A Review of China's Financial Markets

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Abstract

The fast growth of China's economy has brought it not only to the center of the world's economic system but also to a new transition point in its growth model, a transition from scale to efficiency, speed to sustainability, input driven to innovation led. How the financial markets can support and drive this new growth model and facilitate the transition to it are pressing challenges, not just for China but also for the world. We provide a comprehensive review of China's financial markets, including government bonds, corporate/credit bonds, stocks, asset-backed securities, financial derivatives, investment management, and currency, focusing on their development, distinct characteristics and unique opportunities. While China's financial markets have experienced tremendous growth over the same period, especially recently, their development often lags the pace of the economy, uneven over time and across different markets. While some markets, such as the stock market, have quickly gained global prominence, many other markets, such as the corporate bond, asset-backed securities and derivatives markets, are still at their early stage. Even for markets reaching great scale, such as government bond and stock markets, they still exhibit major limitations in serving their key functions such as liquidity provision, risk allocation and price discovery. These patterns arise because the development of China's financial markets are often driven more by the government's desire to support particular policy objectives at the time than the goal of having them best serve their basic market functions. China's financial markets not only provide an interesting cross-section in expanding our understanding of financial markets in general, but also raise important practical questions such as how to further develop them to better meet its developmental needs.

Keywords: China, government bonds, corporate bonds, stocks, asset-backed securities, derivatives, investment management, FX

JEL Classification: G12, G14

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1 Introduction

Accompanying China's phenomenal economic growth over the past four and half decades, its financial markets have also experienced a fast emergence, especially in recent years. The top three panels of Figure 1 plot the growth of China's domestic government bond, credit bond and stock markets over the past 20 years, measured by market size (blue bars) and the number of securities traded (orange lines).[1] For comparison, the GDP is also shown in each of the panels (light blue shade). While the overall size of China's economy as measured by GDP was growing at at fairly fast rate, the three major markets experienced different growth phases, relatively slow in the 2000s but speeding up in recent years.[2]

To better calibrate the growth of China's financial markets relative to its economic growth, Panel (d) of Figure 1 shows the time trend of the sizes of these markets normalized by GDP.[3] Instead of seeing a constant or a slightly upward trend, which would reflect a commensurate or slightly faster growth due to their early development stage, we actually see substantial fluctuations. For the government bond market (shown by orange bars), after a phase of steady growth in the early part of 2000s, it experienced a substantial decline, around the time of the global financial crisis, and reversed the trend in the later part of 2010s. The credit bond market (shown by gray bars) stayed at a very low level until 2005, then entered a faster growth phase, but slowed down after mid-2010s. The stock market, despite its early start in 1990, lost its relative size to GDP in the early half of 2000s. After its explosive increase in 2006-07 due to the split-share reform, it entered another phase of slow growth until recently.

Comparing with other major markets, China's financial markets have already reached their global status, at least by scale. Panel (e) of Figure 1 compares the size of China's stock, government bond and credit bond markets to those of U.S., Japan, Germany and UK, by market capitalization (for stocks) or amount outstanding (for bonds). For both the stock and corporate/credit bond market, China is only next to the U.S. For the government

[1]Except noted otherwise, the value in the paper is always denominated in Renminbi, denoted as RMB or equivalently Chinese Yuan, denoted as CNY, the Chinese currency, whose exchange rate with the US dollar is between 6 to 7 CNY/USD in recent years. Given that the CNY exchange rates with other currencies are heavily managed by Chinese government (see discussions in Section 8), one needs to be cautious in interpreting the values converted as these exchange rates.

[2]It is important to note that in this article, China's financial markets only refer to its domestic or onshore markets, domiciled in mainland China. It does not include markets domiciled in Hong Kong and Macau.

[3]It is understood that market size is a stock measure while GDP is a flow measure. In the absence of a better measure for the size of an economy or its wealth, we use GDP as a proxy.

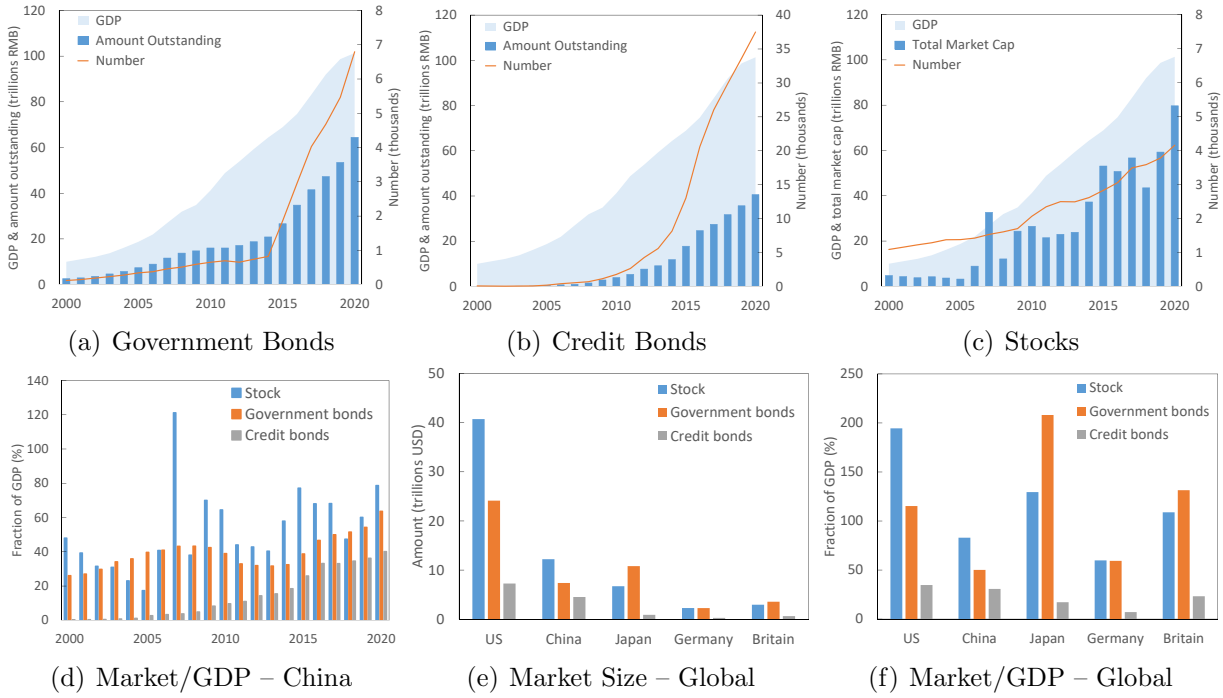


Figure 1: The growth of China's government bond, credit/corporate bond and stock markets and their comparison to other major markets (2000-2020). In Panel (a) - (c), the market size (blue bars, left axis), the number of securities (orange lines, right axis), and GDP (light blue shaded areas, left axis) are plotted. In Panel (d)-(f), the market size and market size to GDP ratios are shown for the stock (blue), government bonds (orange), and credit bonds (gray) markets. Source: Wind, World Bank, European Central Bank, and the Bank for International Settlements.

bond market, China ranks the third, next to U.S. and Japan. In gauging the level of market development, we also normalize its size by the size of its economy, as measured by GDP. By this measure, the ratio of market size to GDP, for the corporate/credit bond market, China is already comparable to the U.S., exceeding the other major markets. But for the stock market, China is still substantially behind the U.S. This also reflects the growth opportunity of the Chinese stock market.[4]

China's financial markets have mostly played a secondary role in facilitating resource allocation, driving growth and improving welfare. In fact, for the Chinese economy, out of the three major markets, the labor market, the goods and services market and the financial market, it is the financial market that has been behind in relying on market mechanisms to serve its basic economic functions and being integrated with the global market. As China

[4]As noted above, the size of China's stock market does not include shares listed offshore, including Hong Kong and the U.S. The inclusion of the offshore parts will substantially increase the overall size of Chinese stocks traded globally. Nonetheless, the fact that a non-trivial fraction of China's stock shares is listed abroad is a partial reflection of the current limitations of China's domestic market.

searches for a more efficient and sustainable growth model, more advanced financial markets ought to play a key role in improving resource allocation, raising productivity and driving innovation. This raises many challenging questions: What kind of financial market system should China have to support its developmental needs? What are the major limitations of the current system? How to improving it to reach its desirable state?

In this paper, we provide a comprehensive review of China's financial markets, including:

- Government bonds
- Credit/corporate bonds
- Stocks
- Asset-backed securities
- Derivatives
- Investment management
- Currency.

In particular, we focus on the development of these markets, their main distinctive characteristics, major issues associated with these characteristics, growing research on these issues, and remaining questions for further studies.

The growth of these markets exhibit several broad patterns. First, their growth often lags substantially behind the growth of the economy. As shown in Panel (d) of Figure 1, which plots the size of China's capital markets relative to its GDP, the growth of China's financial markets experienced different phases and sometimes substantial cycles, and did not always follow the trend of its economic growth. For example, the stock market shrank from 48.0 percent to 17.3 percent of GDP between 2000 and 2005, then peaked at 121 percent in 2007, and has since fluctuated between 38.0 percent and 78.7 percent. The government bond market developed quite slowly from 26.0 percent of GDP in 2000 to 38.7 percent in 2015, but it has grown rapidly in recent years, reaching 63.6 percent of GDP in 2020. The credit bond market is the last market to take off, staying below 10% of GDP until 2010 and rising to 37.2% of GDP in 2020. As shown in the paper, other markets exhibit similar patterns.

Next, the growth is uneven both over time and across different markets. While some markets, such as the stock and the government bond markets, started relatively early and have quickly reached global prominence, many other markets started quite late and remain at their early stages. For example, the market for asset-backed securities did not get really started until 2012, the market for financial futures started at 2010, and the market for financial options started only at 2015.

Moreover, even for markets reaching massive scale, such as the government bond and stock markets, they still face major limitations in serving their key functions such as liquidity provision, risk allocation and price discovery. Strong government interventions, which can vary significantly over time, substantially influence how markets perform these functions. Moreover, contrast to the markets for goods and services and even labor, the financial markets remain mostly separated from the rest of the world due to tight capital controls.

In understanding the growth and the current state of China's financial markets, it is important to bear in mind several major factors influencing its development.

First, the emergence of China's financial markets is part of the overall transformation of China's economy from a command economy to a more market-based economy. This transformation is mostly driven by the government rather than market forces. Thus, the introduction and promotion of various financial markets are often determined by the government's particular objectives, policies and constraints at the time. They are less propelled by endogenous market needs or the ultimate goal of having an efficient market in serving its key functions. For example, the opening of the stock market in 1990 was largely motivated by the desire to have an additional source of funding for SOEs. The fast growth of the government bond market since 2014 was mostly driven by the expansion of local government bonds, which were used as a new source of funding for local governments to promoting local growth. The fast opening up of asset-backed securities market in 2016 was in part to support public-private-partnerships (PPP) in infrastructure investments.

In addition, the competing objectives and their evolution over time often lead to policies and regulations that are more short-termed, compromising on the efficient functioning of the newly developed markets and their long-run growth. Prominent examples include the curbing of the stock market growth after its initial success in the 1990s (until 2005) and the controlling of local government bond growth due to the de-leverage policy in late 2010s.

Second, strong risk aversion of the government in this process leads to a very tight regulatory environment in general, which hinders active market accumulation and preparation for the development of a new market. Such a lack of market preparation, including strong and mature intermediaries, further adds to the uncertainty brought by the new markets. The government's strong risk aversion also leads to strong restrictions and regulations on the markets introduced. Many of these restrictions are aimed at protecting retail participants or containing risks, but they have also limited the roles played by institutional participants and the functions these markets can serve.

Third, the government's desire to develop a modern financial market system and its cautious approach give rise to the situation that financial liberalization often lags the underlying needs for various financial markets. Consequently, the introduction of a new market is usually followed by a very fast growth, which inevitably introduces unanticipated risks and challenges to an unseasoned system. They are then often met with tightening and curbing regulations and even direct interventions, especially when policy priorities shift.

One good example is the stock index futures market. It experienced an explosive growth after its long-waited opening in 2012, quickly becoming a global leader in trading volume, and then collapsed completely amid the market turmoil in the summer of 2015, when regulators imposed strict trading limits in response to concerns that speculative futures trading contributed to the extreme market swings. Additional examples include the rapid expansion and subsequent tightening of the local government bond market, the first issuance and subsequent suspension of mortgage-backed securities, among others.[5]

Fourth, given that China's capital market account remains largely closed, its financial markets are still mostly separated from the rest of the world. This leads to the segmentation of China's financial markets from the global financial system, in terms of rules, policies, practices, and participation. Such a segmentation further sustains many unique characteristics of these markets.

The importance of China's financial markets and many of their unique features have generated a growing interest in research, which we will highlight. Yet, given the relative short history of most of these markets and the limited amount of data available on them, the research coverage is still in its early stage and remains uneven. They also tend to be focused more on micro issues and framed by the existing literature, which is mostly based on mature markets. We hope that our introduction of these markets can provide a useful background for future research, especially factoring in their distinctive nature and the underlying drivers.

The rapid growth of China's financial system and its importance has generated increasing research interest. Several recent reviews have provided useful background, context and texture for understanding these developments. Allen, Qian, and Gu (2017) provide an in-

[5]Two recent theoretical papers have explored the impact of the Chinese government's interventions on its financial market. Brunnermeier, Sockin, and Xiong (2017) point out that the government's gradual approach, while successful in the past, may become ineffective as China's economy and financial system become more complicated. Brunnermeier, Sockin, and Xiong (2022) show that the frequent government intervention in financial markets could divert investor attention away from fundamentals and totally toward government interventions, resulting in a trade-off in which the government's goal of reducing asset price volatility may worsen, rather than improve, asset price information efficiency.

sightful overview of China's financial system. Carpenter and Whitelaw (2017) review the Chinese stock market, Hu, Pan, and Wang (2021) examine the empirical characteristics of major asset classes, focusing on government bonds, credit bonds and stocks. Allen, Qian, and Qian (2019) examine the developments in China's institutions and their roles in its economic advancement. A recently published handbook by Amstad, Sun, and Xiong (2020) contains a broad coverage of China's overall financial system.[6] Our paper aims to provide a comprehensive, detailed and up-to-date review of major markets such as government bonds, credit bonds, and stocks, as well as newly developed ones such as asset-backed securities, derivatives, and investment management, all of which have experienced significant growth and changes in recent years. In particular, we try to identify unique characteristics of these markets, they impact on market development and functioning, and the related issues they raise for future research.

In the following sections, we focus on each market separately. The final section contains concluding remarks.

2 Government Bonds

2.1 Development

The Chinese government resumed issuing government bonds in 1981, after a break for more than two decades, which marked the new era of Chinese government bond market.[7] Since then, it has gone through a period of fast growth, with significant improvements in market structure, trading mechanism, regulation, and supervision.

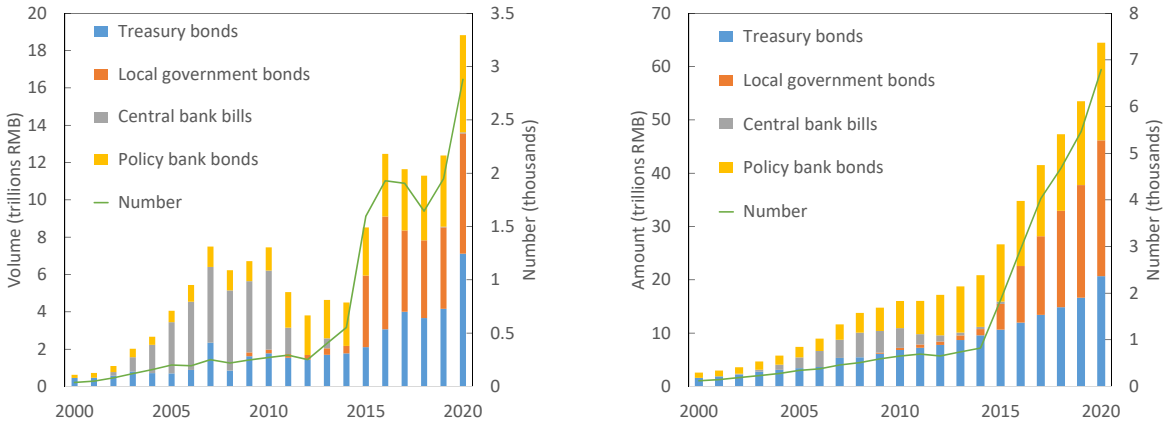
Depending on the issuing body, Chinese government bonds take three main forms: Treasury bonds issued by the Ministry of Finance of the central government, local government bonds issued by local governments, and policy bank bonds issued by the three policy banks, i.e., the China Development Bank, the Export-Import Bank of China, and the Agricultural Development Bank of China.[8] Although not directly issued by the central government, local government and policy bank bonds are generally considered as quasi-sovereign and have

[6]Other related reviews include Song and Xiong (2018) on the risks in China's financial system and Hachem (2018) on China's shadow banking sector.

[7]After the founding of People's Republic of China in 1949, only six government bonds were issued in the 1950s and none were issued from 1959 to 1980.

[8]Central bank bills, issued by the People's Bank of China and backed by the central government, are also considered as quasi-sovereign debt and have no default risk. Since 2014, the People's Bank of China has not issued any central bank bills. The total outstanding amount of central bank bills is also small compared to Treasury, local government bonds, and policy financial bonds.

little default risk. Figure 2 plots the growth of the government bond market in China. The three forms of government bonds have comparable market size, 20.2 trillion RMB for Treasury bonds, 25.4 trillion RMB for local government bonds, and 18.0 trillion RMB for policy bonds, by the end of 2020.



(a) Issuance Volume

(b) Outstanding Amount

Figure 2: Growth of the Chinese Government Bond Market (2000-2020). Source: Wind. The total issuance volume and the total year-end outstanding amount are shown in bars, the total number of securities issued and the total number of securities outstanding at year-end are shown in lines. Source: Wind.

Among the three, Treasury bonds have the longest history. The total issuance amount of Treasury bonds started from merely 5 billion RMB in 1981 to 1.4 trillion RMB in 2009, and 7.0 trillion RMB in 2020.[9] For local government bonds, the first issuance is in April 2009 by Xinjiang Uyghur Autonomous Region. Since then, the local government bond market has grown tremendously, with issuance size increasing from 200 billion RMB in 2009 to 6.4 trillion RMB in 2020. The policy banks began issuing policy bonds in 1997, with only one issuance of 144 billion RMB. As the policy banks grew in size over time, so did the policy bond market. The issuance size of policy financial bonds reached 4.9 trillion RMB in 2020, of which 2.3 trillion are issued by the China Development Bank.[10]

In the early years, the maturity of Treasury bonds was limited to 3 to 5 years. In more

[9]The Treasury bonds in China could 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. In 2020, 6.9 trillion RMB Treasury bonds are issued in book entry forms, while only 0.1 trillion RMB Treasury bonds are issued as electronic savings bonds.

[10]The issuance and amount outstanding numbers are obtained from the monthly reports of China Central Depository and Clearing Company.

recent years, the maturity expanded to 15, 20, 30 and even 50 years, as well as short term maturities below 1 year. The typical maturity of government bonds range from 0.25 to 50 years, with the 1 year, 3 years, 5 years, 7 years, and 10 years known as key term Treasury bonds. The issuance maturity are typically from 1 to 30 years for local government bonds, and 0.25 to 30 years for policy bank bonds. Since 2021, policy banks have been approved to issue perpetual bonds.

Primary Market

Similar to other developed markets, Chinese government bonds are issued through an auction process.[11] The participants are mainly large commercial banks and securities firms, selected every two to three years based on their past underwriting size, trading volume, government bond holdings, business conditions, and other performance measures. After the auction, the underwriters trade with other market participants to re-distribute the bonds.

Secondary Market

The secondary market for Chinese government bonds has three parts: the exchange market, the interbank market, and the commercial bank over-the-counter (OTC) market.

The secondary market for bond trading started in 1988, when investors were allowed to buy and sell Treasury bonds, mostly in the form of physical bonds, at commercial bank counters as well as regional trading centers. To address various shortcomings associated with trading physical bonds, the government switched to issue book-entry Treasury bonds. In early 1990s, the two stock exchanges, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) started to provide trading platforms as well as national-wide custody services. They quickly became a very active secondary market for Treasury bonds.

In 1997, the People's Bank of China (PBOC), China's central bank, banned all commercial banks from participating in spot and repo transactions of Treasury bonds on stock exchanges. Instead, they were permitted to use bonds deposited at the China Central Depository & Clearing Co. (CCDC), 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. Since then, majority of the bond trading volume has shifted from the exchange market to the interbank market. By the end of 2020, approximately 96% of the total outstanding Treasury bonds

[11] Barbosa, Silva, Yang, and Yoshimoto (2019) compare the uniform and discriminatory auction mechanisms conducted by the Chinese Development Bank and the Export-Import Bank. They find that both the uniform and discriminatory mechanism deliver similar auction bond yields and revenues.

are deposited at the interbank market, while only 4% deposited at the exchange market. The commercial bank OTC market began in 2002, when four state-owned commercial banks 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 exchange and interbank markets to individual investors and small and medium size institutional investors. The salient feature of this market is that participants are allowed to trade only with banks.

Among the three markets, the interbank bond market is the largest in size, the exchange market has been the most active in trading until recently, and the commercial bank OTC market is only supplementary. In January 2022, Chinese regulars announced that they are seeking to integrate the two long-separated interbank and exchange bond markets by permitting cross-market bond issuance and trading, although the specific procedure has not been revealed yet.

2.2 Important Characteristics

Despite its large size, the Chinese government bond market faces substantial challenges in aspects such as liquidity, price efficiency, investor participation, and globalization. Several recent paper, such as Huang and Zhu (2007), Amstad and He (2019), and Hu, Pan, and Wang (2021), have provided excellent overview of the Chinese government bond market. Our discussions next will focus on several key features of the market.

Market Segmentation

Chinese government bond market is highly segmented, with three trading venues with different depositories, regulatory agencies, trading mechanisms, and market participants.

Depository Structure CCDC is responsible for the overall bond depository of all bonds traded in the three markets. The interbank market also uses CCDC directly for its trading. For the exchange market and the bank OTC markets, however, CCDC only serves as the primary depository, the China Security Depository and Clearing Co. (CSDC) and commercial banks themselves are the secondary depository, respectively, to support the trading activities in these markets. Cross-market depository transfer is time-consuming and is restricted only to a given set of bonds.

Regulatory Agencies The regulatory framework in China consists of two parts: market regulation and institution supervision. The PBOC and the China Securities Regulatory Commission (CSRC) are responsible for market regulation, covering the interbank market and the exchange market, respectively. For institution supervision, until 2018, the China

Banking Regulatory Commission (CBRC) supervises commercial banks and credit cooperatives, the CSRC regulates security firms and investment funds, and the China Insurance Regulatory Commission (CIRC) oversees insurance companies. In 2018, the CBRC and the CIRC were merged into one agency, the China Banking and Insurance Regulatory Commission (CBIRC), with combined responsibilities.

Trading Mechanism The exchange market for Treasury bonds is a centralized order-book market, similar to stock trading, with the CSDC overseeing its bond registration, depository, and clearing. The interbank market is a wholesale, quote driven OTC market, with CCDC overseeing its registration, depository and clearing.

Market Participants The participants in the exchange market are mainly medium and small size investors, including individual investors, non-financial firms as well as security firms, investment funds and insurance companies. The participants in the interbank market are all large institutional investors, such as commercial banks, credit cooperatives, security firms, insurance companies and funds institutions.

Low Liquidity

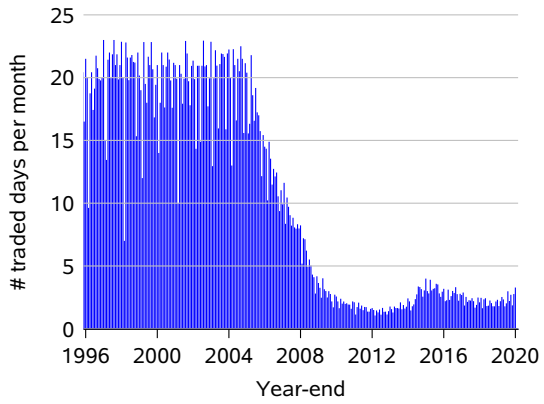
The trading of Chinese government bonds in the secondary market is much less active compared to other developed markets. Among the three types of government bonds, policy financial bonds enjoy relatively high liquidity. We find that in 2020, the turnover for policy bonds, Treasury bonds and local government bonds are respectively 5.21, 2.49, and 0.58, respectively. In comparison, the annual turnover for U.S. Treasury bonds is around 9 (see also Amstad and He (2019)).[12]

Across different segments of Chinese government bond market, there has also been significant shift in terms of trading and liquidity. As seen in Figure 3, Treasury bonds listed on the Shanghai Stock Exchange enjoy high levels of trading frequency and volume during the early period.[13] Since 2005, trading in the Treasury bond market has gradually shifted from the exchange market to the interbank market. The monthly turnover of Treasury bonds traded at the SSE is around 2% to 3% in 2020, approximately one tenth of the turnover at the interbank market. The two markets are more comparable in trading frequency, on average 7 days per month for the interbank market and 3 days per month for the SSE, both

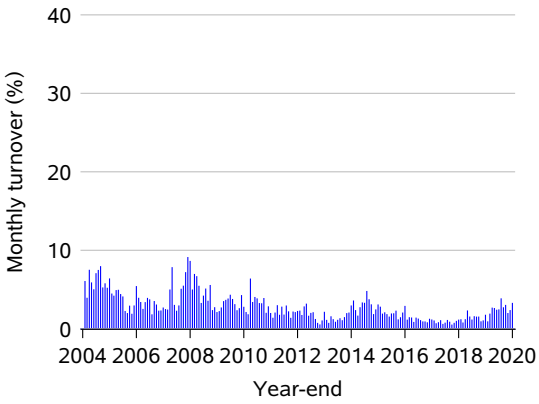
[12]The turnover for the U.S. market is calculated based on the annual average trading volume and the amount outstanding reported by SIFMA.

[13]The time series of turnover is plotted from the beginning of 2005. The reason is that the total amount of Treasuries deposited separately at the exchange and the interbank market are only available after 2005.

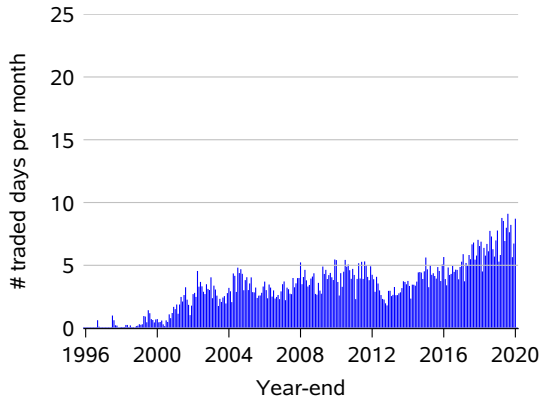
significantly lower than those in the U.S. Treasury market.



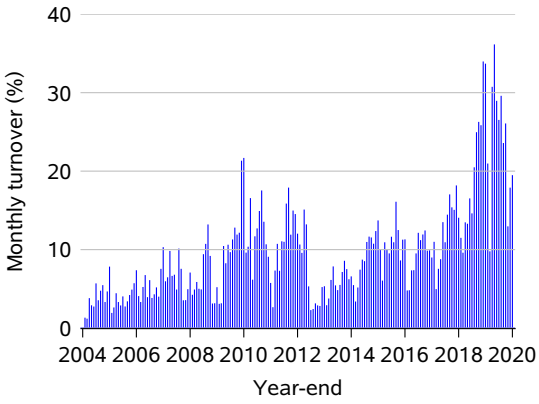
(a) Average Trading Frequency at Exchange



(b) Monthly Turnover at Exchange



(c) Average Trading Frequency at Interbank



(d) Monthly Turnover at Interbank

Figure 3: Liquidity of Treasury Bonds at the Shanghai Stock Exchange and the Interbank Market. Source: authors' own calculations.

Investor Composition and the Role of Banks

Majority of government bonds are held by commercial banks in China. This can be seen from Figure 4, which shows the breakdown of different classes of investors holding Treasury bonds, including Treasury bonds with all maturities, depositories and markets, from late 1997 to the end of 2016.[14] Commercial banks have a large share of Treasury bonds exceeding 60%, which peaked over 90% in 1999, then gradually dropped to a more steady level around 60% in 2004. At the same time, special settlement members took on more share, reaching nearly

[14]The data is obtained from the CCDC website, which is only available up to 2016. 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.

40% at the end of 2007 and then decreasing to slightly below 20%. Clearly, the commercial banks and the special settlement members dominate the Treasury bond market.

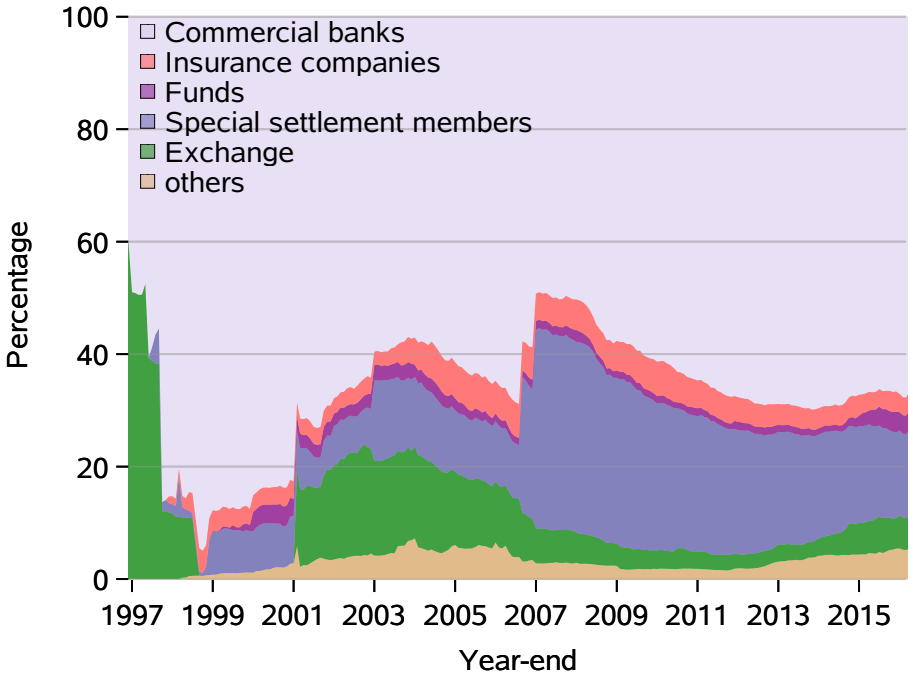


Figure 4: Treasury Bond Holdings. Source: CCDC monthly statistics.

2.3 Term Structure of Chinese Treasury Yield Curve

The term structure of Treasury yield curve serves as important benchmark for the capital market and the economy. It is therefore crucial to understand the dynamics of the yield curve and its determinants. In many developed markets such as the U.S., the monetary authority targets the short-term interest rate, leaving the medium- and long-term interest rates to the market. This is not the case in China. The interest rates (both lending and deposit rates) of all maturities are tightly controlled by the government.

The tight government control on interest rates have important implications for the term structure of Chinese Treasuries. Fan and Johansson (2010) show that the one-year deposit rate, which is the most important policy rates in China, and the spreads between the one-year deposit rate and the one-year market rate are important state variables determining the dynamics of Chinese Treasury yield curve. To incorporate the fact that Treasury bond investors have alternative investment in loans which follow an official term structure of lending rates set by the government, Fan, Li, and Zhou (2013) develop an affine preferred-habitat term structure model for the Chinese Treasury market. The strong government control on the Treasury market is also shown in Loechel, Packham, and Walisch (2016), who

find that macroeconomic variables, such as policy rate, consumer confidence, M2 money supply, CPI expectations, foreign exchange reserves, foreign exchange rate expectations, all have a higher impact on government bond yields in the offshore market than corresponding yields in onshore market. They find weak spillover effects from the onshore government bond yield curve to the offshore yield curve, but no effects the other way round.

A number of studies focus on term structure models that best capture the Chinese government bond market dynamics. Hong, Lin, and Wang (2010) test a variety of popular spot rate models, and find that GARCH, regime-switching and jump-diffusion models capture some important features of the dynamics of Chinese spot rates. They, however, perform the tests on the Chinese 7-day repo rates instead of short-term Treasury yields. Tong, He, and Sun (2018) develop an improved nonparametric Bayesian smoothing splines model to estimate the Chinese Treasury yield curves. Luo, Han, and Zhang (2012) and Umar, Yousaf, and Aharon (2021) find that the dynamic Nelson-Siegel model of Diebold and Li (2006) have good in-sample fit and out-of-sample forecast.

2.4 Bond Returns

Another stand of the literature investigates the return characteristics of the Chinese government bond market. Hu, Pan, and Wang (2021) construct short-, medium-, and long-term Treasury return indexes from bond prices, and give a review on the historical return and risk characteristics of these Treasury indexes in the past three decades. They find that Chinese Treasury bond indexes, across all maturities, have higher returns and volatilities than their U.S. counterparts. An earlier work by Wang, Yang, and Ye (2010) study Chinese Treasury bonds from 2003 to 2006, and find that their returns have three common factors, which are well captured by three indices composed of short-, medium-, and long-term bonds.

Several paper focus on bond return predictability in the Chinese Treasury market. Fan, Tian, and Zhang (2012) find that bond excess returns are far more predictable than those in developed markets, and attribute this to the inflexible short- and long-term official interest rates set by the PBOC. Li, Yang, Su, Qi, and An (2021) find that several macroeconomic variables and financial factors can predict future bond excess returns, above and beyond the information contained in the current yield curve.

2.5 Informational Efficiency

Despite its large size in terms of outstanding amount, the secondary market trading in the Chinese government bond market is highly segmented and far from active. The segmentation

and illiquidity in the Chinese government bond market, coupled with frequent government interventions, raise concerns on the informational efficiency of the market.

Many studies have rejected the hypothesis that the Chinese government bond market is informationally efficient. Wang, Yang, and Ye (2010) find that the common bond return risk factors exhibit strong momentum, indicating market inefficiencies at the Chinese bond market during the period from 2003 to 2006. Bai, Fleming, and Horan (2013) test the market efficiency using the standard Kendall Tau test and the variance ratio test, both rejecting the hypothesis that daily bond price follow a random walk during the period from 1999 to 2011.

Several papers examine how information of different macroeconomic announcements are transmitted in the government bond markets. Bai, Fleming, and Horan (2013) find that certain announcements of macroeconomic news, such as China's producer price index (PPI) and manufacturing purchasing managers' index (PMI), have significant effects on daily bond yields. Sun (2020) investigates the three announcements by the PBOC and find that daily government bond yields respond to the two quantitative announcements, changes in the regulated retail interest rates and the required reserve ratio, but not to the qualitative announcement of PBOC's quarterly monetary policy committee meeting.

Other papers examine the informational efficiency of the Chinese government bond market from the angle of cross-market price discovery. Girardin, Lunven, and Chen (2021) try to determine, between the Chinese Treasury and corporate bond markets, which market takes a leading role in the discovery of the level, slope, and curvature factor of the yield curve. They find that the corporate bond market is the source of price discovery for the level factor, and the government bond market is the source for the slope factor. Umar, Yousaf, and Aharon (2021) investigate the static and dynamic connectedness, in both returns and volatilities, between the government yield curve and the stock market indexes. They find a strong connection between the government bond and stock markets. In particular, they find that the level component of the government yield curve is a net transmitter of return spillovers, whereas the curvature component of the government yield curve is a net transmitter of volatility spillovers.

The special characteristics of China's government bond market raise many interesting questions. For example, what are the advantages and disadvantages of the two trading platforms, the interbank market and the exchange market? How would the better coordination and integration between them improve market efficiency in different dimensions, such as liquidity provision and price discovery? What are the driving factors behind the liquidity level

and liquidity risk in these markets? What impact do different types of major players in the market have on market behavior, especially commercial banks and special settlement members? What are the different roles for treasury bonds, policy bonds and local government bonds to play? What are their return and risk characteristics? At a more macro level, the fact that most of the government bonds are still held by banks, which are mainly owned by the government, raise additional questions. To what extant are the prices of these bonds true market prices? Can these prices being used as benchmark prices in asset pricing? To what extent do these bonds offer long-term investment opportunities for households and private institutions? How might the opening up of the market to global investors, which is discussed in Section 8, influence the functioning of this market?

3 Credit Bonds

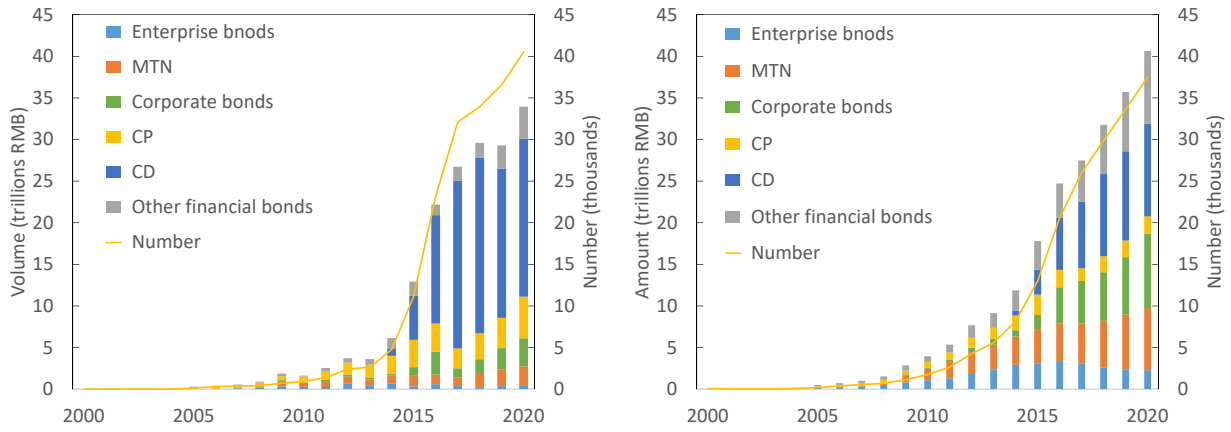
3.1 Development

China's credit bond sector has two major types of issuers: financial firms and non-financial firms. Financial firms consist of commercial banks, insurance companies, and securities firms. Since financial firms are often state-owned and carry implicit government grantees, their bonds, also called financial bonds, are considered to have relatively higher credit quality. By the end of 2020, there are in total 19.9 trillion RMB financial bonds outstanding. Among which, 11.1 trillion RMB are certificates of deposits (CDs) and 8.8 trillion RMB are senior and subordinate debt issued by commercial banks, insurance companies, securities firms and other financial institutions.

Bonds issued by non-financial firms take four major forms: enterprise bonds, (exchange-traded) corporate bonds, medium-term notes (MTNs), and commercial papers (CPs). Non-financial issuers in China are mainly SOEs, large private enterprises, and publicly listed companies. By the end of 2020, there are in total 20.8 trillion RMB non-financial bonds outstanding, comparable to the size of financial bonds. Among the outstanding non-financial bonds, there are 2.3 trillion RMB enterprise bonds, 8.9 trillion RMB corporate bonds, 7.5 trillion RMB medium-term notes, and 2.1 trillion RMB commercial papers.

Figure 5 plots the growth of the credit bond market in China. We discuss the development of each of the major credit bond instruments below.

Certificates of Deposit (CDs) Certificates of Deposits are short-term instruments issued by depository institutions in the interbank market. The typical issuers of CDs are state-owned commercial banks, join-stock commercial banks, urban and rural commercial



(a) Issuance Volume

(b) Outstanding Amount

Figure 5: Growth of the Chinese Credit Bond Market (2000-2020). The total issuance volume and the total year-end outstanding amount are shown in bars, the total number of securities issued and the total number of securities outstanding at year-end are shown in lines. Source: Wind.

banks, accounting for more than 99% of the issuance amount collectively. CDs are guaranteed by the issuing banks and have high credit quality. They enjoy relatively good liquidity in the secondary markets. The interest rates on CDs track closely with the Shanghai Interbank Offered Rate (SHIBOR), and offer higher premium than government bonds, making them popular money market instruments. Major investors of CDs are commercial banks and investment funds (such as bank wealth management products, securities investment funds, corporate annuities, social security funds, insurance products, trust products, pension funds, private equity funds, and etc). Of the total 11.1 trillion RMB deposited at Shanghai Clearing House (SHCH) at the end of 2020, commercial banks held 4.1 trillion RMB and investment funds held 5.5 trillion RMB.

Senior and Subordinated Financial Bonds Financial firms can also issue long-maturity senior and subordinated bonds. At the end of 2020, the total amount of financial bonds outstanding is 5.9 trillion RMB for commercial banks, 1.9 trillion RMB for securities firms, and 0.3 trillion RMB for insurance companies. These bonds can only be traded in the interbank market.

Enterprise Bonds Enterprise bonds are long-term debt issued by government agencies, enterprises under collective ownership, and state-owned enterprises. They are traded in both the interbank market and the exchange market, under the general depository of CCDC. The issuance of enterprise bonds are subject to the approval of the National Development and

Reform Commission (NDRC). 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 2020 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 levels. These bonds are often refereed as Chengtou bonds.

Corporate Bonds Corporate bonds are long-term bonds issued by listed and non-listed companies. The corporate bond market has expanded quickly, especially after 2015 when the CSRC adopted new regulations to expand the issuer list and placement methods. In 2020, 3,617 corporate bonds were issued with total size of 3.4 trillion RMB, of which 1,212 (1.5 trillion RMB) are general corporate bonds and 2,405 (1.8 trillion RMB) are private placement notes. Corporate bonds can only be traded in the exchange market and are under the depository of CSDC.

Commercial Papers CPs are issued by non-financial firms with typical maturities not exceeding one year. CPs first appeared in China in 1989. During the early years, the issuance of short-term CPs were tightly regulated by the PBOC, and were eventually halted in 1997 amid a number of scandals. The market reopened in 2005, when a new regulation policy allows the issuance process to switch from the old approval system to the new registration system, and has grown rapidly since. In 2020, there are 4,842 CPs issued with total size of 5.0 trillion RMB. CPs are issued and traded in the interbank market, and are under the depository of CCDC.

Medium-term Notes MTNs, with typical maturities ranging from 2 to 5 years, and up to 10 years occasionally, fill in the gap between short-term CPs and long-term enterprise and corporate bonds. The first issuance of MTNs occurred on April 2008, when the Ministry of Railways and other six companies issued 119 billion RMB of MTNs in total. MTNs were deposited at the CCDC before June 17, 2013. Afterwards, the newly issued MTNs are under the depository of Shanghai Clearing House (SHCH). In 2020, 2,120 medium-term notes were issued, with a total size of 2.3 trillion RMB. MTNs are traded in the interbank market.

3.2 Important Characteristics

The Chinese credit bond market shares some similar features of the government bond market, such as lack of liquidity and market segmentation. It also has its own unique features including issuance process, pricing, implicit government guarantee.

Market Segmentation

For historical reasons, the Chinese credit bonds market is highly segmented in terms of regulatory agencies, depository institutions, trading venues, and investor compositions. CDs, CPs, financial bonds, and MTNs can only be traded at the interbank market, corporate bonds can only be traded at the exchange market, and enterprise bonds are traded at both markets.

Institutional investors, mainly banks, participate in the interbank bond market, while retail investors and non-bank financial institutions participate in the exchange market. Although certain types of non-bank financial institutions, such as mutual funds, insurance companies, and securities firms, are active in both markets, strong restrictions on market access and trading frictions cause the two markets to be largely segmented.

Low Liquidity

The credit bond market exhibits substantial heterogeneity in liquidity. Short-term bonds such as CDs and CPs enjoy reasonable liquidity in the secondary market. As reported in Amstad and He (2019), in 2019, the annual turnover is 4.85 for CDs and 4.26 for CPs, comparable to the level in the U.S, which is around 5 for corporate bonds. The longer maturity securities, however, have significantly lower liquidity. The annual turnover in 2019 is 0.62 for financial bonds, 0.56 for enterprise bonds, 0.10 for exchange-traded corporate bonds, and 1.51 for MTNs.

Default and Implicit Government Guarantee

China first introduced the Enterprise Bankruptcy Law in 1986, which focused exclusively on how to address insolvency of state-owned enterprises (SOEs). In 2016, the National People's Congress approved a new bankruptcy law reform, aiming to provide a unified legal insolvency framework that are close to international practices. Despite the substantial changes in bankruptcy rules, the implementation of the bankruptcy proceedings has remained challenging due to court inefficiency, low creditor protection, and frequent local-government interventions.

Credit bond defaults are rare in China. The first case of a publicly issued bond default occurred in 2014, when Shanghai Chaori Solar, a privately held company, missed interest payments on its 1 billion RMB bond issued in the exchange market. The amount of default have increased in recent years, but only represents approximately 0.3% of the overall amount outstanding, much lower than many developed markets.

A significant portion of the issuers in the Chinese credit bond market are SOEs. Investors

have long held the view that the Chinese government would not let large SOEs default due to undesirable consequences. Indeed, majority of the credit bond default in China occur to non-SOE issuers. Only a handful of SOE issuers have defaulted so far, mostly in over-capacity industries. Financial bonds, Chengtou bonds, and bonds issued by large SOEs are still considered to have extremely low credit risk.

Bond Ratings and Rating Agencies

Similar to international standards, China adopts nine long-term credit ratings (AAA, AA, A, BBB, BB, B, CCC, CC, C) and six short-term ratings (A-1, A-2, A-3, B, C, and D) for domestic issuers. Despite this similarity, the distribution of ratings is largely skewed to the upside. Close to 97% of the Chinese credit bonds are rated no lower than AA, which is generally seen as the lowest investment-grade rating, versus BBB in international rating standards.

There are nine major rating agencies in China, with six (or four agencies by grouping subsidiaries) dominating the market, having approximately 80% of the market share. They are Chengxin (Chenxgin Securities Rating and Chengxin International Rating), Lianhe (Chin United Rating and China Lianhe Rating), Dagong Global Credit Rating, and Shanghai Brilliance Credit Rating. Chengxin International Rating, China Lianhe Rating, and Shanghai Brilliance Rating are joint-venture rating agencies, of which minority shares are owned by the three major international rating agencies, Moody's, S&P, and Fitch. The remaining three are relatively smaller rating agencies: Pengyuan Credit Rating, Golden Credit Rating, and China Bond Rating Corporation. Eight of the nine rating agencies adopt the international standard of issuer-pay model, while China Bond Rating Corporation is the only one that use the investor-pay model.

3.3 Role of Banks in Credit Bond Market

Banks, as the dominant player in China' financial system, play an important role in the development of the Chinese credit bond market. Banks participate in the credit bond market through two different channels: the direct on-balance-sheet channel and the indirect off-balance-sheet channel via wealth management products (WMPs). For the direct channel, Amstad and He (2019) estimate that commercial banks hold approximately 57% of the credit bonds of the interbank bond market. The second channel is more difficult to measure. Ehlers, Kong, and Zhu (2018) estimate that 30% to 40% of the net issuance of all credit bonds was funded via bank-issued WMPs in 2014-2016, and Amstad and He (2019) estimate

that approximately 42% to 44% of the WMPs are invested in the credit bond market in 2016-2017. In other words, a large portion of the credit bonds are held either directly or indirectly by banks.[15]

The important role of banks in the credit market is also shown in Chen, He, and Liu (2020), through an example of Chengtou bonds. They show that the growth of the Chengtou bond market is directly linked to the large amount of maturing bank loans borrowed by local governments as part of the 2009 stimulus plan during the global financial crisis. To refinance these bank loans, local government financing vehicles (LGFVs) were setup to issue Chengtou bonds in the interbank market, majority of which were bought and implicitly guaranteed by commercial banks through their WMPs.

3.4 Credit Risk Pricing and Government Guarantee

Several recent papers study the price informativeness in the Chinese credit bond market. Geng and Pan (2019) find that credit spreads in China becomes informative only after the first corporate default in 2014. Even though the occurrences of defaults do bring the credit market pricing in line with the underlying credit risk, the explanatory power of the default measures remain limited compared to other developed markets. They focus on medium- and long-term bonds issued by publicly listed companies and construct credit measures based on the Merton's model of default. Using a similar structural approach to credit risk modeling, Huang, Liu, and Shi (2020) find that illiquidity is much more important than default risk in explaining variations in the spreads of short-term commercial papers.

One unique feature of China's credit bond market is that many bonds may carry implicit government guarantees. Geng and Pan (2019) document a severe market segmentation structure of SOEs and non-SOEs. They finds that non-SOE issuers have suffered from explosive credit spreads, unprecedented defaults, and shrinking new issuance amid a waves of default events post 2018, while SOE issuers have remained largely intact. Jin, Wang, and Zhang (2018) study the first large SOE default in 2015, when Baoding Tianwei Group shocked the market by announcing that it would miss its interest payments on its onshore corporate bonds. They hypothesize that bond investors perceived the event as a reduction or even removal of implicit guarantees on SOEs, and find that implicit government guarantees account for 1.45%-1.77% of bond value. For Chengtou bonds issued by LGFVs, both Liu,

[15]Wang, Wang, Wang, and Zhou (2021) argue that the shadow banking system in China, consisting mainly of wealth management products, trust loans, and entrusted loans, serves as a dual-track reform mechanism to gradually liberalize the restrictive interest rate control policy, by channeling credit to underfunded private enterprises at market-determined interest rates.

Lyu, and Yu (2017) and Ang, Bai, and Zhou (2019) show that credit spreads depend not only on the financial conditions of the issuing LGFVs, but also on the the fiscal conditions and risk characteristics of the local governments that are closely connected to the LGFVs.

3.5 The Impact of Market Segmentation on Pricing and Liquidity

Due to severe market segmentation, dual-listed bonds could show different prices despite the same fundamentals. Liu, Wang, Wei, and Zhong (2019) find that enterprise bonds with higher demand from retail investors are traded at significantly higher prices in the exchange market than the same bonds traded by institutional investors in the interbank market. Mo and Subrahmanyam (2019) find similar patterns and also attribute the price differential to clientele differences across the two markets. Chen, Chen, He, Liu, and Xie (2019) use a policy shock in December 2014, which rendered a class of AA+ and AA enterprise bonds ineligible for repo at the exchange market, to study the value of pledgeability in bond pricing and estimate that an increase in the haircut from 0 to 100% would result in an increase in bond yield in the range of 40 to 83 bps.

Market segmentation also affects market liquidity. Mo and Subrahmanyam (2019) find that the levels of liquidity vary substantially across bond types and trading venues. They attribute these variations to cross-market and within-market clientele effects. They also find that government policies have a large impact on the credit bond market liquidity, and the presence of foreign investors improves liquidity in the interbank market.

3.6 Bond Issuance and Firm Behavior

With market-based mechanism of credit allocation and pricing, the bond market provides a new channel of debt financing, potentially cheaper and more efficient, for firms that don't have access to traditional bank credit. Several recent papers focus on credit bond issuance and its impact on the issuing firms. Ding, Xiong, and Zhang (2021) find that there is robust overpricing in the issuance of commercial papers and medium-term notes at the interbank market, in contrast to bond and equity issuance underpricing in western countries. They identify two channels that drive the overpricing: rebates and self-purchases by underwriters. Flannery, Hong, and Wang (2020) study the dollar-denominated Chinese corporate bond issuance in the oversea market. They find that the issuance of two U.S. dollar-denominated government bonds in 2017 helped to reduce yield spreads, bid-ask spreads, and volatility of offshore dollar-denominated Chinese corporate bonds. Huang, Panizza, and Portes (2021) find that the offshore dollar-denominated Chinese corporate bond issuance is related to

the domestic and foreign interest rate differences. Furthermore, they find that firms in risky sectors use the proceeds to do more inter-firm lending, compared to firms in less risky sectors.

3.7 Credit Ratings, Enhancements and Their Impact on Pricing

Even though the credit rating scales are in line with international standards, actual ratings seem highly inflated, as documented by Kennedy (2008), Poon and Chan (2008), Jiang and Packer (2019), and Gao, Huang, and Mo (2020). Despite the absence of more-granular ratings, Poon and Chan (2008) show that credit ratings in China are informative. In particular, they find positive certification effect of initial rating announcements and negative signaling effect of rating downgrade announcements. Gao, Huang, and Mo (2020) find that more than 25% of credit bonds in China received improved issuance ratings, among which 96.6% used credit enhancement which effectively lower credit spreads.

China's unique political, legal and economic environment, which is complex and evolving, brings a rich set of issues, some quite fundamental, to the credit bonds market. For example, given that property rights are not always clearly defined, the rights for creditors face similar challenges. The corresponding legal resolution process is far from being established. Some recent cases of default can provide a glimpse of what may happen. A very large fraction of the issuers have government connection or support of different nature. The associated guarantees or possible interventions are major factors in credit risk assessment and pricing. How do we model and quantify them? How do these guarantees and interventions influence credit allocation and the real economy? The recent growth of CDs and corporate bonds also bring interesting questions. In particular, how has the CD market facilitated the liberalization of interest rates? How did it improve the credit provision to smaller banks and firms? How is the corporate bond market helping private firms obtaining long-term capital and influencing their behavior? What is the corresponding pricing mechanism? What determines their liquidity and liquidity risks? What kind of new opportunities are they providing to investors?

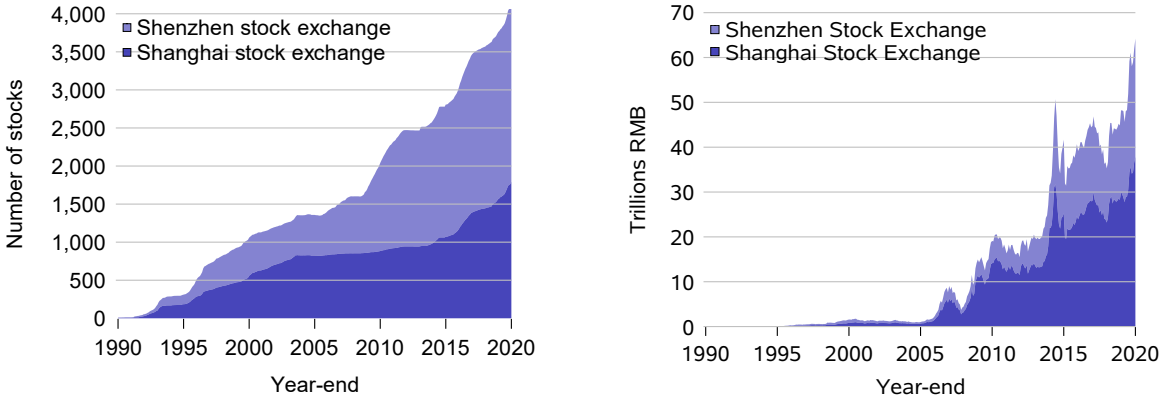
4 Stocks

4.1 Development

The two major Chinese stock exchanges, Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), were established in 1990.[16] The SSE is the largest stock market in

[16]There are a number of regional security exchanges, 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. Our discussions will therefore focus exclusively on the two major exchanges.

mainland China in terms of total market capitalization and trading volume, while the SZSE hosts more small companies. The Chinese stock market has experienced tremendous growth since its establishment, as shown in Figure 6. During the initial "experimental phase" from 1990 to 1992, there were only eight stocks listed in Shanghai, the so-called "old eight," and six listed in Shenzhen in 1991. By the end of 2020, the number of listed firms reached 1,794 at SSE and 2,347 at SZSE. The total market capitalization is close to 65 trillion RMB, second only to the U.S.



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

Figure 6: Size of the Stock Market (1990-2020). Source: authors' own calculations.

The Chinese stock market is characterized by the co-existence of different types of shares. The A shares represent the shares listed on the two main stock exchanges, denominated in RMB; the B shares were introduced in 1992 at both SSE and SZSE, denominated in USD and Hong Kong dollar, respectively; the H Shares refer to shares of companies registered in mainland China but listed on the Hong Kong Exchanges (HKEX). Many companies list their shares simultaneously on the HKEX as well as one of the two exchanges in mainland China. Our discussions in this section will focus primarily on the domestic A shares. We briefly discuss the B shares in Section 8.

There are four major classes of investors in China's stock market: domestic individual investors, financial intermediaries, domestic institutional investors, and qualified foreign institutional investors (QFII).[17] In mainland China, Chinese commercial banks are forbidden by law from participating in security underwriting and investing. Nor can they lend funds to their clients for securities business. Insurance companies are permitted to invest in common

[17]Chinese government has implemented several programs to gradually open its capital market to foreign investors. We discuss these programs in Section 8.

stocks only indirectly, through asset management products operated by investment funds.

The main regulator of the securities industry in China is the CSRC. The CSRC oversees China's securities and futures markets, with the power to regulate and supervise market participants and securities issuers in their related behavior.

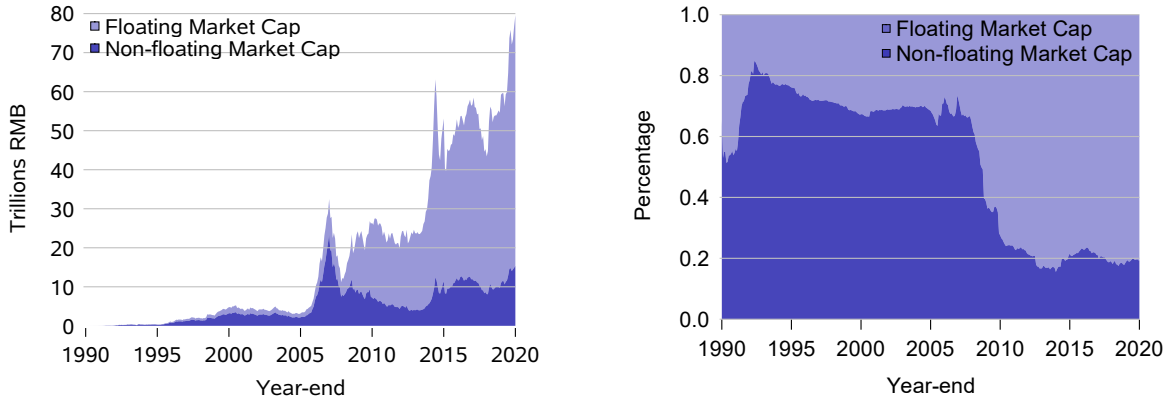
4.2 Important Characteristics

Chinese A-shares market exhibits many distinctive features, and we describe some of the major ones below, which are important in understanding its behavior and underlying forces.

The Split-Share Structure and Its Reform

Since 1978, China has implemented a series of controlled but progressive economic reforms of the SOEs, aimed at improving their productivity. In fact, one of the primary goals of establishing the stock market was to create a platform for partial privatization of large SOEs as well as a new funding channel. In the early days of the privatization, the ownership of SOEs was transformed into equity shares, held by different government and semi-government entities. These shares form the basis of non-floating shares or legal shares. They are different from the floating shares which are issued to the general public, listed and traded on the two 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 both floating and non-floating shares, also refereed as the split-share structure, reflects certain ambiguity in their respective ownership rights. Attempts to reform the split-share structure were made to meet the SOEs' needs for funding, 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-based structure. 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. On January 31, 2004, the State Council announced its intent to "actively address the problem of split-share structure." In April 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. By the end of 2020, the proportion of the market capitalization of non-floating shares dropped to below 20% from the peak of near 80% in early 1990's, as shown in Figure 7.



(a) Market Capitalization (Monthly)

(b) Share in Market Capitalization (Monthly)

Figure 7: Floating versus Non-Floating Shares (1990-2020). Source: authors' own calculations.

Exchange Listings

Different from the registration-based IPO process in most developed markets, the IPO process in China follows on an administrative approval process, relying more on the regulatory agencies to determine and endorse the quality of the issuing firm. Over time, it has gone through several phases. Prior to 2001, IPOs were regulated by an administrative review and approval procedure where State Planning Commission and CSRC determine the total stock issuance quota each year. Candidate firms need to first apply for the issuance quota from the local governments or central government ministries, 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 new system, CSRC is the only approval authority and a sponsor security firm is responsible for the underwriting process. The 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.

To circumvent the restrictive IPO process, many Chinese companies choose to list in Hong Kong and other overseas markets to raise funds globally. As of December 2020, there are 291 H shares (companies incorporated in mainland China), 176 red chip stocks (SOEs incorporated outside mainland China), and 852 mainland private enterprises listed at Hong Kong, accounting for 80.1% of the total market capitalization of the HKEX. Some Chinese companies also choose to list on the U.S. exchanges such as NASDAQ and NYSE. As of February 2019, there are 156 Chinese firms listed in the United States, with a combined

market value of 1.2 trillion dollars, 11 of which are SOEs.[18]

Chinese regulators have been gradually reforming the IPO process in recent years to embrace a full registration-based IPO system. In July 22, 2019, China created a pilot program, the Science and Technology Innovation Board (STAR) at the Shanghai Stock Exchange, under which a registration-based IPO process is adopted for firms in several technology industries. Next year, the ChiNext Board at the Shenzhen Stock Exchange, a high-tech board inaugurated in October 2009, was reformed to include a registration-based mechanism. CSRC also issued a guiding opinions on June 3, 2020 regarding the Transfer of Companies Listed on the National Equities and Exchange Quotations (NEEQ), allowing eligible NEEQ companies to apply for listing directly on ChiNext or STAR, without going through the process of delisting from NEEQ and resubmitting the listing application. Chinese regulators have been stressing that the overall adoption of the registration-based IPO procedure is one of their primary capital market reform priorities in the next few years.

Trading Rules

The exchanges impose a set of trading rules aimed at limiting speculative trading and stabilizing the market. Stock trading in China is settled under the "T+1" rule, that is, investors can only sell the stocks they purchase on day T from day T+1 and onwards. Short-selling and leverage trades are introduced only recently in 2010 and are limited to a selective group of stocks.

There is also a daily price limit, which sets the maximum price change within one trading day relative to the previous day's closing price. The size of the price limit, however, has changed over time. In the 1990s, daily price limit of various sizes were imposed, ranging from 0.5% to 10%, either to discourage speculating or counter low market sentiment. Since 1996, both the SSE and SZSE have settled down on a daily price limit of 10%.

The market-wide circuit breakers in China's stock market was installed in January 4, 2016 with the goal of limiting extreme market volatility. They were triggered on the first day (January 4, 2016) and the third day (January 7, 2016) of their introduction, and were abandoned on January 8, 2016, the fourth day.

[18]The numbers are obtained from the monthly statistics provided by the HKEX, and the U.S.- China Economic and Security Review Commission Report.

Taxes

There is no tax on capital gains on stock investments in China. Tax is, however, levied on dividend income. The tax rate was initially set at 20%, then reduced to 10% in June 2005. To lower the tax rate for long-term investors and restrain speculation on securities with high dividend income, a new differential dividend income tax policy based on the holding period of the dividend distributing security has been applied since January 2018. Another tax feature of China's stock market is the transactions tax, which is also referred as the stamp tax. The stamp tax rate started rather high, at 0.6% on both sides of a transaction, and has been recently reduced to a fairly low level at 0.1% on the sell side.

Investors Composition

China's A share market is dominated by retail investors, who account for over 80% of the total trading volume, significantly higher than most developed markets. As of March 2021, retail investors hold 33% of the total floating market capitalization, which is comparable to the U.S. market. However, majority of the institutional investors in China are legal-person entities, who represent the large shareholders (such as government entities owning major stakes in SOEs), rather than institutional investors such as insurance companies, mutual funds and pension funds. Legal-person entities hold 45% of the total floating market capitalization, substantially higher than professional institutional investors who hold 17%.

Delisting and Special Treatment

Firms can be delisted from exchanges either voluntarily or involuntarily. Voluntary delisting are usually due to privatization or merges and acquisitions, while involuntary delisting is 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 developed markets.

Special Treatment (ST) status refers to a listed company facing financial abnormality. In April 1998, the SSE and the SZSE announced that firms with financial abnormality will undergo special treatment with "ST" being added as prefix to its stock.[19] The daily price

[19]According to the CSRC, there are four types of ST stocks. ST refers to firms with losses for two

limit for ST stocks is 5%, which is half of what it is for normal stocks.

4.3 Risk and Return Properties

A growing literature has been devoted to studying the performance and behavior of Chinese stock market. Hu, Pan, and Wang (2021) compare the statistical properties of returns on seven major asset classes in the Chinese capital market, including stocks. They find that over the period from 1993 to 2020, the Chinese stock market yielded an average annual return of 13%, with a volatility of 43%. For the same period, the U.S. stock market gave an average annual return of 10%, with a volatility of 19%. On risk adjusted basis, the performance of China's stock market is rather disappointing–its Sharpe ratio is a third of that of the U.S. In addition, its annual volatility of 43% is much higher than any other major markets, despite its large size. The poor performance of the Chinese stock market has also been discussed in Allen, Qian, Shan, and Zhu (2020), which shows that domestically listed Chinese firms have performed rather poorly relative to China's overall economic growth and other large developed and emerging countries.

Many papers have also studied the effect of well-known factors in explaining Chinese stock returns. Hu, Chen, Shao, and Wang (2019) and Liu, Stambaugh, and Yuan (2019) study the size and value effects in the Chinese stock market. Other studies have investigated other factors such as momentum, short-term reversals, illiquidity, volatility, investment, profitability, etc. This line of research include a large number of papers, such as Chen, Kim, Yao, and Yu (2010), Hilliard and Zhang (2015), Cakici, Chan, and Topyan (2017), Nartea, Kong, and Wu (2017), Gu, Jiang, and Xu (2019), Yao, Wang, Cui, and Fang (2019), Cheema, Man, and Szulczyk (2020), Gao, Guo, and Xiong (2021), Ma, Yang, and Su (2021), Jansen, Swinkels, and Zhou (2021), Hou, Qiao, and Zhang (2021), Yang, Zhou, and Zhu (2021). Researchers tend to agree that size, illiquidity, short-term reversals, and volatility appear to be robust predictors of returns in the cross section. Results on other factors, such as value, momentum, investment, profitability, are mixed and often depend on sample size and test methodologies. Some researchers further investigate China-specific variables or interpret the results under unique China-specific settings, such as Choi, Jin, and Yan (2016) on information asymmetry, Chen, Demirer, and Jategaonkar (2015) on return dispersions, and Liu, Shu, and Wei (2017) on political uncertainty.

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.

4.4 Price Informativeness

Several papers focus on the information content of stock prices in China. Morck, Yeung, and Yu (2000) and Morck, Yeung, and Yu (2013) use a stock's market model R-squared as an inverse measure of firm-specific information content in the stock price, and point out that China is an example with especially high synchronicity. Gul, Kim, and Qiu (2010) find that ownership concentration can explain the variation of stock synchronicity in the cross section. Carpenter, Lu, and Whitelaw (2021) measure stock price informativeness as the predicted variation in a cross-sectional regression of future earnings on the logarithm of past market valuations. They 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.

4.5 Privatization and Ownership Structure

Given the importance of SOE privatization, a substantial part of the literature has been devoted to studying the impacts of these reforms. Sun and Tong (2003) evaluate the impact of China's share issue privatization during 1994 and 1998 on SOEs' performance. They find that share issue privatization is effective in improving SOEs' earnings ability, real sales, and workers' productivity, but is not successful in improving profit returns and leverage after privatization. Wei, Xie, and Zhang (2005) extend the analysis to the sample to a longer period from 1991 to 2001 and find that state and institutional ownership have negative effects on Tobin's Q, while foreign ownership has positive impact.

Other papers focus on the second stage of privatization in China, the so-called split-share structure reform started in 2005. Liao, Liu, and Wang (2014) find that the expectation of privatization quickly boosted SOEs' output, profits, and employment, but did not improve their operating efficiency and corporate governance. Chen, Chen, Schipper, Xu, and Xue (2012) document that firms on average reduce cash holdings after the split-share reform, and the reduction in cash holdings is greater for firms with weaker governance and firms facing more financial constraints prior to the reform. Li, Wang, Cheung, and Jiang (2011) and Firth, Lin, and Zou (2010) investigate the determinants of the compensation ratio, i.e., the compensation paid to floating share holders as a fraction of the share value. Liao, Liu, and Wang (2011) and Lou, Wang, and Yuan (2014) study the impact of the split-share reform on the stock returns and stock price informativeness.

Prior to the successful implementation of the 2005 split-share reform, Chinese government had made several other privatization attempts, many of which failed. Calomiris, Fisman,

and Wang (2010) studied the surprising announcement of government sales in 2001 and later cancellation of the announcement. They find that the stock market responds negatively to unanticipated privatization and positively to the cancellation of this proposed policy.

4.6 IPOs and Multiple Listings

A large literature study the IPO underpricing and the after-IPO performance of Chinese stocks, including Mok and Hui (1998), Su and Fleisher (1999), Chan, Wang, and Wei (2004), Chen, Firth, and Kim (2004), Ting and Tse (2006), Fan, Wong, and Zhang (2007), Jia, Pownall, and Zhao (2014), and Cong, Howell, and Zhang (2017). In a recent paper, Shi, Sun, and Zhang (2018) find that large IPO issuance could have a negative impact on the values of other stocks due to a regulation that effectively freezes massive amounts of cash throughout the IPO subscription process.

Several studies examine Chinese firms' oversea listings or cross-listings. Pan and Brooker (2014) find that the attitude of the government and the effect of proximity preference affect Chinese firms' overseas listing activity. Allen, Qian, Shan, and Zhu (2020) argue that problematic IPO and delisting processes lead to adverse selection of firms entering and staying in the market.

For cross-listed firms, their domestically listed A-shares are traded at a significant premium. Early literature often focuses on the premium in A-share prices relative to B-share prices. Existing papers give several different explanations, such as Ma (1996) on investors' attitudes toward risks, regulatory changes and the diversification value of the stocks in emerging markets; Chen, Lee, and Rui (2001) on low liquidity of B-shares; Fernald and Rogers (2002) on limited investment opportunity set available to domestic investors; Chan and Kwok (2005) on the relative supply of A-shares versus B-shares; Chan, Menkveld, and Yang (2008) on information asymmetry. Mei, Scheinkman, and Xiong (2009) use the co-existence of A/B shares to test the theory that speculative trading in the presence of short-sales constrains can lead to overvaluation. Karolyi, Li, and Liao (2009) find that the B-share discount decreased significantly after February 2001 when the CSRC announced that Chinese residents would be allowed to own B-share classes of stocks traded on both the SSE and the SZSE.

More recent papers focus on the price disparity between domestic A-shares and Hong-Kong listed H-shares, where the domestic A-shares are traded at a significant premium. Guo, Tang, and Yang (2013) find that the A- to H-share price premiums are related to corporate governance, the A-share premiums are higher for firms in which the controlling shareholders and corporate insiders have greater potential to expropriate wealth from outside investors.

Chung, Hui, and Li (2013) estimate a structural model for equity pricing using a Bayesian approach, and argue that investors' parameter uncertainty, represented by the posterior standard deviation of the firm's asset volatility, could help to explain the A-H share price disparity. Other papers, such as Li, Brockman, and Zurbruegg (2015), Hu, Huang, Xiao, and Zou (2016), Kot and Tam (2016), and Jia, Wang, and Xiong (2017), focus on the informativeness of A- and H- share prices.

4.7 Retail Investor Behavior and Its Market Impact

Dominated by retail investors, the Chinese stock market therefore provides an ideal setting for studying retail investors' behavior and its impact on the market. Using account-level data, Jones, Shi, Zhang, and Zhang (2021) find strong heterogeneity in retail investors' trading dynamics and performance. They find that retail investors with small account sizes, in contrary to large retail investors, fail to process public news, and display behavior biases such as overconfidence. Li, Geng, Subrahmanyam, and Yu (2017) find that retail investors with small account sizes cannot properly assess future returns, while investors with large account size can. Titman, Wei, and Zhao (2021) and Hu, Liu, and Xu (2021) find that small retail investors acquire shares following the announcement of stock dividends, while sophisticated investors accumulate positions before announcements and sell in the post-announcement period to make a profit.

Several other papers investigate factors that drive retail investors' behavior biases. Hong, Jiang, Wang, and Zhao (2014) find that Keeping-Up-with-the-Joneses preferences explain why retail investors' excessive trading in small local stocks. Feng and Seasholes (2004) find that trading is highly correlated among investors who are geographically close. Chang, Hong, Tiedens, Wang, and Zhao (2015) show that investors living in linguistically diverse areas express more diverse opinions on stock message boards and trade stocks more actively. Liu, Peng, Xiong, and Xiong (2021) design and administer a survey to elicit individual retail investors' responses to a list of behavioral biases. They take an integrated approach, combining survey responses with actual investing activity, and conclude that overconfidence in having an information edge and a gambling preference outweigh other trading incentives in explaining observed turnover. Focusing on the 2014-2015 bubble-crash episode, An, Lou, and Shi (2018) find that there is significant wealth redistribution from the bottom 85% households (in terms of their equity market balance) to the top 0.5% households; Liao and Zhu (2021) propose an extrapolation model of bubbles to explain the sharp rise in prices and volume during this period.

4.8 Trading Restrictions and Their Market Impact

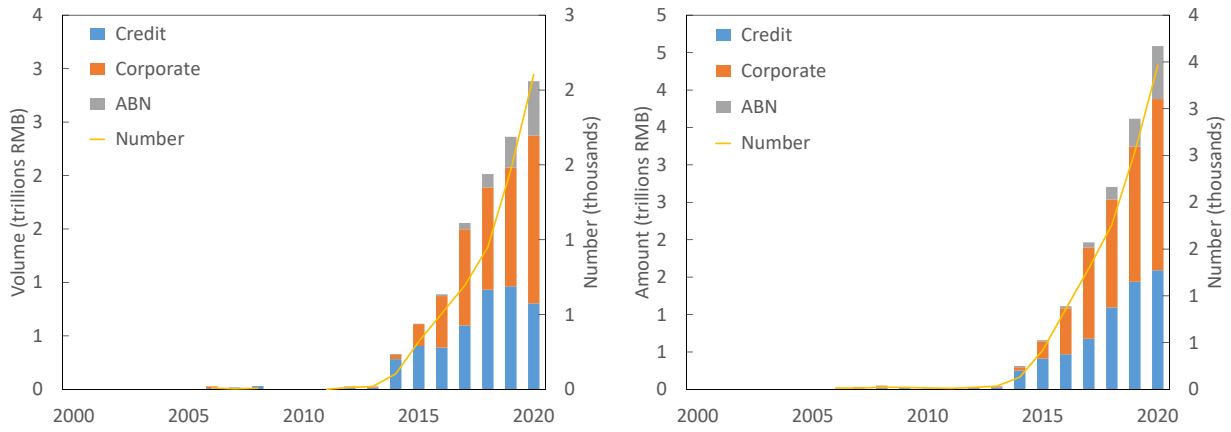
Several papers investigate the market impact of the trading restrictions in China. Bian, Su, and Wang (2017) find that the "T+1" settlement rule, which effectively imposes a one-day lockup on newly purchased shares, lowers the prices of the underlying stocks. They find that investors tend to purchase more stocks toward the market close, when the one-day trading lockup becomes less binding, and switch to the warrant market which are not subject to this trading constraint for intra-day trades. Chen, Gao, He, Zhang, and Xiong (2019) find that the daily price limit may lead to unintended and destructive market behavior, in which large investors tend to buy on the day a stock reaches the 10% upper price limit and then sell the next day, resulting in stronger price reversal in the long run. Ni and Yin (2020) document unintended real effects of short selling, by exploiting a pilot program which gradually removed the short-sale bans on certain stocks from March 2010. They find that pilot firms undertake less risk and have worse short-term and long-term market performances after the removal of short-sale bans. Chen, Petukhov, and Wang (2019) examine the impact of market-wide circuit breakers, which were briefly put in place in China during the sharp stock market downturn in 2015, on market behavior and welfare.

The longer history and more data availability of China's stock market have allowed more extensive and detailed studies on its behavior. Yet, many questions remain. One feature of the stock market is that it has yielded a fairly low return since its inception (with an annual return of 3% from 1993-2020 in real terms), despite the tremendous wealth creation process in China, and yet it has carried very high risk (with an annual volatility of 54%). How to understand these returns and risks of listed firms? What is driving the high volatility? What is the impact of the stock market on listed firms and households? What roles are played by institutional investors in the market? What are the costs and benefits of government's various interventions in the market, ranging from the listing process, transaction taxes, price limits, $T + 1$ rules, to short-sale constraints and special treatments? At a more macro level, how should the government balance its temptation to use the stock market as a tool to achieve certain policy goals such as promoting entrepreneurial and technological innovation and the desire to have a well functioning market for efficient resource allocation? Many of these questions may be more prominent in China, but they also have general implications for our understanding of how financial markets function and impact the economy and welfare.

5 Asset-Backed Securities

5.1 Development and Characteristics

Despite the recent surge in issuance volume, the asset-backed securities (ABS) market in China is still in a nascent stage. Here, ABS is used in its generic sense, with mortgage-backed securities (MBS) being a particular sub-category but not a dominating part. The first residential mortgage-backed security (RMBS) issued by China Construction Bank in 2005 marks the pilot of China's ABS program. It was then temporarily halted in 2007 in the wake of U.S. sub-prime mortgage crisis. Since its restart in 2012, China's ABS market has experienced a rapid growth, especially from 2014. In 2020, the total volume of ABS issuance reached 2.9 trillion RMB. The total outstanding volume of ABS by the end of 2020 stood at 4.6 trillion RMB, the largest in Asia and the second globally. The size of the ABS market is, however, still small relative to the overall size of the capital market. Figure 8 plots the growth of China's ABS market from 2006 to 2020.



(a) Issuance Volume (b) Outstanding Amount

Figure 8: Growth of the Chinese Asset-Backed Securities Market (2000-2020). Source: Wind.

There are three main categories of asset-backed securities in China: credit ABS, corporate ABS, and asset-backed notes (ABN). Credit ABS are backed by loans, such as mortgages, auto-loans, credit card payments, and other consumer loans, typically originated by financial institutions. MBS accounts for the lion's share of credit ABS, which is around 80% by the end of 2020. Corporate ABS and ABN are typically issued by non-financial corporations, backed by their own assets, with account receivables and financing leasing receivables being the most popular. Credit ABS were issued and traded on the interbank market only originally but

also on the exchanges since 2014. Corporate ABS are issued and traded on exchanges, while ABN are issued and traded OTC.

As shown in Figure 8, in 2020, there are 184 credit ABS issued with total volume of 804 billion RMB, 1,473 corporate ABS issued with total volume of 1.6 trillion RMB, and 446 ABN issued with total volume of 509 billion RMB, accounting for 28%, 54% and 18% of the total issuance volume, respectively. By the end of 2020, there are in total 475 credit ABS with outstanding amount 1.6 trillion RMB, 2,323 corporate ABS with outstanding amount 2.3 trillion RMB, and 666 ABN with outstanding amount 708 billion RMB, accounting for 35%, 50%, and 15% of the total amount outstanding, respectively.

In addition to fast growth of the more conventional ABS products, new types of assets have emerged in the securitization market. A notable example is the public-private partnership projects (PPPs) in the infrastructure sector. This was the direct result of government's policy initiatives. In December 2016, the National Development and Reform Commission (NDRC) and CSRC encouraged the participants in PPPs to finance through asset secularization. Subsequently, market infrastructure was updated to facilitate the fast-tracking of secularization for PPP projects.

Another notable recent market development is Real Estate Investment Trusts (REITs). In April 2020, NDRC and CSRC issued two circulars detailing a long-awaited pilot scheme for the creation of listed Real Estate Investment Trusts (REITs) in China. Unlike REITs in other markets, which can invest in commercial real estate, China's REITs will be managed and traded through a mutual fund, investing in ABS backed by infrastructure projects. The design is to circumvent the existing China Securities Investment Fund Law which prohibits mutual funds from making direct equity investments into private companies. The first batch of nine public REITs were listed in June 2021, 5 in Shanghai and 4 in Shenzhen, marking the official launch of China's public REITs market. They own assets ranging from sewage treatment plants and toll roads to industrial parks, and raised about RMB 30 billion in well-subscribed offerings. In July 2021, NDRC issued Circular 958, expanding the pilot area of public REITs to the whole country and permitting the inclusion of indemnification rental apartments as underlying assets.[20]

[20]The asset types for China REITs now include warehouses, transport infrastructure such as highways, airports and seaports, public utilities (electricity, water and gas plants), waste treatment facilities, information network-related infrastructure and other types of new infrastructure, high-tech industrial parks, industrial parks hosting strategic emerging industries, and indemnification rental apartments.

5.2 Government Policy and Market Behavior

Like the other financial markets in the China, the development of its ABS market is heavily influenced by certain policy objectives and regulated by a set of different, sometimes competing, authorities, including PBOC, China Banking and Insurance Regulatory Commission (CBIRC), CSRC, and NAFMII. In recent years, for example, its development was driven by particular policy initiatives, such as financial market reforms led by NDRC and the Belt and Road initiative. Related products, such as PPPs and REITs, were then fast-tracked and received more favorable treatment from the regulators.

Buchanan (2015) and Tang, Chen, Chen, and Xu (2017) study Chinese securitization market during the early period, and recognize that its development was largely driven by government's specific objectives. Buchanan (2015) argues that the Chinese securitization market was initially established to deal with non-performing loans, in contrast to the US securitization market which was developed as a means to improve liquidity. Tang, Chen, Chen, and Xu (2017) collect data of all asset securitization projects from 2005 to 2015 in China. They argue that the securitization market is policy driven, regulation-segmented, and highly illiquid. They find that, in that period, the underlying assets are mainly corporate loans and assets, rather than mortgages and consumer loans. Risk-isolation and credit enhancing techniques significantly improve the rating of asset-backed securities. They also find that state-owned commercial banks and enterprises enjoy significantly lower interest rates at issuance.

Several recent papers focus on the more current development of the Chinese securitization market, in terms of issuance in the primary market and pricing in the secondary market. Zhang, Yin, and Zhang (2019) study the securitization determinants of ABS backed by commercial banks' loans. They find that the determinants of Chinese banks' securitization include cost advantage exploitation, performance promotion and capital regulatory arbitrage. Yang, Wang, Chen, and Luo (2020) focus on the ABS backed by financing leases. They find that originators play a key role in determining the issuing price of ABS, in addition to conventional risk factors, such as credit enhancement, underlying asset characteristics, credit rating, and deal structure. In particular, state-owned and high profitability originators are able to issue at lower spreads. Zhao, Yue, and Wei (2021) study the financing cost advantages of green corporate asset-backed securities. They find that China's green corporate ABS issuance rates are on average lower than traditional corporate ABS.

Although China's asset-backed securities market grew rapidly since its relaunch in 2012,

it is still at an early stage. Given that banks, with the total amount of assets approaching RMB 320 trillion by the end of 2020, are holding large amount of assets (loans), which are opaque and illiquid, there is tremendous room for securitization. An obvious question is what is holding back this process? What are the costs and benefits for banks to hold on to the loans? How is this situation influencing the overall credit market and economy? Given the size of China's real estate market, what is hindering the securitization of mortgages? China has made massive investments in infrastructure to support its economic growth. The securitization of suitable infrastructure assets can also bring many benefits, ranging from returning capital, to bringing new investment opportunities to the market and providing much needed pricing information for these assets for future investments. It would be very interesting to assess these benefits and examine possible impediments and opportunities in securitizing these assets.

6 Financial Derivatives

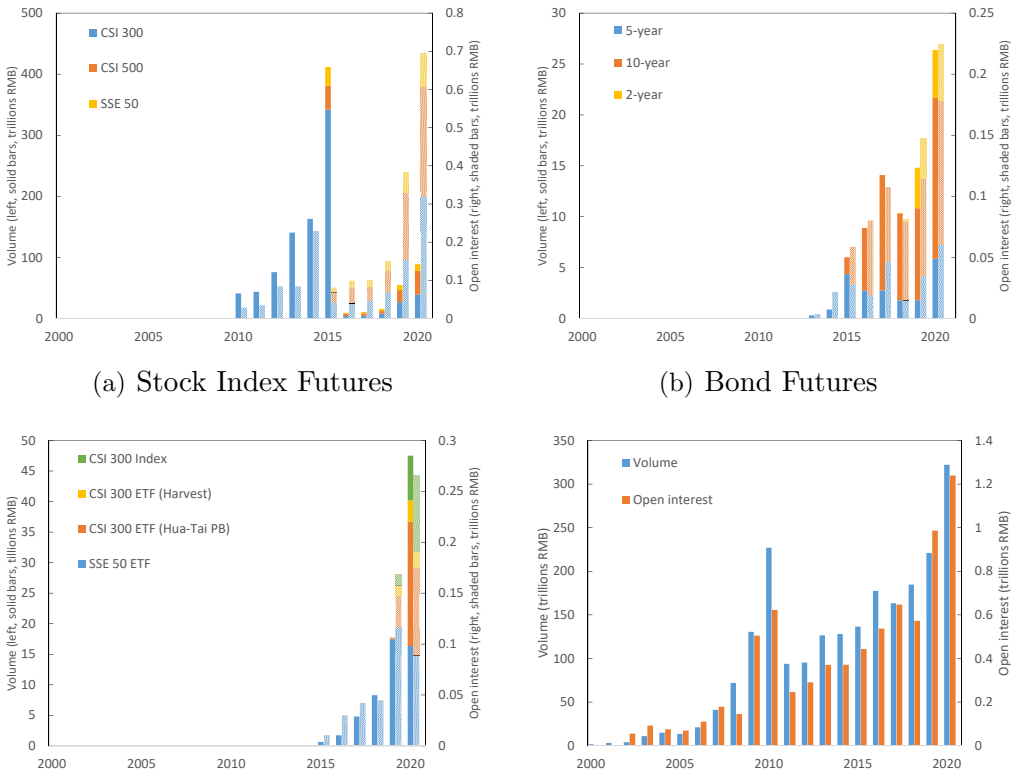
6.1 Development and Characteristics

Although the first commodity futures exchange was setup in 1990 and the first futures brokerage firm was opened in 1992, the full establishment of China's financial derivatives market came along much later. In this section, we focus on the development of financial derivatives, including futures, options and warrants, traded on exchanges and over the counter. Figure 9 illustrates the growth of exchange traded stock index futures, interest rate futures and stock index options, in terms of annual total trading volume and year-end open interest.

Financial Futures

In September 2006, China Financial Futures Exchange (CFFEX) was established by the CSRC to launch the trading and settlement of financial derivatives. Up to now, there are two types of products traded on CFFEX: stock index futures and government bond futures.

Stock Index Futures In April 2010, four years after its establishment, CFFEX rolled out the Shanghai and Shenzhen 300 Chinese Securities Index (CSI 300) futures. Subsequently, the China Securities Regulatory Commission, China Banking Regulatory Commission, and China Insurance Regulatory Commission issued guidelines for relevant institutions to participate in the stock index futures trading. In April 2015, on the occasion of the fifth anniversary of the listing of the CSI 300 stock index futures, CFFEX launched the CSI 500 stock index futures and SSE 50 stock index futures. The CSI 300 index consists of 300 large



(a) Stock Index Futures (b) Bond Futures

(c) Stock Index Options (d) Commodity Futures

Figure 9: Growth of Exchange Derivatives Market in China (2000-2020). The annual trading volume (solid bars) and year-end open interest (shaded bars) are plotted. Source: Wind and authors' own calculations.

and actively traded A-Share stocks listed on SSE and SZSE, the CSI 500 index covers more small and medium-size firms listed on the two exchanges, and the SSE 50 index only includes the top 50 largest firms listed on SSE.[21]

CFFEX enforces strict eligibility requirements for investors, retail and institutional, to trade in stock index futures. Currently, the requirements include minimum 500,000 RMB account balance for at least five consecutive trading days before new futures account application, passing the qualification exam, and previous derivatives trading experience.

Despite its relative short history, the stock index futures market has experienced three distinctive phases, as shown in Panel (a) of Figure 9, showing the trading volume and the open interest of three futures products. Since its inception, the CSI 300 index futures

[21]For the CSI 300 and SSE 50 stock index futures, the notional value of one contract is 300 RMB times the value of the underlying index level. For the CSI 500 stock index futures, the contract multiplier is 200 RMB. The current minimum trading margin of all three stock index futures is 8% of the contract value, and the maximum daily price fluctuation limit is +/- 10% of the settlement price of the previous trading day. The stock index futures are settled on the "T+0" rule.

experienced several years of rapid growth in trading. The trend was cut short in the summer of 2015 when the stock market experienced a large crash after a fast run up. Many blamed speculative futures trading for driving this market cycle. In response to these concerns, CFFEX took strong measures to limit trading, including limiting the maximum amount of open positions in a single day, increasing the margin requirements, and significantly hiking up the transaction fees.[22] Consequently, the trading volume of stock index futures fell sharply, from 335 million contracts (notional value of 441.75 trillion RMB) in 2015 to only 9.4 million contracts (notional value of 9.32 trillion RMB) in 2016. Since February 2017, CFFEX began to gradually relax these restrictions. As a result, the futures market trading has rebounded in recent years, but still far below the level before 2015. In the year of 2020, the trading volume is 29,998,722 contracts (notional value of 39.39 trillion RMB) for CSI 300 stock index futures, 32,755,400 contracts (notional value of 38.53 trillion RMB) for CSI 500 stock index futures, and 11,749,399 contracts (notional value of 11 trillion RMB) for SSE 50 stock index futures. The open interest at the end of 2020 is 203,224 contracts (notional value of 317.72 billion RMB) for CSI 300 stock index futures, 228,652 contracts (notional value of 291.17 billion RMB) fro CSI 500 index futures, and 78,189 contracts (notional value of 85.4 billion RMB) for SSE 50 stock index futures.

Government Bond Futures Chinese government bond futures were first introduced on the Shanghai Stock Exchange for trading by brokerage firms in 1992 and then by the public also in 1993. While trading grew fast initially, it was permanently halted only a year and a half later, in May 1995, after a scandal, which led to the bankruptcy of the country's largest brokerage firm then.

In September 2013, China's government bond futures trading was restarted at CFFEX, which now offers futures contracts on 2-year, 5-year and 10-year Treasury bonds, covering the short-, medium- and long-term of the yield curve. On October 24, 2021, CFFEX announced that it is preparing the launch of the 30-year government bond futures.

Investors in the bond futures market are subject to the same requirement as those for stock index futures trading at CFFEX. Currently, the minimum margins are 0.5% for the 2-year, 1% for the 5-year, and 2% for the 10-year bond futures. The bond futures are settled

[22]CFFEX increased the margin requirement on un-hedged positions to 40% and the margin requirement on hedged positions to 20% on September 7, 2015. On August 25, 2015, CFFEX announced that the maximum volume for new open positions is 600 contracts per product per day. This number was then reduced to 100 contracts on August 31, 2015, and to 10 contracts on September 7, 2015. From August 3, 2015 to September 7, 2015, CFFEX increased the transaction fees for closing positions that were opened on the same day several times to 23 basis points, up from 0.25 basis points previously.

on the "T+0" rule.

Panel (b) of Figure 9 plots the steady growth of trading in the Chinese bond futures market. In 2020, the trading volume is 2,312,956 contracts (notional value of 4.67 trillion RMB), 5,809,792 contracts (notional value of 5.87 trillion RMB), and 15,912,311 contracts (notional value of 15.83 trillion RMB) for 2-year, 5-year, and 10-year bond futures, respectively. At the end of 2020, the open interests is 22,984 contracts (notional value of 45.97 billion RMB), 60,354 contracts (notional value of 60.35 billion RMB), and 118,210 contracts (notional value of 118.21 billion RMB) for 2-year, 5-year, and 10-year bond futures, respectively.

Stock Index Options

At present, China has only stock index options traded on the two main stock exchanges, SSE and SZSE, and the financial futures exchange CFFEX. They have different underlying assets from each of the exchanges, representing different stock market indices. All options are of European-style.

The SSE first opened the trading of the SSE 50 ETF options in February 2015, with a designated SSE 50 Exchange-Traded Fund (ETF) at SSE as the underlying asset.[23] In December 2019, both SSE and SZSE opened trading in their respective CSI 300 ETF options. Each has designated its own listed CSI 300 ETF as the underlying asset.[24] The stock index options offered by the two stock exchanges include both call and put options, with 1 at-the-money, 4 out-of-the-money and 4 in-the-money exercise prices. The contract size is 10,000 units of the ETF share with physical delivery at maturity. The expiration months are the current month, the next month and the next two calendar quarter months, where quarter months refer to March, June, September and December.

The two stock exchanges also set additional thresholds for trading in stock option trading. Individual traders, for example, need to have at least 500,000 RMB balance in his/her trading account, have maintained a trading account at a securities or futures brokerage firm for at least 6 months, have certain financial futures or margin trading experience, and pass the relevant basic financial knowledge tests.

CFFEX offered its own CSI 300 stock index options in December 2019. The underlying security is the CSI 300 index compiled and released by China Securities Index Co., Ltd.

[23]The full name of the ETF is the "SSE 50 Exchange Traded Open-Ended Index Securities Investment Fund", which is the first ETF listed in mainland China and traded on SSE.

[24]For SSE, the designated CSI 300 ETF is the "Huatai-Pinebridge CSI 300 Exchange Traded Open-End Index Securities Investment Fund" (stock code 510300), while for SZSE, the designated ETF is the "Harvest CSI 300 Exchange Traded Fund" (stock code 159919).

The notional value of the contract is 100 RMB times the level of the CSI 300 index, with cash settlement at maturity. The contract expiration month is the current month, the next two months, and the following three quarter months. The strike price covers +/-10% of the closing price of the CSI 300 index on the preceding trading day.

In 2020, the trading volume of the SSE 50 ETF options is 519 million contracts (notional value of 16.35 trillion RMB), and open positions at the year-end are 2.45 million contracts (notional value of 89.19 billion RMB). The trading volume of Huatai-Pinebridge CSI 300 ETF options (SSE) is 464 million contracts (notional value of 20.34 trillion RMB), and the position at the end of the year is 1.62 million contracts (notional value of 85.71 billion RMB). The trading volume of Harvest CSI 300 ETF options (SZSE) is 78.77 million contracts (notional value of 3.48 trillion RMB), and the position at the end of the year is 0.31 million contracts (notional value of 16.04 billion RMB). The trading volume of the CSI 300 stock index options was 16.7 million contracts (notional value of 7.32 trillion RMB), and positions held at the end of the year were 0.14 million contracts (notional value of 74.59 billion RMB).

Warrants

China has also experimented with exchange-traded warrants, in two episodes, from 1992 to 1996 and from 2005 to 2011, respectively. In June 1992, SSE listed its first warrant on Feile. Heavy speculation often pushed prices significantly away from their proper values. The regulatory authorities halted warrant trading at the end of June 1996. During the split-share reform in 2005, SSE listed the warrant on Baosteel in August. SZSE followed suit with its own warrant listings. Compared with the underlying stocks, the warrants are settled on the "T+0" basis, incur lower transaction cost, and have wider price limit. The warrants market soon attracted a speculative frenzy. The trading volume of warrants on the two exchanges reached 938.9 billion RMB in the first half of 2006, ranking the second in the world. As the exchanges stopped listing new warrants, the market shrank rapidly and finally ended in August 2011 as the last warrant expired, marking the end of another six-year cycle in the Chinese warrant market.

Over-the-counter Derivatives

The earliest OTC derivatives traded in China are the forward foreign exchange (FX) contracts between commercial banks and state-owned enterprises in the mid-1990s. The foreign banks played a leading role in this market, which relied mostly on the OTC Derivatives Master Agreement issued by the International Swap and Derivatives Association (ISDA).

Towards late 1990s, PBOC started setting up trading platforms such as the Foreign Exchange Trading Center, also kown as the National Interbank Funding Center, to support interbank transactions. They respectively issued master agreements for OTC derivatives transactions, mainly for RMB FX and financial derivatives, in 2007, and later launched the unified "Master Agreement for Financial Derivatives Transactions in China's Interbank Market (2009 Edition)", also known as the NAFMII (National Association of Financial Market Institutional Investors) Master Agreement.

More recently, the Securities Association of China (SAC) and the China Futures Association (CFA) have successively introduced relevant systems and regulations for security firms and futures companies to trade OTC derivatives. In 2013, SAC issued the "Master Agreement for Financial Derivative Transactions in China's Securities Market (2013 Edition)", also known as the SAC Master Agreement.

Currently, the OTC derivatives market in China consists of an inter-bank market based on the NAFMII master agreement, led by PBOC, a securities and futures market based on the SAC master agreement, led by CSRC, and a OTC market based on the ISDA master agreements, led by foreign institutions. The main institutional participants in the OTC derivatives market include banks, securities companies, and futures companies. The types of derivatives products include exchange rate derivatives (including RMB foreign exchange swaps, RMB foreign exchange forwards, and RMB foreign exchange options), interest rate derivatives (including interest rate swaps and bond forwards), and total return swaps.

Commercial banks are the largest financial institutions to participate in the OTC derivatives market. They trade mainly in the interbank market. According to PBOC, the total trading volume of the inter-bank RMB interest rate derivatives market is 19.9 trillion RMB in 2020, an increase of 6.8% from 2019. Among them, the total trading volume is 19.4 trillion RMB for interest rate swaps, 453.23 billion RMB for bond forwards, 14.93 billion RMB for credit risk mitigation certificates, and 1.2 billion RMB for credit default swaps. The total trading volume of inter-bank exchange rate derivatives is 17.6 trillion USD in 2020, an increase of 1.3% from 2019.

Compared with the inter-bank market, the OTC derivatives market for security and futures companies is much smaller. According to the statistics from SAC for 2020, the total trading volume (notional amount) is 4.2 trillion RMB, with 1.3 trillion RMB open interest at year end. Total return swaps and equity options are the two most popular products. The former has 1.9 trillion RMB in trading volume and 0.5 trillion RMB in open interest at year

end, and the latter has 2.3 trillion RMB in trading volume and 0.8 trillion RMB in year-end open interest.

6.2 The Role of Derivatives

Despite the significance of derivatives in modern finance, in both theory and practice, the development of China's derivatives market has experienced a choppy path. This is in part due to policy makers' concerns about the benefits derivatives may bring, in risk and resource allocation, for example, and the additional risks and uncertainty they may bring, as experienced during unsuccessful experiments in bond futures and warrants.

Many empirical work has been devoted to this topic and related issues, but mostly from more micro perspectives. This body of work include Yang, Yang, and Zhou (2012), Chen, Han, Li, and Wu (2013), Xie and Mo (2014) and Han and Liang (2017) on stock index futures, Li, Yao, Chen, and Lee (2018), Ahn, Bi, and Sohn (2019), Arkorful, Chen, Liu, and Zhang (2020), Dong, Liu, Tao, and Ying (2021), and Wang and Zhou (2021) on the stock index options, and Tang, Yang, and Yu (2018) on the bond futures. The results, however, remain mixed and limited. While some papers find that the derivatives market lead the spot market in terms of price discovery and volatility spill over, other papers find no such evidence, citing high barriers to entry and strict trading restrictions in the derivatives market as the main reasons.

Other papers focus on the Chinese derivatives market's own unique characteristics. For example, several papers study the Chinese warrant market from 2005 to 2008, which offers an unique example to study asset bubbles in an incomplete market dominated by retail investors and with severe market frictions. These work include Xiong and Yu (2011), Chang, Luo, Shi, and Zhang (2013), Tang and Wang (2013),Powers and Xiao (2014), Cai, He, Jiang, and Xiong (2020), Li, Subrahmanyam, and Yang (2021), Pearson, Yang, and Zhang (2021), and Wang, Zhou, and Zhu (2021).

While the important functions the derivatives market serves in modern finance has been well established in both theory and practice, at least in mature markets, the perception of its role remains ambivalent in China. More research is much needed to help sort out the issues. Given that the exchanges maintain trading records of end investors, even with reported trading motives, more informative studies can be conducted on different participants' trading behavior, their impact on the derivatives' market and potential influence on other

markets.[25] One can also study how changes in trading restrictions impact trading behavior and the resulting market dynamics. Given that China is still in the process of interest rate liberalization, it is also interesting to examine how bond futures have helped in interest rate management for both financial and non-financial firms.

6.3 Commodity Futures

In contrast to the late and choppy start of financial derivatives, the development of China's commodity futures market started as early as October 1990, when China's first commodity futures market, Zhengzhou Grain Wholesale market, was first established, the same year the stock market was launched. By the end of 1993, there were more than 50 commodity futures exchanges, more than 300 futures brokerage companies, and more than 2,000 institutions with futures trading business across the country. To cool off the overheated market, the state council authorized the the China Securities Regulatory Commission to conduct a large-scale regulatory crackdown. By the end of 1998, the commodity futures exchanges were consolidated into three exchanges: the Zhengzhou Commodity Exchange (ZCE), Dalian Commodity Exchange (DCE), and Shanghai Futures Exchange (SHFE).[26]

China's commodity futures market has developed quickly in recent years, growing from only 7 products in 2020 to 62 products by the end of 2020. The trade volume of the commodity futures market, as a whole, has increased rapidly from 1.6 trillion RMB in 2000 to 322.0 trillion RMB in 2020, as illustrated in Panel (d) of Figure 7. The open interest reaches 1.2 trillion RMB by the end of 2020, comparable to the open interest of China's financial derivatives market. Energy & Industrial, Agriculture, and Metals are the three primary commodity categories in China, with comparable trading volume and open interest. The total trading volume is 101.3 trillion RMB, 84.8 trillion RMB, and 135.9 trillion RMB in 2020, with year-end open interest of 374.5 billion RMB, 358.1 billion RMB, and 506.1 billion RMB, respectively. Table 1 reports the top 5 commodity products with each category, ranked by the notional value of year-end open interest, in 2000, 2010, and 2020.

The literature on China's commodity market remain limited. Fung, Leung, and Xu (2003), Hua and Chen (2007), Fung, Tse, Yau, and Zhao (2013), and Li and Hayes (2017)

[25] See, for example, Llorente and Wang (2020) for a study on U.S. commodity futures using daily trading records of different classes of investors.

[26] Approved by the China Securities Regulatory Commission, the Shanghai International Energy Exchange Co., Ltd., or INE, was established on November 6th 2013. As a subsidiary of the Shanghai Futures Exchange, NIE is open to international futures participants and offers trading in crude oil, natural gas and petrochemical derivatives.

Table 1: Popular Commodity Products in China

	2000				2010				2020			
	Contract	Volume	Open-interest	Ex	Contract	Volume	Open-interest	Ex	Contract	Volume	Open-interest	Ex
Energy & Industrial	Rubber	90	-	SHFE	Rubber	42,646	79.8	SHFE	Coke	12,259	59.7	DCE
					PTA	989	13.2	ZCE	PTA	5,913	59.3	ZCE
					LLDPE	5,184	12.2	DCE	Rubber	13,097	38.9	SHFE
					Fuel oil	6,871	4.9	SHFE	Crude	11,961	25.5	INE
					PVC	672	4.0	DCE	Methanol	6,835	25.0	ZCE
Agriculture	Soybean	760	-	DCE	Soybean oil	15,553	54.1	DCE	Soybean meal	10,621	80.2	DCE
	Wheat	156	-	ZCE	Cotton	20,593	47.0	ZCE	Cotton	6,954	47.9	ZCE
	Soybean meal	21	-	DCE	White sugar	33,591	41.0	ZCE	Soybean oil	11,420	46.4	DCE
	Green beans	4	-	ZCE	Soybean meal	7,730	35.3	DCE	Corn	4,116	42.7	DCE
					Soybean No.1	3,085	20.8	DCE	White sugar	6,518	29.2	ZCE
Metals	Copper	504	-	SHFE	Copper	29,644	135.0	SHFE	Copper	14,133	90.9	SHFE
	Aluminum	73	-	SHFE	Zinc	25,573	39.6	SHFE	Gold	20,718	74.2	SHFE
					Rebar	19,952	31.5	SHFE	Rebar	13,353	69.1	SHFE
					Gold	1,829	24.4	SHFE	Silver	27,790	60.6	SHFE
					Aluminum	2,834	20.0	SHFE	Iron core	21,594	60.4	DCE

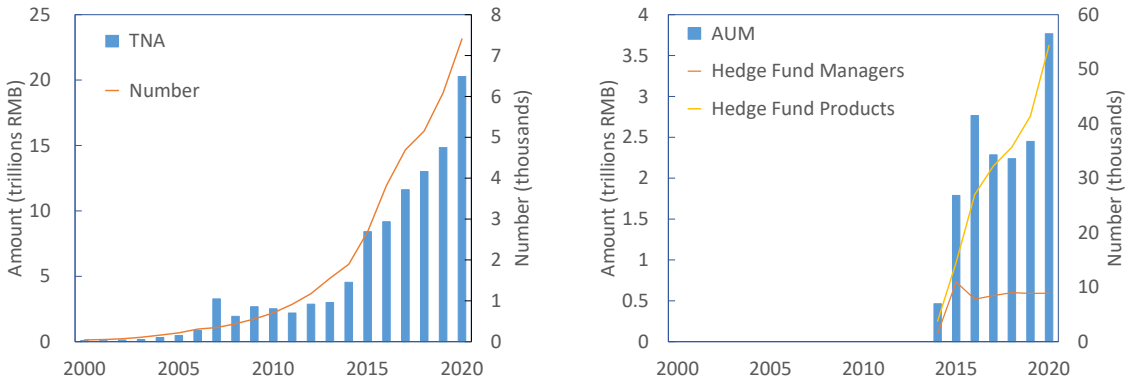
Source: China Futures Association, Wind, and authors' own calculations. Abbreviations: ZCE, the Zhengzhou Commodity Exchange; DCE, the Dalian Commodity Exchange; SHFE, the Shanghai Futures Exchange; INE, the Shanghai International Energy Exchange. Volume and open interests are reported in billions RMB.

study the dynamic relationship between Chinese commodity futures market with the international commodity futures market. Liu, Tse, and Zhang (2018) and Zhang, Ding, and Scheffel (2018) investigate the link between the commodity futures and the stock market in China. Wang and Ke (2005), Fan, Fernandez-Perez, Indriawan, and Todorova (2020), and Fan and Zhang (2020) focus on the risk dynamics, liquidity, and market efficiency of the Chinese commodity futures market.

7 Investment Management

7.1 Mutual funds

The opening of the first two investment funds to public in March 1998 marks the beginning of China's mutual fund industry, which has since experienced tremendous growth. By 2020, the total number of funds reached 7,403 with the total asset under management (AUM) close to 20 trillions RMB, as shown in Figure 10. The major fund types are money market funds, with 333 funds and 40% market share, bond funds, with 2,370 funds and 25% market share, mixed funds, with 3,060 funds and 24% market share, and stock funds, with 1,276 funds and 9% market share.[27]



(a) Mutual Funds (b) Hedge Funds

Figure 10: Growth of the Mutual Fund and Hedge Fund Industry in China (2000-2020). Source: Wind. Abbreviations: TNA, total net assets; AUM, assets under management.

Despite its fast growth, the share of the mutual fund sector in the Chinese capital market remain relatively small. Overall, mutual funds in total own less than 5% of the total market capitalization of Chinese capital markets, significantly lower than for mature markets. In

[27]The rest of the funds, including alternative investment funds, Qualified Domestic Institutional Investor (QDII) funds, fund of funds, are quite small and account for only 1% of the market share.

addition, China's mutual fund industry also has several unique features. As reported in a recent paper by Jiang (2019), Chinese mutual funds charge higher fees compared to their counterparts in more mature markets. The average expensive ratios are 1.2% for active funds and 0.8% for passive funds, respectively, while in the U.S. they are 0.8% and 0.2%. Majority of mutual fun investors are retail investors, who allocate less of their savings in mutual funds, compared with mature markets, invest with short horizons, and show strong tendency in chasing past-performance.

There has been extensive study on China's mutual fund performance. Chi (2013) and Chi (2016) show that actively managed mutual funds in China have significantly positive alpha. Chi and Yin (2018) find that active stock funds exhibit a preference for growth stocks over value stocks, despite value stocks' average outperform over growth stocks. Feng and Johansson (2015) examine mutual funds' stock picking skills in the IPO market. Tang, Wang, and Xu (2012) document an inverted-U shape for the size and performance relationship, different from the U.S.. Chua and Tam (2020) investigate the motivation and performance consequences of intentional style drift in an exclusively in-house fund management sector in China. Jun, Ren, and Sun (2021) study managerial skills by dissecting holding changes of mutual funds. Hong, Kang, and Wang (2021) find that talented fund managers tend to leave mutual funds and establish their own hedge funds when side-by-side arrangements are not feasible. Platform distributions of mutual funds emerged in 2012 and grew quickly into a formidable presence since. Hong, Lu, and Pan (2019) find that platform distribution of mutual funds can induce markedly increase in flow sensitivities to performance. Some work has also studied the impact of mutual funds of firms they invest in. Yuan, Xiao, and Zou (2008) find that mutual fund ownership increases a firm's Tobin's Q and other measure of firm performance. Firth, Lin, and Zou (2010) study the role of mutual funds in the split share reform and find that mutual fund ownership has a negative effect on the compensation ratio, especially in state-owned firms.

7.2 Hedge funds

China's legislation amended the Securities Investment Fund Law to legalize private fund management in 2013. Since then, the hedge fund industry has witnessed a rapid growth. Panel (b) of Figure 10 shows the growth of the hedge fund industry since 2014, where the statistics are complied by the Asset Management Association of China. By the end of 2020, there are in total 54,355 funds associated with 8,908 investment management firms, with the total asset under management (AUM) is estimated to be 3.8 trillion RMB, approximately

20% of the AUM managed by mutual funds in China.

Majority of the hedge funds are relatively small. Depending on their assets and trading strategies, they are typically classified into stock strategy funds, market neutral funds, event-driven funds, bond strategy funds, arbitrage strategy funds, macro strategy funds, managed futures funds, portfolio strategy funds, and multi-strategy funds.

Despite the fast growth of the industry, research on hedge funds in China is still in its early stage, partially due to short history and limited data. Ling, Yao, and Liu (2015) and Hong, Jiang, Yan, and Zhao (2016) provide a comprehensive study of Chinese hedge funds' performance and risk exposures. Li, Li, Wang, and He (2021) study the limited attention, managerial multitasking, and hedge fund performance in China. Li, Li, Wang, and Xiao (2020) investigate the impact of social networks on the return co-movement of stock hedge funds in China. Zhang, Zhang, Li, and Feng (2021) find that hedge funds nurture mis-pricing in Chinese financial markets.

7.3 VC/PE funds

The venture capital (VC) and private equity (PE) industry in China has experienced tremulously growth in the past decade, now the second largest VC market globally in terms of deal value. Used to be dominated by experienced foreign VCs in the 1990s and early 2000s, domestic VCs are now driving most of the growth. Unlike more mature markets, the boundary of VC and PE firms is blurry in China and the two terms are often used interchangeably. By 2020, there are in total 39,802 VC and PE funds, under the management of 14,986 investment companies, with total asset under management reaching 11.1 trillion RMB.

The research on China's VC and PE sector is still limited, largely due to lack of high-quality data. Ahlstrom, Bruton, and Yeh (2007) and Bruton and Ahlstrom (2003) provide an excellent overview of China's VC sector during its early period, and Huang and Tian (2019) give a detailed description of the recent developments in the VC and PE industry. Several papers focus on VC investment and IPO. Guo, Jiang, and Mai (2015) and Otchere and Vong (2016) study VC participation and IPO performance. Wang and Wu (2020) study politically-connected VCs and their IPO activity. Some studies consider the impact of VC investment on firm performance, including Guo and Jiang (2013), Hua, Wang, and Wang (2016), Li, Liao, Wang, and Xiang (2020), and Wu and Xu (2020). Zhang and Mayes (2018) study the performance of governmental VC firms, which play an important role in China's VC sector.

8 Currency and Capital Account

A distinctive feature of China's financial markets is that they are mostly segmented from global markets. This is mainly due to tight cross-border capital controls, which lead to several consequences. First, Renminbi or RMB, the Chinese currency, is not fully convertible. Next, its exchange rates with other currencies are not really market rates. The observed rates are largely dictated by the People's Bank of China (PBOC), China's central bank. Third, there is limited international participation in China's financial markets. Such a separation hinders the integration of China's financial markets into the global financial system, not just in participation but also in rules, standards, and practices.

8.1 Currency Market and Exchange Rates

With tight control over capital flow and the convertibility of RMB, the PBOC closely manages its exchange rates. It's worth noting that there are two types of RMBs: the onshore RMB, denoted by CNY, traded within Mainland China and the offshore RMB, denoted by CNH, traded outside of Mainland China, mostly in Hong Kong but also in Singapore and London. Since PBOC manages the supply of RMB in both markets, the prices of CNY and CNH are quite close, with the average difference between CNY and CNH exchange rates against the US dollar within 6 basis points from 2010 to 2020. Our discussion below will mainly focus on CNY.

The evolution of RMB exchange rates has gone through several phases. Figure 11 plots the evolution of the exchange rates of CNY and CNH against the US dollar. During the era of planned economy (1949-1976), RMB exchange rates were pegged at highly overvalued levels. Since China opened its economy in 1978, the government took steps to allow its exchange rates to be more market oriented. From the early 1980s to 1994, RMB was slowly depreciated from CNY1.53/USD to CNY5.81/USD by the end of 1993, followed by an overnight depreciation of 33.3% to CNY8.72/USD on January 1, 1994. After a period of minor adjustments, RMB was maintained at a fixed rate of CNY8.28/USD until 2005.

On July 21, 2005, China switched from a fixed exchange rate regime to a "managed floating" regime, which sets a daily fixing rate (also called central parity) against a basket of currencies but allows some variation within a narrow band. The band was set to be 0.3% initially, and gradually widened to 2% on March 17, 2014. Since then, RMB gradually appreciated against the US dollar, reaching the peak of CNY6.04/USD in January 2014, and then started to reversed the trend.

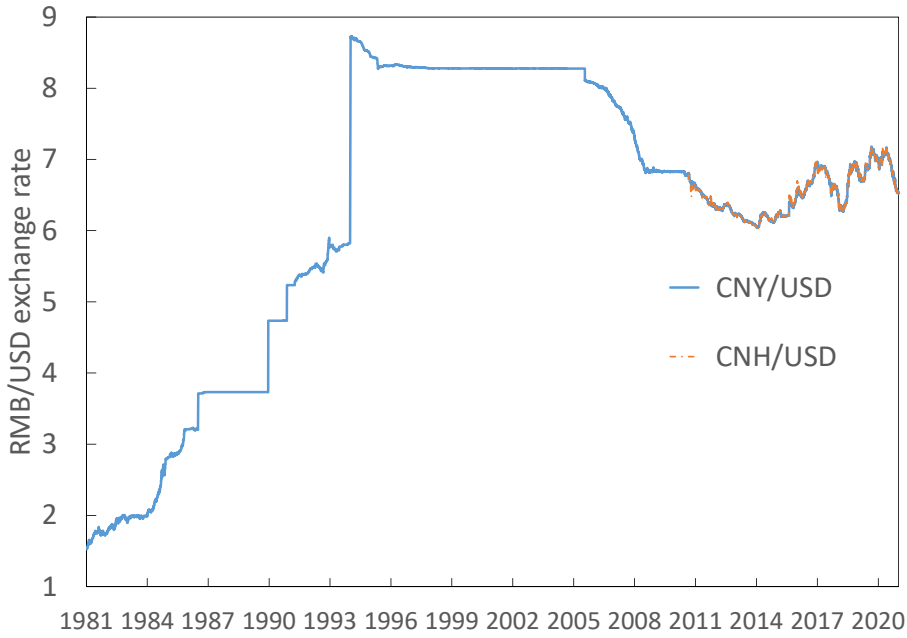


Figure 11: China / U.S. Foreign Exchange Rates (1981-2020). Source: Bloomberg.

In August 2015, PBOC added more transparency to its rate-setting policy, specifying the factors influencing its decisions, including the closing rates of the previous business day and the stability of RMB relative to the currency basket, the so-called two-pillar policy, and a later-added counter-cyclical factor. Since then, the RMB exchange rate has been fluctuating between 6 to 7 CNY per dollar.

8.2 RMB Under/Over-Valuation and Exchange Rate Policy

Given China's tight control over RMB exchange rates, many earlier papers have focused on their misalignment or the undervaluation of RMB. Goldstein and Lardy (2006) use the underlying balance approach and estimate that the RMB was undervalued by 20% to 40% in 2015. Frankel (2006) estimate that the RMB was undervalued by approximately 35% in 2000 and was by at least as much as that in 2006. Cheung, Chinn, and Fujii (2007), however, argue that there is little statistical evidence that the RMB is undervalued, using a framework based on the relationship between relative price and relative output levels. Yu (2007) estimate the market-implied realignment intensity of RMB, and find that this intensity has increased dramatically after February 2002. Despite different estimates on the undervaluation of the RMB, most literature agree that the *de facto* dollar-pegged exchange rate policy have outlived its usefulness for China.

Given thg opacity of PBOC's exchange-rate policy, many papers have tried to better

understand it. Early work such as Frankel and Wei (2007), Frankel (2009), and Sun (2010) find that the value of the RMB remained pegged heavily to the U.S. dollar after 2005, but have gradually switched a substantial part of the U.S. dollar weight to other major currencies. More recent work, including Clark (2017), Cheung, Hui, and Tsang (2018), McCauley and Shu (2018), find that the changes of the daily fixing is highly predictable and the US dollar index still plays a significant role after the 2015 reform. With regards to the stability against a currency basket, Cheung, Hui, and Tsang (2018) find no evidence of a rate-fixing role against the currency basket, and McCauley and Shu (2018) finds that the basket management period is mostly from February 2016 to May 2017. Jermann, Wei, and Yue (2021) construct empirical measures of the two pillars and find that they explain as much as 80% of the variations in the daily fixing rates and both pillars receive roughly equal weights in setting the fixing rates. They also develop a tractable non-arbitrage model of the RMB exchange rate under the two-pillar policy, which predicts the modification of the two-pillar policy in May 2017 when a discretion-based counter-cyclical factor was introduced.

8.3 Global Participation in China's Financial Markets

Under tight capital account controls, China's financial markets remain largely closed to foreign investors. Over the years, Chinese government has implemented several programs to gradually open these markets to cross-border investments, starting from the B shares market, to the establishment of the Qualified Foreign Institutional Investor (QFII) and RMB Qualified Foreign Institutional Investor (RQFII) programs, and, more recently, the stock and bond connect programs.

The Chinese B shares market was established in 1992 at the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), referring to shares of Chinese companies listed on the two exchanges but traded in foreign currencies, US and Hong Kong dollars, respectively. It was open originally only to foreign investors but later also to domestic investors since 2001. The B shares market experienced an initial growth period, with the total of listed companies on both exchanges reaching 109 in 1998 and then started to decline. Since 2000, no new B shares have been listed, and some B shares have been de-listed, with only 93 companies remain listed by the end of 2020, accounting for a tiny proportion of the Chinese equity market.

China established the Qualified Foreign Institutional Investor, or QFII, program in 2002 and the RMB Qualified Institutional Investor, or RQFII, program in 2011, to allow global institutional investors to invest directly in its domestic capital market. QFII allows invest-

ments with US dollars while RQFII allows investments with RMB. Institutions, however, are subject to approval on their qualifications and need to apply for investment quotas. The QFII program started with an initial maximum quota of USD 10 billion and the RQFII program started with an initial maximum quota of 20 billion RMB. Over time, China has gradually relaxed the eligibility requirements and the investment quotas for both programs. In September 2019, China removed the limit on the maximum investment quota for both QFII and RQFII. One year later, China announced that it will further relax the qualification requirements and expand the scope of investment asset classes under QFII and RQFII. As of May 2020, a total of 333 overseas institutions with QFII status and a total approved quota of USD 116 billion, and a total of 272 with RQFII status and a total approved quota of RMB 723 billion.[28]

Recently, China has launched several stock and bond connect programs mainly between the mainland and Hong Kong, which allow cross-border mutual access to each others' markets. The Shanghai-Hong Kong Stock Connect was launched on November 17, 2014, covering large-cap index component stocks listed on the Shanghai Stock Exchange and Hong Kong Stock Exchange. The Shenzhen-Hong Kong Stock Connect was launched two years later on December 5, 2016, covering large-cap index component stocks as well as small- and middle-cap stocks. By the end of 2020, the total cumulative net purchases of northbound funds through the two stock connect programs (overseas investors trading in the mainland market) reached 1.2 trillion RMB.

The bond connect program with Hong Kong was launched on July 3, 2017, initially only allowing northbound trading was allowed with no quota limit. The program has been warmly received. By December 2020, 2,352 institutional investors have registered under the program, and the monthly trading volume reached 447.8 billion RMB, mostly in Chinese Treasury bonds and policy bank bonds. The bond connect program has boosted the total foreign holding of Chinese bonds from 0.84 trillion RMB, right before the opening of the bond connect, to 3.33 trillion RMB by December 2020. On September 15, 2021, China announced that it will open the southbound trading (mainland investors trade oversea bonds) of the bond connect program.

While the market connect programs are relatively successful, foreign investment still account for only a tiny fraction of China's capital market. By the end of 2020, foreign investments in equities and bonds account for 3.41 trillion RMB and 3.33 trillion RMB,

[28]The total approved investment quotas of QFII and RQFII are not disclosed after May 2020.

respectively, representing only 4.3% and 2.8% of the overall market. The impact of China's financial markets' segmentation from world markets remain an interesting research and policy question.

The literature on the impact of China's financial liberalization programs has just recently begun to emerge. Given the data availability, many of these papers focus on the recent stock connect programs and find evidences that they lower the cost of capital of connected stocks and improve price informativeness. Chan and Kwok (2017), Ma, Rogers, and Zhou (2019), and Liu, Wang, and Wei (2021) document that the opening of the stock connect programs reduced the connected stocks' cost of capital, and attribute this to better risk sharing between domestic and foreign investors as well as the demand effect associated with the launch of the program. Tanling and Lu (2018) and Ma, Rogers, and Zhou (2019) find that connected stocks' prices are more informative after the launch of the China connect programs. Chen, Wang, and Zhu (2019) find that weekly changes in northbound shareholdings (from Hong Kong to Mainland China) have a cross-sectional predictive power for A-share returns, and present evidences that northbound investors are well informed about firms fundamentals, especially for firms with higher global exposure. Carpenter, Lu, and Whitelaw (2021) find that China's stock market prices have become more informative about future profits in recent periods, and show some weak evidences that QFII ownership is associated with higher levels of price informativeness.

9 Conclusions

In this paper, we have reviewed China's major financial markets, focusing especially on their development, their distinctive features, and the underlying circumstances. We have also discussed a growing literature studying these markets. Given the tight legal and regulatory environment, the government and its various agencies, rather than market forces, are the main drivers behind the development of these markets, governed by their policy objectives and constraints at the time and implemented with a cautious and experimental approach. As the result, financial market developments often fall behind the underlying needs of economic growth in facilitating efficient allocation of resources and risks. The structural design and development path of these markets are also dictated by the government's specific policy goals, including a strong desire to limit risk, which led to many of their unique features.

Such a process is less conducive to more organic growth of these markets, driven by the needs for the services they provide and their capacity to do so effectively. As China is seeking

a more efficient and sustainable growth path, a well-functioning financial market system can play a critical role in this endeavor. Much research is needed in identifying a path to develop such a system, given China's specific circumstances.

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