Financial Market Turmoil: Implications for Monetary Policy Transmission in China

Chengsi Zhang, Joel Clovis*

Abstract
The recent financial market turmoil has initiated another search for insightful understanding of the interactions between the financial market and monetary policy. This paper explores these interactions in terms of the transmission mechanism of monetary policy in China. We argue that evolving financial development, enhanced by the expansion of the financial market, has altered the conventional channel for monetary transmission in China. Analyzing marked changes in the financial landscape and taking into account policy regime shifts in China, the paper provides clear evidence showing that the financial market has become a new and important channel for transmission of monetary policy in China.

Key words: credit crunch, economic growth, financial crisis, monetary policy transmission
JEL codes: E58, F3, F31, F41

I. Introduction

The most recent financial market turmoil began in 2007, spurring massive reactions from central banks and generating money market turbulence. Since the onset of the financial turbulence, new monetary policy tools, including the Term Auction Facility, the Primary Dealer Credit Facility, the Term Securities Lending Facility, and the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility have been created by the US Federal Reserve System to cushion the credit crunch in the financial market. These interactions between the financial market and the monetary authorities have attracted much attention from academics. However, more studies are needed to discuss the wide range of monetary

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policy responses that may be considered in light of these significant financial disruptions. For example, how does a central bank maintain an appropriate policy stance in both the short run and the long run? How does a central bank fulfill its role as lender-of-last-resort in a global financial marketplace? How should the subprime lending boom–bust cycle affect central bank actions? What tools does the central bank need to address the credit crunch problem? Does the nationalization of AIG convincingly demonstrate that splitting the roles of monetary policy and financial supervision is a flawed strategy?

These questions have prompted both policy-makers and the private sector to reconsidering the dynamic interactions between government policies and financial market development. In line with this consideration, a small but growing number of studies have contributed to the literature in the directions cited above. For example, Borio (2008) suggests that a central bank should adopt a tightening stance even if near-term inflation remains under control. Demyanyk and Hemert (2008) use loan-level data to analyze the quality of subprime mortgage loans and suggest that the fluctuations of the subprime mortgage market follow a classic lending boom–bust cycle. Mian and Sufi (2008) show that the increases in demand for subprime mortgage-backed securities spurred the lending boom, and eventually led to the credit crunch problem, which spread through the US financial market and beyond. The results in Frank et al. (2008), in contrast, indicate that the sharp shift from lending boom to credit crunch is a result of the high volatility of market liquidity and funding liquidity across US financial markets during 2007. Brunnermeier and Pedersen (2009) further show that market liquidity and funding liquidity are mutually reinforcing, leading to liquidity spirals.

To date, the published literature has achieved a broad consensus that understanding developments in financial markets is an absolute prerequisite for monetary policy-making in both typical and extraordinary times.

However, an important yet under-researched factor is the transmission mechanism of monetary policy under the new paradigm of the financial market. In particular, it is important to examine how financial development, enhanced by the expansion of the financial market, has reshaped the conventional monetary transmission mechanism. Therefore, the present paper examines the implications of the financial market turmoil for monetary policy in China, with a focus on investigating whether the evolving financial market developments in China have induced vital changes in the transmission mechanism of monetary policy.

With this focus, we organize the paper as follows. Section II summarizes lessons for monetary transmission from the recent financial market turmoil. Section III investigates the important role of financial markets in the transmission mechanism of current monetary policy in China. This section documents the changes in China’s financial landscape over the past decade. Based on the analysis in Section III, Section IV proposes a new channel
for monetary policy in China in which the financial market itself becomes key in underpinning the transmission system. Section V provides concluding remarks and policy implications.

II. Financial Turmoil: Lessons for the Transmission of Monetary Policy

Financial turbulence has shown considerable potential to adversely influence the ability of central banks to control their monetary policy tools, which can pose a real threat to economic growth and, more generally, affect the transmission mechanism of monetary policy. Therefore, central banks around the world are deeply interested in tracing the developments of the 2007–2008 financial turmoil and its effects on the evolving global financial market integration.

In response to the heightened scrutiny and concern, monetary authorities have implemented both traditional and newly-created measures and initiatives to address severe problems prevailing in financial institutions. Whether these reactions of central banks to the current financial turmoil will be effective remains a matter of some debate in both institutional and private sectors.

Nevertheless, it is certain that lessons must be drawn from the interactions between the financial market and central banks during the recent financial turbulence. The existing literature mainly focuses on the lessons for credit crisis management of financial institutions and on central bank regulations of financial markets. However, the lessons for monetary policy transmission have yet to be fully explored. Therefore, in the present paper, we discuss the effects of the current financial turmoil on monetary transmission.

Monetary policy was persistently expansive in most industrial countries over the first half of this decade. This is particularly true of the interest rate-based measures of monetary policy stance. For example, US interest rates were exceptionally low during 2002–2005, induced by the mild recession in the US economy in 2001 and the devastating events of September 11 (see Figure 1).

The low interest rate policy reflects a significant, although temporary, monetary policy shift triggered by extraordinary events in the USA. According to the Monetary Policy Report to Congress by the Board of Governors of the Federal Reserve System in February 2001, the Federal Open Market Committee (FOMC) recognized signs of a moderation in the growth of economic activity and decreased the target federal funds rate (FFR) by 0.5 percentage points in January 2001. The Fed further lowered the FFR in subsequent months to prevent tightening

1 See the references cited in Section I.
Despite the FFR reductions, weakness in economic activity was still widespread, with the September 11 terrorist attacks exacerbating an already fragile economy. The Monetary Policy Report to Congress in February 2002 indicated that the economic fallout of the catastrophe led the FOMC to further cut the target FFR immediately after the attack. Consequently, the short-term interest rate was pulled down by nearly 5 percentage points from 6.4 percent in late 2000 to 1.8 percent by the end of 2001, and was held at this historically low level until 2005, in order to stimulate investment through cheap credit.

The low nominal interest rates also induced negative real interest rates: nominal interest rates adjusted for expectations of future inflation during 2002–2005. Figure 2 shows that the short-term real interest rates, measured by the effective federal funds rate and the 3-month Treasury Bill rate.
Treasury Bill rate, adjusted for future CPI inflation, remained negative for more than 3 years from the middle of 2002 (shaded area), followed by an upsurge after 2006.

These interactions between monetary policy and real economic performance appear to be in line with the conventional interest rate channel of the monetary policy transmission mechanism. The interest rate channel of monetary transmission has been much discussed in the economics literature over the past half century (Mishkin, 1995). The transmission mechanism of the interest rate channel can be characterized by a schematic diagram as in Figure 3 below.

According to the interest rate channel of the monetary policy transmission mechanism, the central bank adjusts the interest rate to influence firms’ (and households’) investment expenditure, which, in turn, leads to ups and downs in the real output of the underlying economy. This interest rate channel lies at the heart of the well-known IS–LM model, originated by Hicks (1937). Note that in Figure 3, we characterize the policy transmission channel as a transmission circle in which the changes in real output will further affect the policy-making of the central bank, as in the expansive monetary policy discussed above.

This traditional channel of monetary policy transmission, however, overlooks the impact of monetary policy on financial market development. In particular, protracted loose policy might induce an irrational boom in the financial markets. Indeed, it is the over-expansive monetary policy in the USA that contained the seeds of the overinflated subprime housing market and the consequent bursting of the speculative bubble.

The prolonged expansionary policy stance was accompanied by historically low risk premiums in financial markets. Consequently, the protracted low interest rates fostered financial market participants’ appetite for risk and contributed to the dramatic growth of credit aggregates through the financial market during monetary policy transmission. During the period of low interest rates (2002–2005), the values of securitized assets, such as collateralized debt obligations, collateralized loan obligations, and collateralized mortgage obligations in the subprime housing market, continuously increased, which stimulated irregular demand for these assets. The ever-higher demand further pushed up asset prices.

**Figure 3. Interest Rate Channel of Monetary Policy Transmission**
This was, however, not an unstoppable spiral. Prices ceased rising when US interest rates reverted to previously high levels after 2006.

Simultaneous to the rise of interest rates in the USA between 2005 and 2006, the interest burden of mortgages also rose and real estate prices were forced down, as indicated by both the S&P Case–Shiller 10-city composite (CSXR), a composite index of the home price index for the top 10 metropolitan areas in the USA, and the S&P Case–Shiller Composite Home Price Index, based on the residential real estate market in 20 metropolitan regions across the USA (SPCS20R). These two indices are shown in Figure 4.

With the sinking real estate prices, the prices and values of the collateralized assets in the subprime market also fell and serial default prevailed in the market, thus causing the financial players that engaged in the subprime game to witness huge losses and even bankruptcies.

The foregoing discussion is a sound reflection of the interactions between monetary policy and asset prices documented in the seminal work of Bernanke and Gertler (2001). However, lessons on monetary policy transmission from the current financial crisis should encompass more than just the question of how to deal with asset price bubbles. The development of financial markets must be incorporated in the central banks’ design of the monetary policy transmission system.

In effect, a policy-induced decrease in the short-term nominal interest rate leads to an instant decrease in longer-term nominal interest rates, as investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities, as indicated by the expectations hypothesis of the term structure of interest rates. In turn,

Figure 4. S&P Case–Shiller Home Price Indices:
January 2000 – August 2008

Source: Standard & Poor.
Notes: CSXR, S&P Case–Shiller 10-city composite index of the home price index for the top 10 metropolitan areas in the USA; SPCS20R, S&P Case–Shiller composite home price index based on the residential real estate market in 20 metropolitan regions across the USA.

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both institutional and private investors will seek higher risk premiums in the financial markets through new financial products. This will foster a financial market boom.

Furthermore, the sluggish reaction of monetary policy to the proliferation of the derivative products in the financial markets influences market participants’ risk perception in the following upturn of the economy. This is especially evident where monetary policymakers apply a risk management approach that asymmetrically lowers interest rates over and above what would be deemed necessary given the baseline outlook on inflation and economic growth.

A more symmetric method of monetary policy would take into account boom and bust episodes in the financial markets when formulating monetary policy, both in the short run and the long run. Given the policy relevance of financial market development, it is advisable for central banks to widen channels for monetary policy transmission mechanisms and to give the financial market more weight in the analytical framework of the monetary transmission system. Although such a framework would not eliminate financial market turbulence altogether, in the medium term to long term, it would do more to reduce damaging financial turmoil than a policy that merely uses aggressive interest rate tools to limit damage after the event.

III. Financial Market Developments in China

Since the end of the 1990s, remarkable changes have occurred in the financial landscape of China. These changes are reflected in many aspects of the financial market developments in the country. In this section, our discussion focuses on four major changes pertaining to the financial market developments; namely, financial institutions’, stock markets’, bond markets’ and insurance markets’ changes in sources and uses of credit funds. These changes are reshaping the conventional monetary policy transmission mechanism in China, as we will show in Section IV.

1. Sources and Uses of Credit Funds of Financial Institutions

Since 2000, financial institutions’ sources and uses of credit funds have changed considerably. In terms of sources, credit funds can be decomposed into total deposits, financial bonds, currency in circulation, liabilities to international financial institutions, and

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2 The financial institutions here include the People’s Bank of China, policy banks, state-owned commercial banks, other commercial banks, urban and rural commercial banks, rural cooperative banks, urban and rural credit cooperatives, financial companies, credit trust companies, lending companies, post office savings banks and foreign financial institutions.

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other items. Among these five main items, the role of financial bonds has become increasingly important, whereas the traditional source, bank deposits, appears to have weakened. Figure 5 shows this. It compares the ratio of financial bonds to total credit funds with the ratio of total deposits to total credit funds during 2000–2008. It is evident that the ratio of financial bonds has been steadily increasing from a remarkably low ratio of less than 1 percent before 2003 to approximately 4 percent in 2008. In contrast, a marked decline occurred in the ratio of total deposits to credit funds after 2006, with a magnitude of approximately 10 percent.

This structural change in the components of the sources of credit funds reflects, on the one hand, an active participation of investors (both institutional and private) in the conventional financial market. On the other hand, it also indicates an extension in the sources of financing for the financial institutions in China.

Indeed, the portfolio of financial assets of both households and institutional investors has progressively shifted away from traditional instruments, such as banknotes and deposits, to more sophisticated financial assets whose prices are more sensitive to market movements and credit risk. From a monetary policy perspective, the growing diversification of investors’ portfolios is especially relevant because they are increasingly correlated with the developments in financial markets.

From an investment perspective, the scenario here has also changed for the credit funds of the financial institutions. In particular, the ratio of total loans to total credit funds has followed a downward trend since 2000. However, the ratio of portfolio investment of financial institutions to total credit funds experienced dramatic upsurges in 2001 and 2008, with an interim period of decline over 2004–2007. This comparison can be observed in Figure 6. This change suggests that the financial market has broadened, not only in terms...
of the instruments available to investors, but also because of the creation and uses of financial derivatives, and because of innovations by financial institutions.

2. Stock Market Capitalization

Over the past decade, gross financial assets in China have grown rapidly. Based on the Shanghai Composite Index, stock market capitalization rose from less than 50 percent to nearly 300 percent of nominal GDP between 1996 and 2008, as shown in Figure 7. China’s stock market capitalization surpassed the country’s GDP for the first time in 2007, and again in 2008. Figure 7 also compares the ratio of stock market capitalization to GDP of China with that of the USA, the EU and Japan. The EU had the highest stock market capitalization ratio before 2006. Nonetheless, the underlying ratio of stock market capitalization to China’s GDP has been even higher than that for the other selected economies during 2007–2008.
The marked acceleration of stock market capitalization that has been observed in 2007–2008 reflects, on the one hand, the impact of market speculations spurred by excessive liquidity during the period (Zhang and Pang, 2008), and, on the other hand, the greater development of financial markets.

3. Bond Market Developments

Traditionally, China’s banking system has been the main source of external corporate financing, and much has been done to reform the system through the transfer of nonperforming bank loans to specialized asset-management corporations and, recently, through initial public offerings by major banks in China. The banking system alone, however, might not be able to provide efficient capital allocation because it is still at an early stage in its development compared to, say, the European banking system.

Therefore, the bond market provides an alternative channel for firms to borrow. Although still at a relatively early stage in its development, the bond market has been present for more than 20 years in China. Currently, the bond market in China contains three broad categories of bonds: enterprise bonds, treasury bonds and government bonds (see Figure 8). Enterprise bonds and government bonds can be divided into further sub-categories of bonds, which have all witnessed steady development since 2000.

Hence, with the recent developments in the bond market, the set of corporate finance instruments used by firms in China has been broadened. The issuance of corporate bonds and financial bonds, in particular, accelerated rapidly after 2005, as shown in Figure 9. The marked acceleration that has been observed in both corporate bonds and financial bonds reflects the greater availability of funds for firms from bond market development. Firms might want to finance their businesses in the bond market rather than in the traditional banking sectors because of the cost advantages available in the bond market.

**Figure 8. Bond Market Structure in China**

![Diagram of bond market structure in China]

*Source: Chinabond (2008).*
The development of the bond market is also reflected in changes in the structure of its components. According to Chinabond (2008), the percentage of Treasury bonds and government bonds in overall issue in 2008 decreased by 5 percent from 2007, whereas the percentage of corporate bonds increased by more than 37 percent in the same period. These developments open up for both firms and financial institutions the possibility of unbundling various risks and allocating them among a multitude of investors. This is one of the more important aspects of the broader financial market development.

4. Insurance Market Developments

The insurance market, as an indispensable component of most modern financial markets, is one of the fastest developing markets in China. Since 2000, the pace of development of the Chinese insurance market has been remarkable. The successful dual listing of market leader China Life on the New York and Hong Kong Stock Exchanges in 2003 highlighted the emergence of the Chinese insurance market in the world arena. To date, there are five Chinese major insurance companies successfully listed in domestic and overseas markets.

Over the past 8 years, insurance premiums in China have grown by more than 20 percent annually. Figure 10 plots the year-on-year growth rate of insurance premium income in conjunction with the 12-month moving average during the period 2000–2008. The figure shows that the insurance premium income experienced the highest annual growth over 2002–2003, and steadily increased after 2005, with an especially large upsurge after 2007.

The developments in China’s insurance market are enhanced by a regulatory framework that has become more supportive over the most recent decade, and that provides insurance companies greater flexibility to pursue both business and investment. For example, the
The government has allowed insurance companies to increase the proportions of assets they hold in domestic equity markets. This change is part of a government effort to broaden the scope of investment channels for insurers, who previously had to keep a large proportion of their assets in low-yield bank deposits.

Figure 11 compares the ratio of portfolio investment to total assets of insurance companies with the ratio of bank deposits to total assets over 2000–2008. The former ratio surpassed the latter in 2005, and maintained an upward trend thereafter. In contrast, the ratio of bank deposits to total assets of insurance companies has been decreasing since 2005, with a total reduction of up to 20 percent within 3 years.

In essence, these developments in the insurance market have increased the participation...
of insurance companies in the financial market. As increasingly important financial market players, Chinese insurers have become significant drivers of innovation in a broad range of financial markets. In this sense, the developments in the insurance market also reflect developments in broader financial markets.

**IV. Financial Market Channel for Monetary Policy Transmission in China**

**1. Basic Structure**

In China, the interest rate channel of monetary policy transmission described in Figure 3 is blurred because of the lack of market interest rates. Geiger (2008) describes interest rates as an indirect instrument for monetary policy in China. The direct instrument, however, is the so-called quantity-based tool by which the Peoples’ Bank of China (PBOC) controls the money and credit supply to banks. The quantity-based instrument is implemented in conjunction with the policy of “window guidance,” which took effect in 1998, to adjust money supplied to banking institutions.

Subject to changes in the money supply from the PBOC, banks will adjust credit funds available to firms for their investments and, in turn, real output will be affected by the corresponding changes. The changes to real output will also cause changes in inflation. In response to the changes both in real output and inflation, the central bank will then re-adjust its policy tools to correct the money supply. As such, the monetary authority achieves its policy transmission objective. Figure 12 characterizes this conventional channel of monetary transmission in China.

However, financial market developments have the potential to greatly modify the conventional transmission mechanism of monetary policy. Indeed, the developments in financial markets described in Section III have been reshaping the speed and strength of

*Figure 12. Conventional Monetary Policy Transmission Mechanism in China*
the conventional channel of monetary policy transmission in the Chinese economy.

The remarkable financial market developments of the past decade have brought a wider range of new financial products and businesses, greater competition among financial institutions, more participation of new market players, and wider credit sources for firms and households. These developments have broadened the range of financial market participants’ activities, shifted their reactions to monetary policy shocks, and have potentially changed the monetary policy transmission mechanism in a number of important ways.

First, increased competition in the banking sectors, with enhanced availability of alternative capital market based instruments for financial investment, has possibly accelerated the effects of monetary policy changes on bank interest rates. As financial markets become more liquid, changes in official interest rates are more likely transmitted to the whole term structure of interest rates and, more generally, to financial asset prices. In turn, monetary policy more easily affects real output through the cost of investment financing and the return on savings, as firms can use a wider range of financing opportunities and households’ portfolios are more diversified.

Second, although financial market development can accelerate the transmission of monetary policy decisions through the term structure and broader asset prices, they are also likely to weaken the bank lending channel of monetary policy. This is because the developments in financial markets have led to broadened borrowers’ financing options and, hence, reduced their dependency on traditional bank lending. In the past, a decrease in policy rates, for example, tended to increase banks’ credit supply, which would then affect borrowers that depend on bank lending for external financing. However, the developments in financial markets, in particular the greater availability of financing options, enable firms and other borrowers in China to seek credit financing in financial markets. As a consequence, the bank lending channel is likely to be weakened.

Third, the preceding two points imply that the impact of monetary policy through the financial markets is more relevant to the monetary transmission mechanism in present China in comparison to the past decade. In particular, the PBOC can now affect a whole range of asset prices not merely by means of actual decisions on the policy rates but also by providing signals, as communication with the market regarding their intentions. Recent research by Blinder et al. (2008) suggests that communication can be an important and powerful component of a central bank’s toolkit in monetary policy transmission. Through communication with the market, a central bank can move financial markets and enhance the predictability of monetary policy decisions. Such communication can help central banks to achieve their objectives.

Because asset prices also reflect expectations regarding other economic variables
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(Stock and Watson, 2003), it might be difficult for the PBOC to identify the specific impact of monetary policy actions and announcements. Therefore, the PBOC and the other relevant authorities should scrutinize and supervise developments in financial markets in China. As surmised from the 2007–2008 financial turmoil, overdevelopment of the financial markets can induce seriously negative effects on monetary policy transmission to the real economy. In particular, moral hazard and speculation activities might be spurred by financial market expansions, both in size and securitization. In extreme cases, both banks and non-bank lenders are able to attract large amounts of external funds and to securitize their existing loans. The prices of the securitized assets ultimately depend on their perceived creditworthiness, which is influenced by cyclical developments and also by monetary policy changes. In turn, funding conditions will be reflected in the cost and availability of credit to final borrowers. The recent credit crunch spreading across the world is a serious reminder of this possibility.

2. Empirical Evidence

In the preceding subsection, we discuss the possible modifications of the traditional monetary transmission mechanism in China resulting from the rapid financial development over the past decade. However, to clarify to what extent and in which direction the financial development in China has affected its monetary transmission mechanism, we provide some further empirical evidence.

The empirical analysis is based on the fact that quantity-based monetary instruments (money supply) remain the most important means by which the PBOC intends to fine-tune real economic development (Burdekin and Siklos, 2008; Geiger, 2008). Price-based instruments (i.e. short-term interest rates), the main monetary policy tool used by leading central banks in most developed countries, particularly in the USA, did not gain much weight in the policy profile of the PBOC until 2000. For comparison purposes, however, we consider the China interbank offered rate (CHIBOR) as a possible instrument of monetary policy in China in the following analysis.

Specifically, in two exercises, we explore the impact of financial development on the traditional channel of monetary policy transmission. The first exercise investigates

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3 To further promote the development of market-based interest rates and to improve the monetary policy transmission system, the Shanghai Interbank Offered Rate (SHIBOR) was launched by the PBOC and commenced operation in January 2007. This operation marks a new beginning for China’s market-determined interest rate mechanism. The SHIBOR system may become a new standard for the money market and eventually replace the central bank’s benchmark lending rates, and could supersede the bond repurchase rates as the basis for money market pricing.
correlations of the growth rate of real GDP (denoted $RGDPGR$) with the traditional policy instruments and a measure of financial development. The second exercise compares impulse responses of real GDP to shocks associated with the policy instruments and financial development. By construction, if financial development, enhanced by the expansion of the financial market, has indeed altered the conventional channel for monetary transmission, we would expect to observe a substantial role of financial development in both exercises.

Prior to the empirical investigations, we need to construct a good measure for financial development. In the published literature, the ratio of money stock to nominal GDP (NGDP) is often used to proxy financial development. However, this proxy might induce an interpretation problem for developing economies because such money stock proxies measure the degree of monetization rather than that of financial development. For the early stages of financial development, when financial intermediaries were mainly banks, money stock can be used as a reliable proxy to measure the extent of financial development; however, as the financial system evolves, the use of money stock alone becomes inappropriate, especially with the emergence of diverse types of financial institutions.

Therefore, we construct a financial credit ratio (denoted $FINANCIAL$) of quarterly frequency as our measure of financial development. It equals the value of domestic credit by all financial institutions in China divided by nominal GDP. This measure incorporates the domestic credit of most financial institutions in China and, hence, provides a better indicator for financial development than domestic credit provided by the large commercial banks alone. Although a measure with a focus on private credit, as in Beck et al. (2000), might be more appealing, it is hard, if not impossible, to construct quarterly time-series data for such a measure in our analysis.

In addition, unlike the existing published literature that uses annual data, we use quarterly data and carefully deflate our financial development statistics. Specifically, nominal GDP is measured over the period, while financial stock items (total credits of all financial institutions in China) are measured at the end of the period. It is worth noting that simply dividing financial stock items by nominal GDP, as is commonly done in the literature, can produce a misleading measure of financial development. A plot of our measure of financial development in conjunction with the year-on-year growth rate of the real GDP ($RGDPGR$) is shown in Figure 13. The figure provides a very interesting scenario, showing that the co-movement between $FINANCIAL$ and $RGDPGR$ increases considerably after 2000, with $FINANCIAL$ leading $RGDPGR$ in most periods.

Based on this construction, we carry out the first exercise by investigating the simple

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4 The data for domestic credit and GDP are from the PBOC and the National Bureau of Statistics of China, with the former available from 1997 to 2008 and the latter from 1992 to 2008.
correlations of \( \text{RGDPGR} \) with traditional policy instruments and \( \text{FINANCIAL} \) over different sample periods. The results are summarized in Table 1, in which we compare the correlations before 1997, over 1998–2008 and over 2000–2008. The first two rows of Table 1 show that the correlation between \( \text{RGDPGR} \) and the growth rate of money stocks after 1998 was much lower than that pertaining to the period before 1997. The level of the reduction in the correlation is generally large, with the one corresponding to \( \text{M2GR} \) being reduced by 36 percent and \( \text{M1GR} \) being reduced by more than 50 percent. In the 2000–2008 sample, the

![Figure 13. Growth Rate of the Real GDP and the Measure of Financial Development](image)

**Source:** People’s Bank of China, National Bureau of Statistics and the authors’ calculation.

**Note:** NGDP, nominal GDP.

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<tr>
<td>( \text{M2GR} )</td>
<td>0.755</td>
<td>0.476</td>
<td>0.430</td>
</tr>
<tr>
<td>( \text{M1GR} )</td>
<td>0.658</td>
<td>0.310</td>
<td>0.163</td>
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<tr>
<td>( \text{CHIBOR3M} )</td>
<td>NA</td>
<td>−0.508</td>
<td>−0.263</td>
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<tr>
<td>( \text{CHIBOR1M} )</td>
<td>NA</td>
<td>−0.341</td>
<td>0.238</td>
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<tr>
<td>( \text{FINANCIAL} )</td>
<td>NA</td>
<td>0.440</td>
<td>0.452</td>
</tr>
</tbody>
</table>

**Source:** The authors’ calculation.

**Note:** NA indicates that the corresponding data are not available over the period.

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5 The policy instruments considered here are growth rates of M2 and M1 (denoted \( \text{M2GR} \) and \( \text{M1GR} \)), and 3-month and 1-month CHIBOR (denoted \( \text{CHIBOR3M} \) and \( \text{CHIBOR1M} \)). The data for CHIBOR span 1997–2008 while the data for money stocks span 1992–2008 in our analysis, dictated by data availability. The correlation is measured using the correlation coefficient.
reduction of the correlations between the growth rates of money supply and the growth rate of the real GDP is more pronounced. This decreasing pattern of correlations is also observed for the short-term interest rates (i.e. CHIBOR3M and CHIBOR1M). In contrast, the correlation between RGDPGR and the measure of financial development appears to be increasing steadily. As can be seen from the bottom row of Table 1, the correlation between RGDPGR and FINANCIAL is 0.440 over 1998–2008 and increases slightly to 0.452 over 2000–2008.

The baseline finding that financial development becomes increasingly correlated with the real economic growth shown in Table 1 is reinforced by a rolling correlation analysis. Figure 14 illustrates 6-year (i.e. 24-quarter) backward rolling correlations between RGDPGR and M2GR, CHIBOR3M and FINANCIAL (note that the effective observations for each pair of variables in the rolling correlations are dictated by the data availability described in footnote 5). The correlation between FINANCIAL and RGDPGR witnessed a dramatic jump over the period starting in 2004, and continued to strengthen afterwards. Despite a gradual decline in correlations for all three cases, the correlation pertaining to FINANCIAL remains predominant, which again indicates that financial development becomes more relevant to real economic growth after 2000.

Our second exercise compares different impulse responses of the growth rate of real GDP to shocks in traditional policy instruments and the measure of financial development over 1998–2008. This investigation is based on a reduced-form vector autoregressive (VAR) model, which can be written as

$$Y_t = C + \Phi(L)Y_{t-1} + \epsilon_t,$$

(1)

where $Y_t$ is a vector containing RGDPGR, CPI inflation, M2GR, and FINANCIAL; $C$ denotes
a vector of constants, $\Phi(L)$ denotes a vector polynomial of a lag operator with optimal lag order determined by the Akaike Inflation Criterion; and $\varepsilon$, is assumed to be vector Gaussian white noise ($VGW$); namely,

$$\varepsilon \sim VGW(0, \Sigma).$$  \hspace{1cm} (2)

This multivariate dynamic model mimics the standard monetary policy analysis framework (as in Stock and Watson, 2002), and appears to capture the dynamics involved in the monetary policy transmission mechanism for China.

To assess the role of interest rates in the monetary transmission system, we also estimate an alternative VAR model, with $M2GR$ being replaced by $CHIBOR3M$. In addition, we go further by extending the alternative VAR models to incorporate the effective exchange rate, to replace $M2GR$ with $M1GR$, and to replace $CHIBOR3M$ with $CHIBOR1M$. Because our baseline finding is robust to all of these sensitivity examinations, we focus on the results found using $M2GR$ and $CHIBOR3M$ as traditional policy instruments.

As our main objective is to investigate to what extent and in which direction financial development has influenced the traditional monetary policy transmission mechanism, we compute orthogonalized impulse response functions (IRF) of $RGDPGR$ to the shocks associated with policy instruments and $FINANCIAL$. By definition, the orthogonalized IRF produce IRF of structural shocks implied by the reduced-form shocks in Equation (1). The underlying computations of the IRF are then based on standard Cholesky decomposition. The results of the various IRF are reported in Figure 15.

Figure 15(a) compares the impulse responses of $RGDPGR$ to $M2GR$ and to $FINANCIAL$. It clearly shows that $RGDPGR$ is more responsive to $FINANCIAL$ than to $M2GR$, both in magnitude and duration. Figure 15(b) shows that $RGDPGR$ actively responds to

Figure 15. Impulse Response Functions of $RGDPGR$ to Policy Instruments and $FINANCIAL$

Source: The authors’ calculation.

Interestingly, this graph suggests that the impulse response of $\text{RGDPGR}$ to $\text{CHIBOR3M}$ is also striking (the negative response shown in the graph is consistent with the fact that a positive shock pushing up interest rates tends to dampen investment and, in turn, reduce economic growth). This indicates that the role of interest rates in China’s monetary policy transmission mechanism is also important over the most recent decade, which provides support for interest rate marketization in China.

Taken as a whole, the developments in financial markets in China have indeed reshaped its conventional monetary policy transmission mechanism. The financial market channel has entered the policy transmission system. Figure 16 attempts to summarize the foregoing descriptions of the financial market channel of monetary policy transmission. The figure shows the interactions between the central bank, the financial market, and real economic performance. Within this transmission system, bank lending is not only affected by policy rates (or simply by money supply), but also by financial market developments, indicating the important role of the financial market in monetary policy transmission in China.

**V. Conclusions and Policy Implications**

Since the eruption of the US subprime turmoil in 2007, research has been focused on the causes and/or cures of the severe credit crunch prevailing in the world market. Little research has been designated to exploring potential changes to the conventional monetary policy transmission mechanism. This paper brings this issue onto the research agenda and shows that financial market developments over the past 10 years have significantly reshaped the
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At issue, among other things, is the important role of the financial market in the policy transmission system. Indeed, monetary policy in China is now conducted in a world characterized by a relatively high level of financial market development and integration, and, hence, a high degree of financial complexity. In turn, the interaction between monetary policy and economic development in the real sector takes effect not only through the traditional tools of interest rate adjustment and quantitative control in conjunction with “window guidance,” but also by means of financial market development.

This implies that the PBOC should be cautious in using stylized macroeconomic models when applying monetary policy in both normal and extreme times. The new Keynesian models of monetary policy analysis described in the seminal work by Clarida et al. (1999) and by Zhang et al. (2008, 2009), for example, must be modified to accommodate the financial market channel when applied to characterizing the monetary policy transmission mechanism in China, and possibly other countries.

References

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(Edited by Xiaoming Feng)