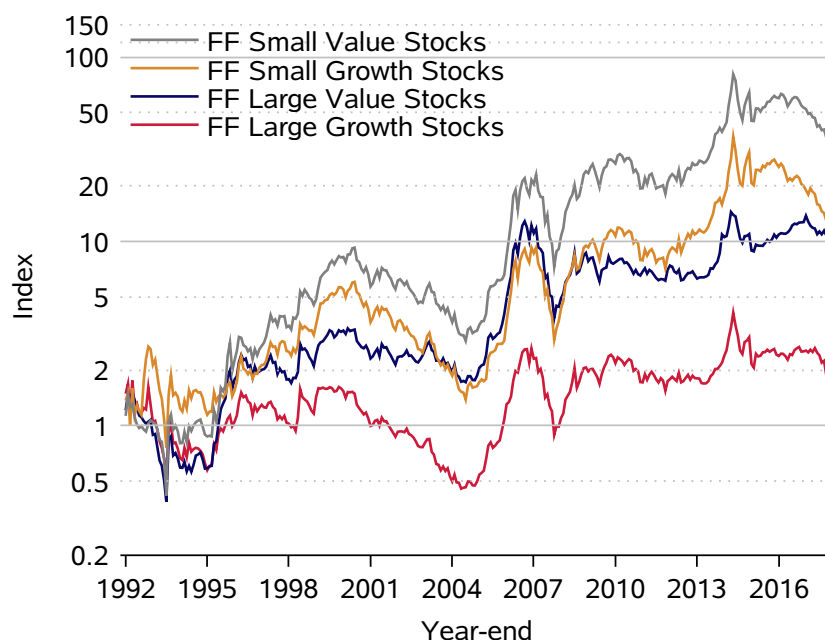


Figure 5.1: Small Value, Small Growth, Large Value, and Large Growth Stocks. Index (Year-End 1992 = CNY 1.00)

the returns from the beginning of month  $t - 12$  to the end of month  $t - 2$ . To be included in a portfolio for month  $t$ , which is formed at the end of month  $t - 1$ , a stock must have a valid floating A-share market capitalization at the end of month  $t - 1$ , a price for the end of month  $t - 13$  and a good return for  $t - 2$ . Annual portfolio returns are calculated by compounding the monthly portfolio returns over a 1-year horizon, from the beginning of January to the end of December. Similar as before, we consider only four portfolios in the low and high prior return subgroups, namely, large down, large up, small down and small up. By double-sorting stocks by their market capitalization and prior returns, we can ensure that the size effect on returns is properly controlled and results are purely driven by their prior returns. In the discussion below, we will focus on comparing the returns of large down stocks against large up stocks, and the returns of small down stocks against small up stocks.

Table 5.2 summarizes the annual returns of the four momentum series. The pattern of the geometric mean and arithmetic mean suggest that there is no significant difference in the returns of portfolios with low prior returns and those with high prior returns. Among the large stocks, the geometric mean of the annual returns of the large down stocks is 1.42%,

Table 5.2: Momentum Series: Annual Returns (%), 1993 through 2018

	#Years	Geometric Mean	Arithmetic Mean	Standard Deviation
FF Large Down Stocks	26	1.42	13.97	61.62
FF Large Up Stocks	26	7.07	16.24	50.60
FF Small Down Stocks	26	13.29	26.54	67.76
FF Small Up Stocks	26	11.92	23.62	58.81
FF Large Up - Large Down Stocks	26	2.53	4.94	23.89
FF Small Up - Small Down Stocks	26	-4.14	-2.69	16.67

lower than the geometric mean of 7.07% for the annual returns of the large up stocks; the arithmetic mean of the annual returns of the large down stocks is 13.97%, slightly lower than the arithmetic mean of 16.24% for the annual returns of the large up stocks. By comparison, the geometric mean of the small down stocks annual returns is 13.29%, slightly higher than the geometric mean of 11.92% for the small up stocks; the arithmetic mean of the annual returns on the small down stocks is 26.54%, also slightly higher the arithmetic mean of 23.62% for the small up stocks. Considering the large standard deviations of these four portfolios' annual returns, in the range from 50.60% to 67.76%, the portfolios with low and high prior returns do not exhibit significantly different returns. Apparently, the momentum phenomenon often observed in other markets is not evident in China's stock market.

## 6 Comparison with the U.S. market

In this section, we compare the return and risk characteristics of major asset classes in the Chinese capital market with those in the U.S. market. To put them on an equal footing, we use the official exchange rates of the Chinese currency (RMB) to convert local currency returns on major Chinese asset classes into U.S. dollar returns. Due to China's tight capital control policies, these returns only represent theoretical returns for U.S. investors and not easily achievable in practice. Nevertheless, the comparison can offer some useful insights on the uniqueness of the Chinese capital market which is still largely isolated from the rest of the world. We conclude this section by discussing several unique institutional features in the Chinese capital market.

## 6.1 Exchange Rates

Unlike most mature markets, China does not have floating exchange rates determined by market forces. Chinese government uses strict controls to manage trading activities and exchange rates on its currency (RMB). During the era of planned economy, China pegged the exchange rate at a highly overvalued level. Since China opened its economy in 1978, the Chinese government has taken steps to gradually allow more flexibility in its exchange rate. The Bank of China official midpoint reference rates for the Chinese RMB against the U.S. dollars are plotted at Figure 6.1, which reflects this evolution.

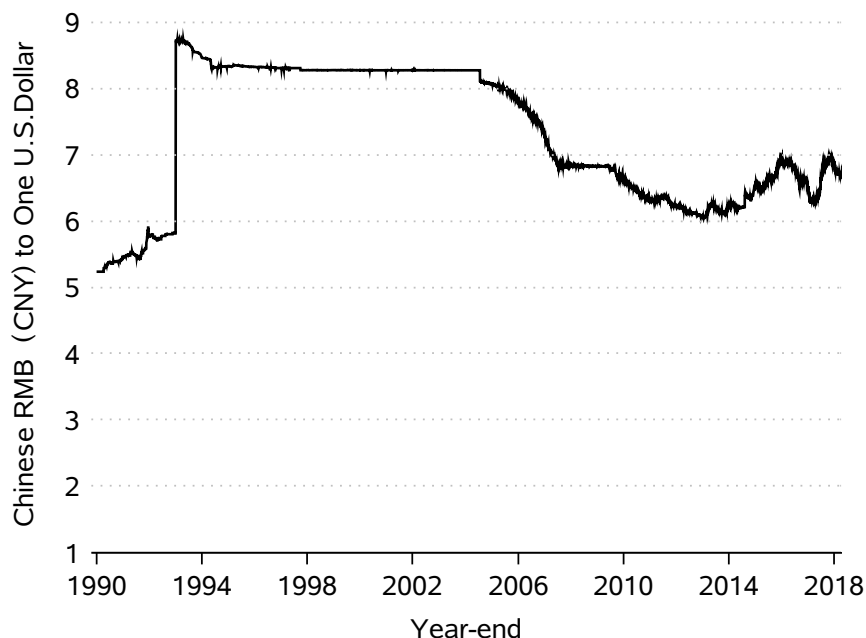


Figure 6.1: China / U.S. Foreign Exchange Rates

From the early 1980s to the end of 1993, Chinese government slowly depreciated its currency from 1.53 CNY per dollar to 5.81 CNY per dollar. On January 1, 1994, the government moved then official rate to 8.72 CNY per dollar overnight, resulting the largest one-day depreciation of 33.3% on its currency. From January 1994 to October 1997, the government revalued the currency to 8.28 CNY per dollar. After that, the exchange rate of the currency fluctuated in a very narrow range around 8.28 CNY per dollar until 2005.

On July 21, 2005, China announced a major reform on its exchange rate policy, from a fixed exchange rate regime with respect to the U.S. dollar to a more flexible exchange rate

regime based on a basket of currencies. The RMB exchange rate against the U.S. dollar was allowed to move in a daily band of  $\pm 30$  basis points around previous day's close, and the RMB exchange rate against other foreign currencies was allowed to move in a daily band of  $\pm 150$  basis points. The government also appreciated its currency to 8.11 CNY per dollar at the July 2005 reform. In the next several years, the government further widened the trading band to allow more flexibility on its currency. Since the July 2005 reform, the exchange rate has gradually appreciated against the U.S. dollar and reached the peak of 6.04 CNY per dollar at January 2014. After that, the exchange rate reversed its decade long trend of appreciation and started to fluctuate within the range between 6 to 7 CNY per dollar. At the end of 2018, the exchange rate is 6.88 CNY per dollar.

## 6.2 Comparison of Returns and Volatilities

We compare the statistical properties of returns on the seven asset classes in the Chinese and the U.S. capital market: large company stocks, small company stocks, long-term Treasury bonds, medium-term Treasury bonds, short-term Treasury bonds, long-term enterprise bonds and a hypothetical asset returning the inflation rate. The construction of the basic return series for the Chinese market are discussed in details at Section 2. We use the official exchange rates to convert the local currency returns on the Chinese assets to the theoretical returns in US dollars. We also match the sample periods of each U.S. return series with the corresponding China series.

For the U.S. market, we choose the value-weighted returns on the decile 1 (largest decile) of the Fama-French size-sorted portfolios as the returns on large company stocks; the value-weighted returns on the decile 10 (smallest decile) of the Fama-French size-sorted portfolios as the returns on small company stocks; the total returns on the Bloomberg Barclays U.S. investment grade corporate index as the returns on long-term corporate bonds. We use the CRSP Fixed-Term Indices at the 1-, 5-, and 10-year maturities to represent the returns on the short-term, medium-term, and long-term Treasury bonds. We use the U.S. Consumer Price Index for all urban consumers to construct the hypothetical series that yield returns equal to the inflation rates in the United States. The data series for the Chinese and the U.S. markets are listed at Table 6.1.

Table 6.1: Data Series for the China and the U.S. Markets

Series	Sample	China	U.S.
Large Company Stocks	1993-2018	A-share size sorted portfolios, decile 1	Fama-French size sorted portfolios, decile 1
Small Company Stocks	1993-2018	A-share size sorted portfolios, decile 10	Fama-French size sorted portfolios, decile 10
Long-Term Corporate Bonds	2000-2018	Long-term enterprise bond portfolios	Bloomberg Barclays US corporate investment grade
Long-Term Treasury Bonds	1997-2018	One-bond portfolio with maturity near 10 year	CRSP Fixed-Term Indices at 10 year maturity
Medium-Term Treasury Bonds	1997-2018	One-bond portfolio with maturity near 5 year	CRSP Fixed-Term Indices at 5 year maturity
Short-Term Treasury Bonds	1997-2018	One-bond portfolio with maturity near 1 year	CRSP Fixed-Term Indices at 1 year maturity
Inflation	1993-2018	CPI for all urban consumers	CPI for all urban consumers

Table 6.2 reports the geometric mean, arithmetic mean, and standard deviations of the annual returns on the seven major asset classes in the Chinese and the U.S. capital market. The return volatilities in the Chinese capital market are substantially higher than their counterparts in the U.S. market. The standard deviation of the annual returns on large company stocks is 60.27% in China, more than three times higher than that of 18.42% in the U.S. market. Similarly, the annual return volatility of Chinese small company stocks is 69.15%, substantially higher than the 27.10% volatility of the U.S. small company stocks. For long-term corporate bonds, long-term Treasury bonds, medium-term Treasury bonds, short-term Treasury bonds, and inflation, the annual return volatilities are 9.74%, 10.36%, 7.04%, 3.96%, and 7.03%, respectively, in China. All numbers are higher than their counterparts in the U.S. market, which are 6.47%, 7.45%, 4.93%, 2.57%, and 0.93%, respectively.<sup>10</sup>

In contrast to their significantly higher volatilities, assets in China do not always offer higher returns than their U.S. counterparts. For example, the geometric mean of the annual returns on large company stocks is 4.85% in China, lower than the geometric mean of 8.86%

<sup>10</sup>Since we convert the local currency return in China to the U.S. dollar returns, part of the return volatilities comes from the fluctuations in the exchange rates. However, as the exchange rates in China are highly controlled by the government, there is only limited variations in the exchange rates during our sample period. In fact, for all of the seven asset classes, the volatilities based on returns in local currency (RMB) are still significantly higher their counterparties in the U.S. market.



in the U.S. market. The geometric mean of the annual returns on long-term corporate bonds is 5.90% in China, very close to the mean of 5.93% in the U.S. market. On the other hand, for small company stocks, long-term Treasury bonds, medium-term Treasury bonds, short-term Treasury bonds, and inflation in the Chinese market, the geometric means are 16.10%, 6.75%, 6.36%, 4.25%, and 3.24%, respectively, higher than their counterparts in the U.S. market.

Table 6.2: Summary Statistics of Yearly Returns (% return in U.S. dollars)

	China			US		
	Geometric Mean	Arithmetic Mean	Standard Deviation	Geometric Mean	Arithmetic Mean	Standard Deviation
Large Company Stocks	4.85	17.33	60.27	8.86	10.49	18.42
Small Company Stocks	16.10	30.29	69.15	10.27	13.37	27.10
Long-Term Corporate Bonds	5.90	6.30	9.74	5.93	6.11	6.47
Long-Term Treasury Bonds	6.75	7.21	10.36	5.11	5.36	7.45
Medium-Term Treasury Bonds	6.36	6.58	7.04	4.61	4.72	4.93
Short-Term Treasury Bonds	4.25	4.33	3.96	2.67	2.70	2.57
Inflation	3.24	3.47	7.03	2.22	2.23	0.93

Table 6.3 reports the cross correlation between the annual returns on the seven major assets in China and those in the United States. Large company stocks in China are positively correlated with large company stocks (0.31), negatively correlated with long-term corporate bonds (-0.45), and positively correlated with the inflation (0.45) in the U.S. market. Compared with large company stocks in China, small company stocks in China are less correlated with assets in the U.S. market. The returns on long-term enterprise bonds are negatively correlated with the returns on the large (-0.40) and small (-0.41) company stocks in the U.S., are positively correlated with the returns on long-term corporate bonds (0.22) and long-term Treasury bonds (0.34) in the U.S. The returns on long-, medium-, and short-term Treasury bonds in China are positively correlated with the returns on Treasury bonds in the U.S., with correlations in the range between 0.41 and 0.51. Inflation in China is positively correlated

with the long-term corporate bond returns (0.28), the long-term Treasury bond returns (0.39), and the medium-term Treasury bond returns (0.33) in the U.S. market.

Table 6.3: Correlation Between Yearly Returns in China and the U.S. (1993-2018)

China Series	US Series						
	Large Stocks	Small Stocks	LT Corp Bonds	LT Tres Bonds	MT Tres Bonds	ST Tres Bonds	Inflation
Large Co Stocks	0.31	0.13	-0.45	-0.12	-0.10	0.15	0.45
Small Co Stocks	0.24	0.02	-0.36	-0.14	-0.04	0.18	0.32
LT Ente Bonds	-0.40	-0.41	0.22	0.34	0.21	0.05	-0.32
LT Tres Bonds	-0.10	-0.43	0.14	0.48	0.41	0.45	-0.30
MT Tres Bonds	-0.08	-0.39	0.23	0.51	0.44	0.46	-0.21
ST Tres Bonds	-0.08	-0.30	0.07	0.47	0.47	0.44	0.07
Inflation	0.12	0.02	0.28	0.39	0.33	0.06	0.13

We compare the average market capitalization of stocks in China and those in the U.S. in Table 6.4. During the early period, Chinese company stocks are substantially smaller than their counterparts in the United States. The average market capitalization of the largest decile stocks in China is 246 million at 1998, accounting for a mere 0.6% of their counterparts' capitalization in the U.S. However, large stocks in China have gone through rapid growth over the last two decades. Although still smaller than their counterparts in the U.S., the gap between the two countries has narrowed substantially. The average market capitalization of the largest decile stocks in China is 13,101 million at 2018, 11.8% of the average market capitalization of the largest decile stocks in the U.S.

The size of small stocks in China are more comparable to their counterparts in the U.S. The average market capitalization of the smallest decile stocks in China is 23 million at 1998, 44 million at 2008, and 123 million at 2018. By comparison, the average market capitalization of the smallest decile stocks in the U.S. is 40 million at 1998, 57 million at 2008, and 122 million at 2018. As a result, the range of the market capitalization between the largest and the smallest stocks in China is substantially smaller than those in the U.S.

### 6.3 Institutional Features

Despite its large size, China's capital market is still very young and in development. In this section, we discuss several unique institutional features of the Chinese capital market.

Table 6.4: Average Market Capitalization of China and U.S. Size-Decile Portfolios (US\$ million)

Decile	China			US		
	2018	2008	1998	2018	2008	1998
1-Largest	13,101	2,832	246	110,782	41,685	38,573
2	2,244	588	124	19,810	7,564	6,512
3	1,272	356	94	10,686	3,664	2,971
4	848	253	77	5,817	2,204	1,694
5	620	192	66	3,832	1,680	1,024
6	477	151	56	2,498	1,000	694
7	368	119	49	1,739	725	471
8	284	93	41	1,059	425	294
9	211	69	33	539	253	159
10-Smallest	123	44	23	122	57	40
Large-Cap 1-3	5,054	1,252	155	46,742	17,165	15,070
Mid-Cap 4-7	563	177	62	3,305	1,292	892
Small-Cap 8-10	200	66	32	371	141	92

## Exchange Listings

- Initial Public Offerings (IPOs)** China uses an administrative based process to approve initial public offerings in China. Different from the registration-based IPO process used by most developed countries, the IPO process in China relies more on the regulatory agencies to determine and endorse the quality of the issuing firm, a task usually left to the market elsewhere. China's IPO policy has gone through different phases. From 1990 to 2001, IPOs were regulated by an administrative review and approval system where State Planning Commission and CSRC determine the total stock issuance quota. Issuer firms need to first apply for the issuance quota from the local governments or central departments, and then submit the application to the CSRC for review and approval. In March 2001, China switched to an approval system which gradually lifted the issuance quota and local government approval requirements. Under the approval system, CSRC is the only approval authority and a sponsor security firm is responsible for the underwriting process. CSRC relies on a series of accounting and financial metrics to determine the quality of the issuing firm and has restrictive requirements on the issuance size, IPO price, and usage of proceeds raised from the issuance. In March

2019, CSRC announced that it will initiate a pilot program, the Science and Technology Innovation Board, at the Shanghai Stock Exchange. Under the pilot program, CSRC will use a registration-based IPO process for firms in several technology industries which usually do not meet the high earnings and cash flows standards required for listing on the main boards in China.

- **The Delisting Process** Firms can be delisted from exchanges either voluntarily or involuntarily. Voluntary delisting are usually due to privatization or merges and acquisitions. Involuntary delistings are triggered when firms no longer satisfy the rules set by the exchanges and regulators. In China, firms that experience losses for three consecutive years would receive warnings for delisting, and would be delisted if the loss continues in the subsequent six months. Despite these rules, delistings are very rare in China due to the huge demand for reverse mergers, whereas a private firm could go public by merging with a listed firm, bypassing the lengthy approval process required by IPOs. It is estimated that less than 1% of firms are delisted in China every year, substantially lower than those in other countries.
- **Cross-Listing at Hong Kong and Overseas Markets** Many Chinese companies choose to list in Hong Kong and other overseas markets to raise funding globally. As of April 2020, there are 282 H shares (companies incorporated in mainland China and listed in Hong Kong), 177 red chip stocks (SOEs incorporated outside mainland China and listed in Hong Kong), and 799 mainland private enterprises listed at Hong Kong, accounting for 75.8% of the total market capitalization of the Hong Kong Stock Exchange.<sup>11</sup> Many Chinese companies also choose to list in the U.S. stock exchanges such as NASDAQ, New York Stock Exchange, and NYSE American. As of February 2019, there are 156 Chinese companies listed in these U.S. exchanges with a total market capitalization of 1.2 trillion U.S. dollars, 11 of which are state owned enterprises.<sup>12</sup>

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<sup>11</sup>The numbers are obtained from the monthly statistics provided by the Hong Kong stock exchange.

<sup>12</sup>The numbers are obtained from the U.S.- China Economic and security review commission report.

## Investors Compositions

China's A share market is dominated by retail investors. Retail investors account for over 80% of the total trading volume in China, significantly higher than most developed countries. Although retail investors account for majority of the trading volume, their holdings of China A shares have been decreasing over the years as institutional investors increase their presence in the market. As of March 2019, retail investors hold approximately 31.7% of the total floating market capitalization in China, which is comparable to the U.S. market. However, majority of the institutional investors in China are legal person entities rather than professional institutional investors such as insurance companies, mutual funds and pension funds. As of March 2019, Legal person entities hold 53.2% of the total floating market capitalization, substantially higher than professional institutional investors who hold only 11.5%.

Foreign investment only accounts for a tiny fraction of the A share market in China due to tight capital controls. As of March 2019, foreign investors hold only 3.6% of the total floating market capitalization of China A shares. In recent years, Chinese government has implemented several programs to gradually loosen regulations on cross-border investments.

- **QFII and RQFII** China established the Qualified Foreign Institutional Investor (QFII) program in 2002 and the Renminbi Qualified Foreign Institutional Investor (RQFII) program in 2011 to allow global institutional investors to invest directly in its domestic capital market. Under the two programs, investors are subject to approval and need to apply for investment quotas. The QFII scheme started with an initial quota of US\$ 20 billion and the RQFII scheme started with an initial quota of CNY 20 billion. Over time, China has gradually relaxed the eligibility requirements and the investment quotas for both programs. On September 2019, China announced that it would remove the investment quota limit for both QFII and RQFII.
- **Stock Connect Programs** China has launched several cross-boundary stock connect programs to allow investors to directly trade stocks listed on the other market. The Shanghai-Hong Kong stock connect program was first launched on November 17, 2014 and mainly covers large-cap index component stocks listed on the Shanghai Stock Exchange and Hong Kong Stock Exchange. The Shenzhen-Hong Kong stock connect pro-

gram was launched two years later on December 5, 2016. The eligible stocks include large-cap index component stocks as well as small- and middle-cap stocks. The Shanghai-London stock connect program was launched on June 17, 2019 and allows investors to participate in both the primary market and secondary market. The Shanghai-London connect program is still at early stage. As of May 2020, only one Shanghai listed firm, Huatai Securities, has been approved to raise 1.54 billion US dollars through global depository receipts.

- **Bond Connect Program** The bond connect program, launched on July 3, 2017, is a mutual market access scheme which allows investors from Mainland China and overseas to trade in each others' bond markets. As of May 2020, only Northbound trading (overseas investors trade bonds in Mainland China) has been implemented. The bond connect program offers a convenient channel for overseas investors to directly invest in China's interbank bond market with no quota limit. The program has been received warmly by market participants since its inception. According to the statistics provided by the China Foreign Exchange Trade System (CFETS), 1,883 institutional investors have registered under the program, and the monthly bond connect trading volume reaches CNY 319.4 billion at April 2020. Majority of the bond transactions are of Chinese Treasury bonds and policy bank bonds. With the help of the bond connect program, the total foreign holdings of Chinese bonds reaches CNY 2.31 trillion by the end of April 2020.

## Trading Rules

China applies a set of trading rules aiming to reduce speculative trading and stabilize the market. Stock trading in China are settled under the "T+1" rule, investors can only sell the stocks they purchase on day T from day T+1 and onwards. Both stock exchanges apply the 10% price limit rule which sets the maximum price change within one trading day, with only a few exceptions, to  $[-10\%, +10\%]$  relative to the previous close price. Short-selling and leverage trades are introduced only recently in March 2010 and are limited to a selective group of stocks.

## 7 Concluding Remarks

In this paper, we provide an empirical overview on the development and the main empirical characteristics of the Chinese capital market. As mentioned earlier, more details of the results presented here can be found in the 2017 Chinese Capital Market Yearbook (Wang, Hu, and Pan (2017)). Other review papers focusing on different parts of the Chinese capital market include Carpenter and Whitelaw (2017) on the Chinese stock market, Amstad and He (2019) on the Chinese bond market, and Allen, Qian, and Gu (2017) on the broad financial system in China.

Given the size of the Chinese capital market and its continuing growth, its experience and behavior raise many interesting and important questions. For example, at the market level, what are the driving factors behind the risk and returns of broad asset classes? How to reconcile the gap between China's tremendous economic growth over the period we examined and the unimpressive return from its capital market? How about the gap between the stock market's large size and its high levels of risk? At a more micro level, many unique features of the Chinese capital market and their time variation, as described in the paper, ranging from market structure and organization, market segmentation and restrictions, to different forms of transactions costs and constraints, provide interesting settings to examine how different forms of market imperfection impact the market's functioning? At a more macro level, what role did the capital market play in supporting China's economic growth, in its size, efficiency and welfare implications? Are there lessons we can learn from the Chinese capital market that are useful for the future development of itself and other emerging markets?

A growing literature has been devoted to studying the performance and behavior of Chinese stock market. Allen, Qian, Shan, and Zhu (2020) show that domestically listed Chinese firms have performed rather poorly relative to China's overall economic growth and other large developed and emerging countries. Carpenter, Lu, and Whitelaw (2020) find that stock prices, although uninformative in the early years, have become as informative about future profits in China as they are in the U.S. since 2004. In the cross-section, Hu, Chen, Shao, and Wang (2019) and Liu, Stambaugh, and Yuan (2019) study the size and value effects in the Chinese stock market.

Many researchers have explored the unique institutional features and their time variation

of the Chinese capital market to investigate theoretic and empirical implications of policies that are different from more mature markets. For example, privatization of China's SOEs, for example, is a major goal of the initial establishment of the Chinese stock market and continues to play an important role in its ongoing development. The impact of the privatization of SOEs have been studied in Lin, Cai, and Li (1998), Sun and Tong (2003), Calomiris, Fisman, and Wang (2010), Li, Wang, Cheung, and Jiang (2011), and Liao, Liu, and Wang (2014), among others.

The Chinese stock market is also featured by overwhelming retail investors, limited institutional participation, segmented dual-class shares, frequent government interventions, stringent IPOs and delisting process, and special trading rules such as the "T+1" settlement, daily trading limits, short-sale constrains and trading halts. Many work has been done to address the asset pricing implications of these unique market features, for example, on bubbles, crashes, and the A-H/A-B share premia. A partial list of studies in this direction include Chan, Menkveld, and Yang (2008), Mei, Scheinkman, and Xiong (2009), Xiong and Yu (2011), Andrade, Bian, and Burch (2013), Hong, Jiang, Wang, and Zhao (2014), and Chen, Gao, He, Zhang, and Xiong (2019).

China's fast growing bond market has also attracted interest from many researchers. Some of the recent empirical work include Wang, Wei, and Zhong (2019) on the demand effect from yield-chasing retail investors, Jin, Wang, and Zhang (2018) on the implicit government guarantee embedded in bonds issued by SOEs, Geng and Pan (2019) on the information content of credit spreads, Mo and Subrahmanyam (2019) on the Chinese corporate credit bonds liquidity, and Chen, Chen, He, Liu, and Xie (2019) on the value of pledgeability in Chinese corporate bonds. Other papers, such as Liu, Lyu, and Yu (2017), Ang, Bai, and Zhou (2019), and Chen, He, and Liu (2020), have been focusing on chengtou bonds, which are technically enterprise bonds but issued by local government financing vehicles (LGFV) to finance urban construction and investments.

Lastly, as China becomes more integrated into the global financial system, its growing impact on the global market opens many fundamental questions. From the angle of global investors, the access to the Chinese capital market could potentially help to improve global diversification and support broader financial stability. On the other hand, the increasing



presence of foreign investors may have large impact on the capital allocation efficiency, information disclosure practices, asset price informativeness, and corporate governance standards in China.

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