Monetary Policy and Macrocontrol in China:
The Actual Impact of Window Guidance

Job Market Paper

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Abstract

Have market-oriented instruments replaced quantitative controls in the implementation of the monetary policy in China, as the monetary and financial reforms enacted in 1998 intended? To answer this question, I make two estimations with an error correction model specification: first, over the sample period of 1952-2006, I test the role of credit in the determination of the money demand and aggregate output, a factor that the literature has ignored. Second, I investigate the determinants of credit volume over the available sample period of 1985-2007. The results indicate that (i) the money demand and aggregate output are determined by credit rather than by interest rates; (ii) interest rates do not play a role in determining credit availability while a proxy for quantitative control is found to be significant. These results show that China's current monetary policy regime is not significantly different from that of the pre-reform period and that the monetary policy is still reliant on quantitative controls. This finding is contrary to official Chinese statements. Finally, I find (iii) a low impact of administrative control over credit, which suggests that the effectiveness of moral suasion is limited.

1   Introduction

This paper questions the claims of the Chinese authorities that market-oriented policy instruments have replaced the overall credit quotas in the operation of the monetary policy. Officially, direct credit quotas were abolished in 1998 and the monetary policy package was supplemented by policy instruments based on price signals (e.g., central bank lending and deposit rates, discount and rediscount rates, open market operations). However scholars have suggested that the People's Bank of China (PBC) has not been able to enforce the 1998 reforms and actually still monitors the credit operations of banks (Ikeya, 2002, Green, 2005, Geiger, 2006, Laurens and Maino, 2007). This would be done through the practice of *window guidance*, which is, as defined by Ikeya (2002), "[...] more than a guidance. Despite its soft image, there has not been a case in which a bank refused the guidance, as PBC is also the banking supervisory authority and has a great influence on banks. PBC meets officers from commercial banks monthly to check whether the operation of banks is in line with the plan and, if necessary, to give banks additional or adjusted guidance. Therefore, this system is a mechanism to control credit creation by banks." This description differs from the official PBC statement: "The role of policy guidance is to advise financial institutions to appropriately control credit expansion and improve the loan structure. [...] Financial institutions will be advised [...] to rationally issue loans [...] accordingly to the need of the real economic sectors." (PBC quarterly monetary policy report, 2005, first quarter).

In order to examine which statement captures the real practice in China, I proceed in two steps. First, I estimate the demand for money and the aggregate output in an error correction model specification by taking into account the role of credit, a factor that the literature on demand for money in China has ignored. In a stable estimation over the 1952-2006 period, I find that credit has played a crucial role in the determination of the demand for money and the aggregate output whereas the interest rate is found to be not significant. This means that credit is still a key channel in the transmission of monetary to real dynamics. The obvious next question is, what determines the volume of credit? This is answered with a second estimation using the same error correction model specification. I propose a novel proxy for direct control to assess its relative influence on credit versus that of market-oriented instruments, captured through the interest rate. In a stable estimation over the 1985-2007 period, I find that direct control is a key variable in the determination of credit quantity while the interest rate is not significant. This means that banks' credit operations are still directly monitored by the PBC. This finding as well as the methodology used here are new contributions to the literature. Consequently, because of findings that credit channel is crucial to money demand and real output and that credit is influenced by direct control exercised by the PBC, I conclude that the PBC's statement does not describe real practices in China. Finally moral suasion is found to have a low impact on credit given given that it is estimated to reduce credit by only 15%. This suggests that the effectiveness of administrative control is limited.

By adopting a structural approach within the theoretical IS-LM framework and by taking into account the role of credit, this study leads to a better understanding of the impact of monetary policies onto monetary and real dynamics in the Chinese economy than provided by previous empirical works based on the sole estimation of demand for money in China (Yu, 1997, Chen, 1997, Hasan, 1999, Gerlach and Kong 2005 and Mehrotra, 2006). It provides evidence that the transformation of the monetary policy and financial sector governance in China lags behind the reforms undertaken in the real sector. In addition, it shows that the PBC cannot rely on window guidance to enforce an effective monetary policy. It suggests important macroeconomic implications, such as the effect of poor financial intermediation of monetary transfers coming from the buoyant trade surplus and foreign direct investments. It also suggests that concerns about the bad loans in the banking sector may re-emerge. Finally the weak allocation of capital may result in a decline in the total factor productivity in the long run.

The next section provides an institutional analysis of the development of the monetary policy in China. Section 3 presents a short literature review of the empirical work dealing with monetary dynamics in China. Section 4 presents the empirical methodology and analyzes the data. Section 5 presents and interprets the results of the estimation and final section summarizes the findings and concludes the paper.

2 Institutional background and monetary transformations during the Chinese reforms

Prior to 1978, money was issued in China to meet the needs of the centrally planned economy. It was separated in two different circuits. On one hand, household-consumer transactions were settled in cash only and injection of cash into the economy was under the supervision of the cash plan[2]. On the other hand, inter-enterprise transactions were cash-less and producer goods were purchased only through bank transfers. Credit was extended on the basis of the production plan and was thus supposed to grow along with output. There was no financial market, only financial intermediaries between the State on one hand and households and firms on the other hand. Money was simply channelled through the only state bank, the PBC, which was a subordinate of the Ministry of Finance, to finance the physical production plan. This monobank system allowed the channeling of savings to the sectors targeted by the five-year and annual plans[3]. In such a system where production and money were planned, prices were determined by the state. In sum, loans were not constrained by deposits and creation of money financed a part of the credit per the instructions of the plan (Feltenstein and Farhadian 1987, Peebles 1992, Holz 2000).

After 1978, the transition to a market economy and the introduction of flexibility in the allocation of resources required reforms of the monetary and financial institutions. The objective was to progressively pave the way for money to play a standard role in

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[2]Checking accounts did not exist.

[3]Depositors were generally taxed through negative real interest rates.

price determination and resource allocation. As a result, the monobank was progressively dismantled. Originally departments in the PBC or the finance ministry were turned into a network of four state-owned specialized banks (SOB)[4]. In 1983, the PBC became the central bank. A credit plan was introduced to match funds sources with funds usage.

However, the reform did not lift significant controls on the issuing and use of money and resource allocation remained tightly controlled by the government. The Financial and State Planning Commission determined the allocation of credit by volume, sector and province. The PBC was required to comply with volume targets and credit allocations set by the Plan through the four SOB, which channelled credit to the state-owned enterprises along their specialized sectorial lines. By 1994, the so-called "policy loans" provided by the four SOB to meet the Plan accounted for 40% of their loans (Cheng and Cheng, 1998). The ambitious economic growth and investment targets set by the State Planning Commission problematically did not match the deposit base of the banking system. As a consequence, the PBC had to cover what the budget and bank funds could not. Any credit granted was discretionary and financed in the last resort by the PBC. To provide the missing funds, the PBC recycled a part of the required and excess reserves deposited by the banks, 13% and 5-7% of bank deposits, respectively (Montes Negret, 1995)[5]. In sum the transmission of the Chinese monetary policy to the real activity consisted of liquidity provided by the central bank to state-owned banks, which subsidized state-owned enterprises through negative interest rate. After 1983 and until 1998, the role played by the PBC could be considered as fiscal rather than that of a monetary authority (Cheng and Cheng, 1998).

This resulted in excess lending, high ratios of non-performing loans in the banks' balance sheets, a general loss of monetary control and a pro-cyclical role for credit expansion: periods of lax demand-driven credit expansion, in 1984-85, 1987-88 and 1992-93, were followed by austerity programmes in 1986, 1988, 1989 and 1994, which caused the stop-and-go cycle that characterized the Chinese economy in the 1980s and early 1990s.

The cyclical growth pattern and the poor state of banks' balance sheets made it necessary to strenghten the ability to control the creation of money. In 1993, a new set of reforms was initiated with the double objective to turn the SOB into independent commercial banks and make the PBC truly independent. A first step consisted of the separation of policy operations from the SOB through the establishment of three policy banks responsible for providing long-term capital investments to the priority sectors (Cheng and Cheng, 1998)[6]. This move was enacted by the Commercial Bank Law in 1995. In addition, nine prudential ratios were introduced in 1994 to improve the overall asset and liabilities management of

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[4]The Agricultural Bank of China and the Bank of China (1979), the People's Construction Bank (1983) and the Industrial and Commercial Bank of China (1985).

[5]As a consequence, the reserves of the banking system played two opposing roles depending on the stance of the monetary policy: a standard role of withdrawing money from circulation when the monetary policy stance was tight and an opposite expansive role when the stance was at ease.

[6]The State Development Bank of China was responsible for key capital investments; the Import and Exportation Bank of China for providing funds for the export of machinery, electric and electronic goods and equipment; the Agricultural Development Bank for financing agricultural purchases and storage and poverty alleviation (see Cheng and Cheng 1998).

the financial system; they were to be followed by the entire financial system, including banks and non-bank financial institutions.

Last, the suppression of the credit plan was the cornerstone of the reform to allow the SOB to gain discretion in their allocation decisions and the PBC to become independent. Officially, direct credit quotas were abolished in 1998 and the monetary policy package was supplemented by indirect instruments based on price signals that would change bank and enterprise incentive. Theu included lending and deposit rates (both limited within a floating margin), discount and rediscount rates, the price at which banks could borrow capital from the central bank, reserves requirements, which determine the amount of money banks have to hold on deposit with the central bank and open market operations (OMO), designed to influence the money supply through a variation of the central bank's assets. The credit ceilings were to be eliminated and the money supply became the single intermediate target.

However, the PBC faced impediments in implementing these indirect policy instruments. OMO and the rediscount rate have had limited impact on the reserve rate and the liquidity of commercial banks, the monetary base and money issues since they were implemented. The inefficiency of the OMO resulted from the poor development of the Chinese public bond market of which the supply, in terms of term structure and amount, is not attractive to the banking sector (Liu and Xie, 2006). In addition, the banking system has been flush with liquidity, resulting from the buoyant trade surplus and has had no need to borrow money from the central bank (Green, 2005). Hence, we would expect banks and firms to have low sensitivity to the interest rates.

Despite the statement from the Chinese monetary authorities that the interest rate policy and open market operations are now the main channels of the money supply (Xie, 2004), it has been suspected that reserves requirements, instructive credit plans and window guidance are more than complementary instruments (Ikeya, 2002, Green, 2005, Geiger, 2006, Laurens and Maino, 2007). In practice, the PBC extensively used minimum reserves requirements while not relying much on interest rates[7]. This may result from the fact that the central bank came up against the obstacle of the weak influence of OMO and interest rates on banking sector allocation decisions. Consequently, the central bank may still desire to keep control of monetary aggregates through the credit multiplier effect in enforcing a thorough control of the credit supply. According to Cheng and Cheng (1998), even after the enforcement of the Commercial Bank Law, the SOB's choice in selecting borrowers remained seriously constrained. A major part of the loans provided by the SOB to state-owned enterprises should actually be classified as policy loans. In addition, the authorities published a notice and organized three meetings with representatives of the banking sector during the summer of 2003 to limit credit expansion in the real estate sector (Geiger 2006). Therefore the SOB network still seems to be responding to central bank directions. The central bank, in turn, remains subordinated to the central government.

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[7]The Central Bank's interest rates were changed four times between 2003 and 2007 while the reserve requirement were modified five times in three quarters in 2006.

PBC and bank representatives meet on a monthly basis and the guidance they are given may actually imply volume and sector targets. Indicative credit plans are enforced through the so-called *window guidance,* which should be understood as moral persuasion through either formal statements or private talks (Geiger, 2006, Green, 2005, Ikeya, 2002, Liu and Xie, 2006)[8].

In sum, until the credit plan was officially abandoned in 1998, nominal income was regulated through an exogenous control on total bank credit instead of on the money supply. As credit targets were underfunded and actually financed through liquidity injection into the economy, the regulation implied an acceleration of inflation, which was curbed through a drastic reduction in the credit supply. It led to the typical stop-and-go cycle that characterized the Chinese economy in the 1980s. Since the reform of monetary procedures in 1998, the money supply became the single intermediate target and indirect policy instruments officially replaced credit quotas in the operating procedures of the Central Bank. However standard monetary transmission mechanisms were difficult to implement in China particularly interest rates, to reach the monetary policy targets. The task ahead is to test empirically these observations. To establish an empirical strategy, the next section reviews the findings of previous empirical surveys on monetary dynamics in China.

3 Literature review and empirical strategy

Annual money and output data have been available in China since 1952. However the application of the quantity theory of money and the neoclassical description of consumers' behavior to China before 1978 is questionable given that prices, output and money were under government plans. Peebles (1992) criticized Chow's interpretation of the finding of a stable statistical relationship between money, income and prices before 1978 through the quantity theory of money (Chow, 1987). Peebles (1992) argued in turn that both monetary growth and price variation were driven by the planner's reactions to excess demand in the goods market. In the same vein, Fehltenstein and Farhadian (1987) related monetary dynamics to shortages in the goods market[9].

After these pioneering works, subsequent authors have applied the new cointegration methodology to Chinese data and limited their investigation to the estimation of a demand for money (Hasan and Taghavi, 1996, Yu, 1997, Chen, 1997, Hasan, 1999, Gerlach and Kong 2005 and Mehrotra, 2006)[10]. These did not take credit into account and thus ignored the role that it may have played in both monetary and real dynamics highlighted in the institutional analysis. I integrate the real dynamics of the economy by estimating an

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[8]Window guidance is PBC's terminology and is a translation of a Japanese expression because Japan used a similar process until 1993. The expressions *moral suasion* and *jawboning* are synonimous (Geiger, 2006).

[9]They assumed the existence of a true or implied price index beside the official one, which reflected shortages in the goods market. They estimated this price index, used it in a regression of the consumer demand for cash balances and found a stable statistical relationship.

[10]Hasan and Taghavi (1996) is the only study to find no evidence for a cointegration relationship.

aggregate output equation as well as all credit into my model to determine the importance of the credit channel. I estimate the model over the 1952-2006 sample period in order to determine the effect of the successive reforms detailed in the institutional analysis with the required caution regarding interpretation of prior-to-1978 results.

To my knowledge, Dickinson and Liu (2007) only, have recently investigated the role of credit. They tested the effect of interest rates and the quantity of credit on real activities in a vector auto-regressive (VAR) specification and checked for the presence of structural changes over the 1984-2005 sample period. They found that bank lending had a lower impact on income after 1989 while interest rates were becoming more significant, consistent with the official PBC statement. However, they adopted an approach open to criticism due to its non-structural features, which do not allow us to interpret the results rigorously inside a theoretical framework. I propose to test the impact of credit on money demand and real output in a structural, cointegrated, error-correction model based on the theoretical IS-LM framework. The reduced form of the model adopted in the subsequent econometric estimation follows Johansen and Juselius (1992).

Before proceeding, it is worth noting some important findings common in previous works that may need to be checked. While the successive reforms raised the possibility of structural breaks in the regression, notably, all previous estimations of the demand for money, except one, do not reject stability. Adding together all overlapping periods of the previous works demonstrates that there is no evidence of instability in the period 1952-2005[11]. Only Dickinson and Liu (2007) found evidence of a break in the stability in 1989. It is also worth noting the consensus on the lack of impact of the real interest rates on macroeconomic variables (Li and Leung, 1994, Hasan and Taghavi, 1996, Xie, 2004, Laurens and Maino, 2007)[12]. Once again only Dickinson and Liu (2007) found it significant after 1989.

In sum I investigate the monetary and real dynamics of the Chinese economy from 1952 to 2006 using an IS-LM framework to test the impact of credit on the demand for money and on the real output. Both equations are simultaneously estimated based on the same set of variables. I adopt a cointegrated, error-correction model because the variables are non-stationary (see below). Given that income was regulated through an exogenous control on bank credit until the monetary policy reform in 1998, it is expected to be a determinant of the real output at least before 1998 as well as of money demand through the multiplier effect. Stability tests described below are applied to the results to check the previous finding of stability.

The obvious next question is, what determines the volume of credit? This is answered

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[11]Hasan (1999) did not find a structural breakdown between 1952 and 1993, Yu (1997) between 1983 and 1994, Gerlach and Kong (2005) between 1980 and 2004 and Mehrotra (2006) between 1994 and 2005.

[12]Li and Leung (1994) and Hasan and Taghavi (1996) examine the Granger causality relationships between monetary, financial and real variables on yearly data from 1952-1989 and 1952-93 and on univariate and multivariate frameworks respectively (the former rejects the hypothesis of cointegration among the variables). In these two studies, as variables are found (I(2) or) I(1), Granger causality relationships are examined on (double) differentiated series. Recently Xie (2004), Dickinson and Liu (2007), and Laurens and Maino (2007) renewed the analysis on shorter periods (starting in the 1990s) though they could perform it on variables in levels using an impulse response analysis in a multivariate framework.

with a second estimation in the same error-correction model specification. I propose a novel proxy for direct control to assess its relative influence on credit versus the influence of market-oriented instruments. The credit supply equation and the logic of the proxy for direct control are detailed below. Notice that the time span is shorter than that of the first estimation due to the unavailability of some data before 1985. Using a shorter span allows me to investigate only the post-transition period but this does not invalidate my findings because the sample spans the first reform of the monetary institutions in 1986 and includes enough observations prior to the second reform in 1998 to analyze the changes it may have implied. To collect enough observations, I use quarterly data.

4 Empirical Methodology

4.1 Money demand

Starting with the aggregate real money demand, recall that its value falls when the opportunity cost of holding money rises and that its value rises when real income rises. In addition I integrate the variable of credit to estimate the multiplier effect of credit on money. The reduced form of the aggregate real money demand used to interpret the results follows Johansen and Juselius (1992), the pioneers of applying cointegration analysis to monetary policy issues. They first used the framework on Australian data[13]. Expressed as a logarithm (denoted by small letters here and elsewhere in the text), it takes the following form:

$$m_t = \beta_{1,1} y_t + \beta_{1,2} R_t^d + \beta_{1,3} \Delta p_t + \beta_{1,4} tc_t + w_{1,t} \tag{1}$$

In Eq. (1), real money demand, m, is specified as a function of real income, y, measured by the real GDP[14], two opportunity costs of holding money, i.e., the return on an alternative asset to money, R^d and inflation Δp and finally the credit granted by all financial institutions in real terms, tc[15]. Three different price indices, consumer, retail and GDP deflator, were estimated and yielded similar results. Data sources and definitions as well as the descriptive statistics of the series are specified in the Tables A1 and A3 in the appendix, respectively. Annual data are used for the 1952-2006 period.

With real money increasing along with output, the coefficient, $\beta_{1,1}$, is expected to be positive and above unity, which is consistent with previous findings (Hasan, 1999, Gerlach and Kong, 2005 and Mehrotra, 2006); $\beta_{1,2}$ and $\beta_{1,3}$ are expected to be negative, implying

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[13]A similar specification was later adopted by Juselius on Danish data.

[14]This study relies on the annual GDP growth rates revised upward in December 2005 by China's National Bureau of Statistics to correct an underestimation of the importance of the service sector in the Chinese economy.

[15]The absolute value of the interest rate is used in the estimation to stand for the opportunity cost of holding money rather than a differential between the return of money and of an alternative asset because deposit rates are not available for the entire period. However, the absolute rate makes sense if one can check in available data that the differential is not constant, which is the case after 1985 when the deposit rate data become available. In addition the only rate available for the entire period, the lending rate, followed the return on government bonds, a proper alternative asset, during the available period.

that demand for money declines along with the opportunity cost of holding money. Total bank credit is expected to induce an increase in the money demand through the credit multiplier effect, $\beta_{1,4}$.

4.2 Aggregate income

The aggregate output equation is estimated simultaneously with the demand for money. I use the same set of annual data over the 1952-2006 period and follow the reduced form proposed by Johansen and Juselius (1992) to interpret the results. The IS relationship in an open economy states that trend-adjusted real aggregate income is negatively related to the long-term real interest rate given expectations about returns on investment, every level of interest rate will generate a certain level of investment and other interest-sensitive spending (including spending abroad); lower interest rates encourage higher investment and rising national income and output. Inflation is included in the specification on the account of the Phillips-curve relationship, which states that real income is positively cointegrated with inflation. Last, with bank credit being determined by the credit plan and the credit plan being designed with real output targets in mind, the model tests the existence of cointegration between credit and the real output. Consequently, the following reduced form of the real-output relation accounts for the three hypotheses:

$$y_t = \beta_{2,1} R_t^d + \beta_{2,2}\Delta p_t + \beta_{2,3} tc_t + \beta_{2,4}t + w_{2,t} \tag{2}$$

where $\beta_{2,1} < 0, \beta_{2,2} = -\beta_{2,1}$, and $\beta_{2,4} \geqslant 0$ are consistent with an IS curve whereas $\beta_{2,1} = 0$, $\beta_{2,2} > 0$, and $\beta_{2,4} \geqslant 0$ are consistent with a Phillips curve and $\beta_{2,3} > 0$ confirms the role played by credit on the determination of the real output.

4.3 Credit supply

The fact that information about *window guidance* is not transparent prevents the systematic use of a direct measure of administrative control as a determinant of the credit supply. How do we measure the quantitative impact of a non- transparent practice? The solution I adopt is new to the literature and consists of controlling the variation in credit to excess reserves by a dummy representing the monetary policy stance. My justification is as follows.

The representative bank takes demand deposits from the households, lends to firms, holds government bonds and holds required reserves in the central bank determined by the required reserve ratio. In addition, when asset (bonds, B, credit, TC and required reserves, RR,) do not match with the liabilities (deposits, D), the bank holds excess reserves, ER, in the central bank. If τ_1 denotes the required reserve ratio (i.e., RR divided by D) and τ_2 is the share of deposits the bank holds as excess reserves in the central bank (i.e., ER

divided by D), then the bank's balance sheet identity is as follows[16]:

$$RR_t + ER_t + B_t + TC_t = D_t \tag{3}$$
$$B_t + TC_t = (1 - \tau_1 - \tau_2)D_t$$

We hold the required reserves ratio constant, $\hat{\tau}_1 = 0$, and assume that $B_t = 0$ given the poor development of the Chinese public bond market mentioned above. Given these assumptions, the ratio of the excess reserves to deposits held in the central bank, τ_2, indicates a bank's potential for granting additional loans. In a free environment, the variation of τ_2 reflects the decision to allocate limited resources given the returns on each asset. Other things equal, a bank that is likely to lend because of higher returns on lending and is free to do so uses its excess reserves to grant new loans. This implies that loans are positively correlated with the lending returns and negatively correlated with excess reserves. Hence, the sign of τ_2 is negative.

Now consider a restrictive environment where credit is under government control: banks are likely to grant loans because of higher returns on lending but they are constrained through government suasion in doing so. Banks hold more excess reserves at the central bank[17]. Excess reserves may thus increase even if banks would like to lend. Therefore, in a restrictive environment, a variation in the excess reserves may not reflect a free decision to allocate resources, but the control of monetary authorities over banks' allocations instead. In other words, excess reserves may be as "required" as required reserves in a restricted environment. As a result, I analyze the supply of credit based on the following reduced form equation:

$$(tc - d)_t = (er - d)_t \left(\gamma_1 + \gamma_2 Dum_t \right) + \gamma_3 (I_t^l - I_t^d) \tag{4}$$

where tc stands for total credit (here as a ratio of deposits, d), er for excess reserves (here as a ratio of deposits), I^l and I^d for the interest rate for lending and deposits, respectively. Dum stands for a dummy variable discriminating between tight and easy monetary stance policies designated as 1 and 0, respectively.

The impact of excess reserves on credit is expected to vary depending on whether the authorities limit the quantity of credit that the banks desire to supply, i.e., on the value of the dummy controlling the monetary policy stance, Dum. The expected impact of excess reserves is negative, indicating that when the monetary policy is relaxed, and Dum is 0, banks grant loans through the allocation of excess reserves to credit. Hence, the value of γ_1 is expected to be negative. On the other hand, the sign of γ_2 is expected to be positive. When the dummy is 1 when the monetary policy stance is tight, a positive value of γ_2 diminishes the overall transfer of excess reserves to fund credit. This is because, when the monetary policy is tight, the authorities restrict the quantity of credit that banks desire to supply and force them to maintain a larger than desired proportion of their excess reserves in the central bank, other things equal. In sum, if the monetary policy is relaxed and Dum

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[16] Unlike in many other countries, the PBC pays interest on excess deposits.

[17] The possibility that they may also circumvent the restriction by channelling credit through subsidiaries cannot be statistically considered.

is 0, then credit expands by the entire desired reduction of excess reserves, γ_1; in turn, when the monetary policy is restrictive, Dum is 1, and the desired credit quantity financed by a reduction of excess reserves, γ_1, is diminished by γ_2, the proportion of excess reserves that banks are forced to maintain in the central bank. In turn, the expected signs of γ_3 is positive because the credit supply is expected to expand when lending is more profitable (the credit demand is assumed to be constrained).

The tightness and ease of the monetary policy, designated as 1 and 0, respectively, have been computed from three sources. Brandt and Zhu (2000) analyzed the economic cycles in China after the transition and provided useful information on the subsequent monetary policy in the 1980s until 1994. Ikeya (2002) provided intermediate and final targets reported by the monetary authorities between 1994 and 2001 and the subsequent policy directions. This information is compared with the information provided by the PBC's quarterly reports including a section called "Monetary Policy Stance to be Adopted in the Next Period". The estimation is limited to 1986 onwards because excess reserves data are available only after 1986. To get enough observation points, I use quarterly data from 1985-2007. Quarterly variables for excess reserves and credit are seasonally adjusted through a seasonal moving average filter. The sources, the descriptive statistics of the data and the 0-1 coding are specified in the Table A2, A4 and A5 in the appendix, respectively.

4.4 Properties of the Series

4.4.1 Integration

All variables (except interest rates) were expressed in log form and their stationarity checked with the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test, the Augmented Dickey–Fuller (ADF) test and the Phillips–Perron (PP) test (presented in Tables 1 and 2). Over 1952-2006, interest rates were found to be stationary in the KPSS and ADF tests, not in the PP test. Over 1986-2007 the excess reserves were found to be stationary in all tests. The rest of the variables was all found to be integrated of first order. As non stationary variables can be cointegrated with stationary variables, as long as their combination is stationary, the cointegration theory and its implied vector error correction modeling strategy is adopted to carry out the estimation .

4.4.2 Cointegration

The optimal number of lags is identified by using the Akaike and Schwartz information criteria on a VAR specification. Trace and maximum eigenvalue statistics proposed by Johansen and Juselius (1990) are used to identify the number of cointegration equations (see Tables 3 and 4). I proceed step by step to the estimation of a parsimonious model[18].

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[18]All variables found not significant in the cointegration relationship(s) are eliminated from the vector of the estimation and the model is re-estimated with the reduced vector.

Table 1: Integration test. First model

Variable	Level			1st difference		
	KPSS	**ADF**	**PP**	**KPSS**	**ADF**	**PP**
m	0.87**	0.78	0.55	0.19	-6.56**	-6.53**
y	0.88**	2.37	3.84	0.36	-5.83**	-4.33**
p1	0.34	-1.88	-3.09		-5.27**	-13.13**
p2	0.1	-2.7	-3.1		-7.2**	-1.31*
p3	0.23**	-2.8	-1.24	0.09	-6.88**	-3.25*
R^d	0.14	-2.01*	-2.02			-5.96**
tc	1.00*	3.28	-0.68	0.08	-4.01**	-3.52*

Unit root tests (KPSS, ADF, PP) include a constant in ADF, the optimal lag length is chosen by the Akaike information criterion, allowing a maximum lag length of pmax =4 in the test; in KPSS and PP, the bandwidth is chosen using the Newey–West method and spectral estimation using Bartlett kernel. *Signifies rejected at 5%, ** rejected at 1% level. The null hypothesis for KPSS is that the variable is stationary, for ADF and PP that the variable has a unit root.

Money demand and aggregate output   To adjust to the trend of the real output as indicated in the real aggregate output (2), the regression is estimated with a specification including a linear trend in the data and in the cointegration equation. The interest rate is found to be not significant in the initial regression so it is eliminated from the vector and the model is re-estimated. Finally, the regression was estimated with five lags based on the results from Schwartz information criteria[19] and two cointegration relationships based on concordant trace and max tests (see Table 3). The estimation sample runs from 1952 to 2006. Since the observations from 1952 to 1956 are used as pre-sample values, the actual sample size amounts to 49 observations.

Credit supply   A specification with a linear trend in the data and no trend in the cointegration equation appears mostly appropriate because the series are all positively trended. Both trace and max eigenvalues tests for cointegration rank indicate the existence of two cointegration relationships (see Table 4).
The estimation reveals, however, that the second vector does not contain valuable information. Three out of five adjustment coefficients to the second vector are not significant and the t-values of all coefficients are less than 2.0. No additional information is gained. The risk of underestimating the rank is to omit empirically relevant equilibrium-correction mechanisms but there is no statistical consequence. On the contrary, overestimating the rank implies non-standard distributions of some statistics, so that incorrect inferences may result from using conventional critical test values. Finally, since the second vector does

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[19]Frequently Akaike and Schwartz criteria do not indicate the same optimal number of lags. However, five lags provide more information than two.

Table 2: Integration test. Second model.

Variable	in level			in difference		
	KPSS	**ADF**	**PP**	**KPSS**	**ADF**	**PP**
tc	1.07**	-0.71	-0.7	0.09	-9.68**	-9.68**
er	0.07	-3.33**	-3.44**	0.07	-5.15**	-9.02**
I^l	0.66**	-1.41	-1.2	0.14	-3.29*	-7.61**
I^d	0.83**	−0.92	-0.92	0.14	-6.88**	-6.90**
dum*er	0.16	-2.48	-2.61	0.06	-9.46**	-9.49**

Unit root tests (KPSS, ADF, PP) include a constant in ADF, the optimal lag length is chosen by the Akaike information criterion, allowing a maximum lag length of pmax =4 in the test; in KPSS and PP, the bandwidth is chosen using the Newey–West method and spectral estimation using Bartlett kernel. *Signifies rejected at 5%, ** rejected at 1% level. The null hypothesis for KPSS is that the variable is stationary, for ADF and PP that the variable has a unit root.

Table 3: Cointegration test. First model

Rank determination				
$\lambda_i(i = 0, 3)$	**Trace**	$\mathbf{Q}_{95}$	**Max**	$\mathbf{Q}_{95}$
0.83	136.5*	63.87	85.39*	32.11
0.44	51.12.73*	42.91	27.63*	25.82
0.25	23.4.04	25.87	13.82	19.38
0.18	9.67.26	12.51	9.67	12.51

* Signifies rejected at 5%

not add much valuable information about the co-movements of the financial variables at stake, the empirical analysis will not benefit from choosing $r = 2$ and the empirical analysis proceeds assuming that $r = 1$[20]. The estimation sample runs from 1985 Q1 to 2007 Q1. The model is estimated with one lag. Since the 1985 Q4 observation is used for pre-sample values, the actual sample size is 84 observations.

4.5 Stability tests

As mentioned above, particular attention is paid to the stability of the estimations because the successive reforms raised the possibility of structural breaks in the regression.

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[20]This decision is reinforced by Hendry and Juselius (2001), two pioneers of cointegration analysis: "A correct choice of the cointegration rank is crucial for the analysis, but in practice, is far from easy [...]. It is important to make the decision based on as much information as possible, including prior economic information [...] to find out if important information is lost by leaving out the rth + 1 cointegration vector, or if anything is gained by including it (Hendry and Juselius, 1999, p. 23).

Table 4: Cointegration test. Second model

Rank determination				
$\lambda_i(i = 0, 3)$	Trace	Q_{95}	Max	Q_{95}
0.37	99.23*	69.81	39.48*	33.87
0.33	59.75*	47.85	34.2*	27.58
0.2	25.5	29.79	18.81	21.13
0.07	6.7	15.49	6.44	14.26

* Signifies rejected at 5%

Nevertheless, previous estimations did not find evidence of instability on the demand for money over the long period starting in 1952. In this work, the null hypothesis of structural change is tested in two ways. The Jarque Berra normality test is first performed to check if the residuals of the estimation follow a normal distribution. Indeed, significant reforms responsible for non-linearity in the model are likely to lead to a violation of normality. Second, a standard Chow forecast test assuming that the break date is known is performed. The Chow forecast test consists of estimating two models, one using the full set of data and the other using a long subperiod. A large difference between the two models is interpreted as evidence of the instability of the estimated relation over the sample period[21].

The institutional analysis above provided enough information to identify potential breaks in the relationships. In the first model estimating money and output, the tested exogenous breaks are the first reform of the monetary institutions in 1985, the adoption of a peg regime in 1994, and the second monetary policy reform in 1998. In turn in the second model, the break is in 1998 given that the 1998 reform is expected to have changed the way credit is allocated by banks. As some time to enforce the reform may have been required, the second regression on the credit supply is estimated recursively from 1998 to 2007 and each quarter is tested as a potential structural break.

4.6   The Vector Error Correction Model

A reduced-form representation of the vector error correction model (VECM), omitting the deterministic terms, can be written as:

$$\Delta x_t = \Pi x_{t-1} + \Gamma_1 \Delta x_{t-1} + ... + \Gamma_{p-1} \Delta x_{t-1+1} + u_t$$

where p is the order of the VAR-model, K is the number of variables, $x_t = (x_{1,t}, ..., x_{Kt})$ is a (Kx1) random vector, and Γ_1 are fixed (KxK) coefficient matrices. The $u_t = (u_1...u_{Kt})'$ is a K-dimensional white noise process with $E(u_t) = 0$. When the variables are cointegrated, Π has reduced rank and $r = rk(\Pi) < K$ and can be written $\Pi = \alpha\beta'$,   where α and β

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[21]Section A2 in the appendix specifies the way to compute the F-statistics.

are (Kxr) matrices that contain the weight coefficients α_r and the cointegration vectors, $\beta(r, k = 1\ to\ K)$ of the rth cointegrating relation.

5   Empirical evidence

5.1   Money demand and aggregate output

The vector of endogenous variables is written as $x_t = (m_t, y_t, R_t^d, \Delta p_t, tc_t)'$, with an unrestricted constant and a trend included as the deterministic term. The interest rate was eliminated after being found to be not significant in both relationships and the regression was re-estimated[22]. The normalization of the coefficient on real money balances and real output in the first and second cointegration relationship, respectively, as well as a null estimator in front of real money in the output equation are designed to get a final output in line with specifications (1) and (2). In addition, the following restrictions are placed on the coefficient vectors, $\beta(r, k)$ consistent with (1) and (2): a first restriction on $\beta_{1,1} = -1.6$ verified the finding of previous studies of an elasticity of money to income higher than one (Chen, 1997, Gerlach and Kong, 2005, Mehrotra, 2007); a second restriction on $\beta_{1,3} = 0$ verified the insignificance of inflation in the demand for money. The test of overidentifying restrictions was accepted with $\chi^2(5) = 0.98$, which indicates that the null can not be rejected at the 10% significance level for the full sample.

The model stability was checked according to the methodology detailed previously. First, the Jarque Berra normality test confirmed that all residuals are normally distributed to give a first indication of stability. Following the institutional analysis, the Chow forecast test was performed for three potential breaks: 1985, the year of the formal introduction of the credit plan system, 1994, the year of the adoption of the pegged regime, and 1998, the year of the official abandonment of the credit plan. The null hypothesis of stability is rejected when the test statistic is greater than the critical value. According to Table 5, the Chow forecast test does not reject stability, which confirms the results of previous surveys on stability over the entire period.

The Johansen maximum likelihood (ML) procedure including the restrictions yielded the following estimate for the long-run relationships[23]. The normalization of the coefficient on real money balances and on output to one in (5) and (6), respectively, led to possible interpretations of them as money demand and aggregate output relationships in line with (1) and (2):

$$m_t = 1.6y_t + 0.84tc_t - 0.093t + 0.97 \tag{5}$$
$$y_t = -1.3\Delta p_t + 0.45tc_t + 0.03t \tag{6}$$

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[22] The tests to identify the optimal number of lags and the number of cointegration relationships were reperformed.

[23] Only significant variables are reported.

Table 5: Results of stability tests. First model.

	Norm. JB Residuals	Chow Forecast test					
		1985	crit. value F(47,19)	1994	crit. value F(47,10)	1998	crit.value F(47,7)
Δm	1.05	0.76	3.45	0.1	2.53	0.09	2.24
Δy	0.67	0.45	3.45	0.07	2.53	0.03	2.24
Δp	5.22	1.67	3.45	0.11	2.53	0.01	2.24
Δtc	0.97	0.10.49	3.45	0.39	2.53	0.21	2.24

Note that the elasticity of money to income, 1.6 in (5), is consistent with earlier findings for China (e.g., Chen, 1997, Gerlach and Kong, 2005, Mehrotra, 2007). This means that, other things equal, as income rose by 10%, money velocity ($y - m$) declined by 6%. This decline in money velocity fits with the development of bank accounts after the economic reforms in 1978 and the subsequent periods of economic growth.

Both Eq. (5) and (6) yield a very interesting finding by formally explaining why the money supply has grown at a faster rate than the GDP since the 1980s without accompanying inflation, a puzzle on which Robert Mundell offered an intuition recently: China's money supply can grow faster than income because it fills an excess demand for money, which implies that inflation does not arise[24]. This huge desire by the Chinese to save by holding yuan and yuan-denominated assets, he suggests, is due to the fact that capital controls restrict domestic wealth from going abroad. The Chinese thus invest in, among other assets, productive assets so that it results in over-capacity rather than overheating consumption[25]. Indeed Eq. (5) shows this huge desire by Chinese households and firms to hold money as described by R. Mundell. It is illustrated by the high elasticity of the money demand to income, as well as by the fact that money balance is demanded regardless the opportunity cost of holding money. Note that the interest rate and inflation are not significant in (5). In sum, the money supply grows faster than GDP to satisfy a booming demand for money.

Additional new findings from (5) and (6) are the driving role played by credit in the determination of real output along with the limited inflationary impact from it. As credit rose by 10%, national income rose by 4.5% (see (6)). And the credit extension implied that the demand for money would rise by 8.4% only (see (5)). This suggests that the effect of the initial credit supply is not magnified by the standard credit multiplier effect, usually due to multiple deposit creation in the banking sector. It fits with Chinese households' preference

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[24]On average, since 1980, China's GDP has grown by 10% a year while money gowth was approximately 20% a year. It resulted in 6% yearly inflation and note only 2.8% a year since 1995 (sources: IFS).

[25]Interview of Robert Mundell in June 2007 by the editor of the Far Eastern Economic Review, Hugo Restall (Restall, 2007).

for liquidity and implies that only a small part of loans are deposited by borrowers into bank accounts[26]. It means that the amount available for granting new loans is limited. In addition, the low elasticity of the credit multiplier also suggests that the tight control over the credit supply exercised by the authorities limited the amount of new deposits that could become new credit. In sum, the low elasticity suggests that the authorities managed to keep credit growth under reasonable limits, thus preventing a loss of control over the money supply. In other words, the economic growth regulation through the management of credit resulted in the stop-and-go cycles rather than unmanageable high inflation dynamics.

In addition to the estimation of long run dynamics, the cointegrated error-correction model allows to examine short run dynamics as reported below[27]. The first cointegration relationship does not represent an equilibrium value towards which money converges[28]. However, output, inflation and credit converge towards their equilibrium values yielded from the long-term value of the demand for money (see (8), (9) and (10)). In turn, the aggregate output equation (6) drives the dynamics of inflation and credit (see (9) and (10)). Statistically, this means that credit growth adjusts to its equilibrium value, which itself depends on the level of output. This is consistent with credit being determined by the credit plan and the credit plan designed with real output targets. The fact that inflation growth adjusts to both money demand and aggregate output ((5) and (6)) emphasizes once again that the central bank managed to closely monitor the inflation dynamics through the management of credit. One resulting shortcoming was the stop-and-go cycle described in the institutional analysis.

$$
\begin{aligned}
\Delta m_t &= 0.86(m_{t-1} - 1.6y_{t-1} - 0.84tc_{t-1} + 0.093(t-1) - 0.97) + 1.1\Delta tc_{t-1} + \Delta tc_{t-5} \quad (7)\\
\Delta y_t &= 0.6(m_{t-1} - 1.6y_{t-1} - 0.84tc_{t-1} + 0.093t - 0.97) - 0.43\Delta m_{t-1} - 0.31\Delta m_{t-2} \quad (8)\\
&\quad -0.2\Delta m_{t-3} + 0.16\Delta m_{t-4} + 0.7\Delta y_{t-1} - 0.38\Delta y_{t-5} + 0.6\Delta\Delta p_{t-4} + 0.84\Delta tc_{t-1}\\
&\quad +0.44\Delta tc_{t-2} + 0.3\Delta tc_{t-4}\\
\Delta\Delta p_t &= -0.44(m_{t-1} - 1.6y_{t-1} - 0.84tc_{t-1} + 0.093(t-1) - 0.97) \quad (9)\\
&\quad -0.7(y_t + 1.3\Delta p_t - 0.45tc_t + 0.03t) + 0.45\Delta y_{t-1} + 0.35\Delta y_{t-3} + 0.45\Delta\Delta p_{t-1}\\
&\quad -0.3\Delta\Delta p_{t-2} - 0.4\Delta tc_{t-1} - 0.36\Delta tc_{t-2} - 0.21\Delta tc_{t-3}\\
\Delta tc_t &= 0.7(m_{t-1} - 1.6y_{t-1} - 0.84tc_{t-1} + 0.093(t-1) - 0.97) \quad (10)\\
&\quad +0.6(y_t + 1.3\Delta p_t - 0.45tc_t + 0.03t) - 0.4\Delta m_{t-2} - 0.9\Delta\Delta p_{t-3} + 0.8\Delta\Delta p_{t-4}\\
&\quad +1.25\Delta tc_{t-1} + 0.53\Delta tc_{t-2} + 0.47\Delta tc_{t-4}
\end{aligned}
$$

To conclude, the fact that the model holds over the entire period suggests that the suc-

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[26] Liquidity preference is demonstrated by the fact that the amount of currency in circulation and demand deposits was higher than long-term deposits until 1996.

[27] Only significant variables are reported.

[28] The positive sign of the vector elasticity, 0.86, in (7) indicates that money growth increases when money is above its value as shown by the cointegration relationship, contrary to what equilibrium dynamics would require.

cessive monetary and financial reforms in 1985 and 1998 have had no significant impact on monetary dynamics. It confirms the impediment faced by the central bank to enforce the new monetary policy reform after 1998. With the money demand and aggregate output being not sensitive to interest rate, policy instruments based on price signals do not change agents incentives. It confirms that the reforms undertaken by the country in the real sector in building a market economy have not been accompanied nor did they induce changes of the same scope on the financial and money markets (Holz, 2000). It implies that total loans is still the *control variable* of the conduct of the monetary policy. With credit playing a crucial role in the determination of money, output and inflation, a factor that the literature has completely ignored, the obvious next question is what determines the volume of credit. The task ahead is to estimate the determinants of the credit supply.

5.2 Credit supply

The vector of endogenous variables is written as $x_t = (tc_t, er_t, I_t^l, I_t^d)'$, with an unrestricted constant included as the deterministic term. As mentioned above the estimation sample starts in 1986 because information on excess reserves are not available before then. To have enough observations, I use quarterly data from 1986 Q1 to 2007 Q1. The model is estimated with one lag.

The following restrictions were placed on the coefficients of the only cointegration vector: first $\gamma_1 = 1$ normalizes the coefficient of credit and allows the interpretation of the results in line with the specification of credit supply (4); second the estimation of the model indicated that the differential of interest rates was not significant; to confirm it I imposed $\gamma_3 = \gamma_4 = 0$. The test of overidentifying restrictions was accepted with $\chi^2(3) = 1.88$ (indicating that the null can not be rejected at 10% significance level for the full sample). The Jarque Berra test performed on the residuals rejected the normality assumption. The observation of the credit equation residuals shows outliers in Q4 2001 and Q1 2002 (see Figure 1). This may be due to a change in the definition of data: indeed the data after 2002 (reported in the 2003 edition) include foreign financial institutions which was not the case in the previous editions. The shift between Q4 2001 and Q1 2002 may thus result from this change of definition. I introduced a dummy to correct the outlier which value is +1 in Q4 2001, -1 in Q1 2002, 0 in the rest of the quarters. With the dummy introduced normality is not rejected anymore.

Finally, the Chow forecast test checks stability further and was performed recursively for every quarter after Q1 1998 and the null hypothesis of stability could not be rejected. Table 6 shows the statistics for Q1 1999 only, one year after the reform was *officially* enforced.

The Johansen maximum likelihood (ML) procedure including the restrictions yields the following estimate for the long-run relationships[29]. The normalization of the coefficient on credit to one in (11) leads to an interpretation in line with the specification of the credit

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[29] Only significant variables are reported.
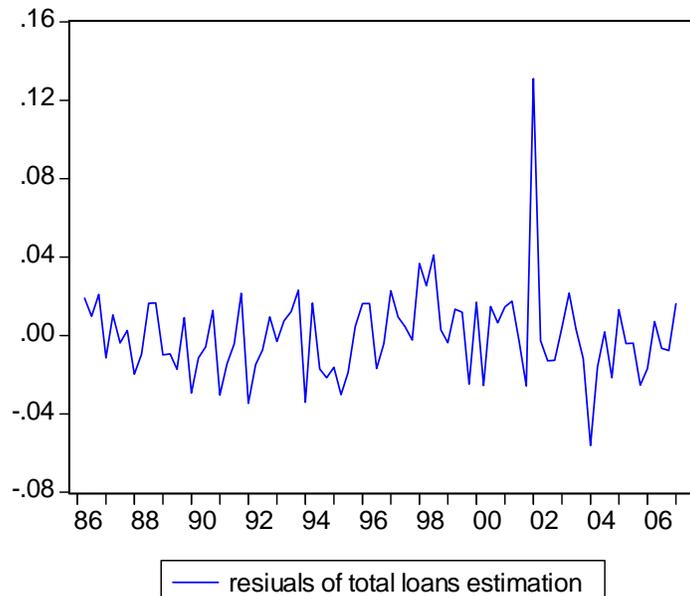
Figure 1: Residuals of total credit estimation

supply (4):

$$(tc - d)_t = 3.9 + (er - d)_t(-3.1 + 0.63Dum_t) \tag{11}$$

The interest rate differential is not significant, confirming that the result on interest rates obtained in the previous estimation is similar. This means that credit is supplied regardless of the lending rate, which fits with the lack of alternative asset opportunities available to the banking sector; in addition, it suggests that the credit supply is influenced by the authorities rather than allocated according to decisions based on profit maximization[30].
On the other hand, the fact that Dum is significant in (11), confirms that the credit supply varies depending on whether the monetary policy stance is tight or relaxed. With the dummy equal to 0 when the policy stance is relaxed, credit expands by the entire desired reduction of excess reserves, which is estimated to 3.1. This indicates a high multiplier effect, which means that every renminbi withdrawn from the excess reserves finances 3.1 renminbi of credit. In contrast, when the monetary policy is tight, Dum is equal to 1, and the overall transfer of excess reserves credit is diminished to 2.5, which means that every renminbi withdrawn from the excess reserves finances 2.5 rather than 3.1 renminbi of credit. This is because the authorities restrict the quantity of credit that banks desire to supply and force the banks to maintain a larger than desired proportion of their excess reserves in the central bank.

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[30]Note that the estimation yields similar results when the interest rate on government bonds is tested.

Table 6: Results of stability tests. Second model.

		Norm. JB		Chow Forecast test	
	Residuals	Res. after the introd. of the dum.	Q1 1999	crit. value F(52,11)	
Δtc	488 (5.99)	0.19 (5.99)	0.42	1.72	

An additional important finding is that the effect of the administrative control is significant but low, considering that it implies a credit reduction by only 15%. The low effectiveness of administrative control is confirmed by the low value of the adjustment coefficient, -0.008, in the short run dynamics, (12). This indicates that the adjustment to equilibrium is a slow process. Whenever credit deviates from its equilibrium, it takes a long time for the authorities to bring it back in under control.

$$\Delta tc_t = -0.008(tc_{t-1} - er_{t-1}(-3.1 + 0.63Dum_{t-1}) - 3.9ec_{t-1}) \qquad (12)$$
$$+0.025\Delta er_{t-1} - 0.07 - 0.07DUM01$$
$$\Delta i_t^l = -0.2(tc_{t-1} - er_{t-1}(-3.1 + 0.63Dum_{t-1}) - 3.9ec_{t-1}) \qquad (13)$$

In conclusion, that administrative control is the only determinant of the credit supply in China and that the relationship between administrative control and the credit supply is stable over the period between 1985 and 2007 are further evidence of the Chinese authorities' inability to enforce indirect governance after 1998. In addition, the low impact of administrative control over credit suggests that the effectiveness of window guidance is limited and that the PBC cannot rely on window guidance to enforce an effective monetary policy.

6 Summary and Conclusion

This paper shows that the regulation of economic growth in China relies significantly on the credit channel, over which the monetary authorities still exert quantitative control. Within a structural framework, I find that credit played a crucial role in the determination of money supply and output during the 1952- 2006 period, a factor that the literature has omitted. The model is found to be stable over time. I find a low multiplier effect of credit on the money supply, suggesting that the authorities managed to regulate credit growth under reasonable limits to prevent the inflationary impact of a regulation based on credit quotas. In addition, I find high elasticity between money demand and income and that there is a strong demand for money among Chinese agents regardless of the opportunity

cost from holding money. This indicates the huge desire of Chinese households and firms to hold money. This finding provides the first quantitative evidence in the empirical literature on China's monetary policy to explain why the money supply can grow faster than GDP in China without leading to inflation, because the growth in the money supply simply satisfies a booming demand for money.

However, China faces other serious issues besides inflation because of its lack of macrocontrol via its monetary policy. Indeed, I find that credit is supplied regardless of the lending rate and that administrative control is the only determinant of the credit supply even since the 1998 reform. Along with the stability of the demand for money, the evidence presented here shows that the authorities were unable to enforce indirect governance after 1998. This finding contradicts PBC's official statement about its policies.

Moral suasion is found to have a low impact on credit given that it is estimated to reduce credit by only 15%. This suggests that the effectiveness of administrative control is limited and that the PBC cannot rely on window guidance to enforce an effective monetary policy. It would then be misleading to suggest that China's unique monetary policy framework is effective enough to spare the authorities the necessity of enacting reforms.

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A Appendix

A.1 Description of the series

Table A1: Description of the variables used in the first model.

1952-2005	Annual data	Source	Comments
M	M2	NBS (2005, 2006)	
Y	Nominal GDP	Holz (2005), NBS (2006)	Recalculation of the GDP after 1981
P1	consumer price index	NBS (2005, 2006)	
P2	retail price	NBS (2005, 2006)	
P3	GDP deflator	NBS (2005, 06)	Formula: $\frac{Y_t realY_{t-1}}{Y_{t-1} realY_t}$
TC	Total Credits	NBS (2005, 2006)	all financial institutions after 1992
R^l	lending interest rate	NBS (2005, 2006)	

Table A2: Description of the variables used in the second model.

1985-2007	quarterly	source	comment
tc	domestic credit	Financial Yearbook of China (various issues)	Change of definition after 2003
er	excess reserves	IFS, PBC	formula: total reserves- (required reserves ratio*deposits)
I^l	1 year lending rate	IFS	
I^d	1 year deposit rate	IFS	
I^b	intertest rate on 3 years-government bonds	The People's Bank of China quarterly statistical bulletin	
dum	monetary policy stance	PBC quarterly report (various issues), Ikeya (2002), Brandt and Zhu (2000)	tight: dum=1/ ease: dum =0

Table A3: Descriptive statistics of the variables used in the first model.

	M	P	Y	TC	R
Mean	3561	270	2754	2719	6.45
Median	154	152	385	194	5.71
Max	29875	671	18232	19469	14.4
Min	12	115.5	67.9	10.8	1.98
St Dev	7001.6	199.2	4535.5	4907	3.83
Skewness	2.26	1.11	1.8	2	0.92
Kurtosis	7.3	2.5	5.5	6.1	2.7

Table A4: Descriptive statistics of the variables used in the second model.

	ER/D	TC/D	Id	Il
Mean	0.07	1.24	6.1	7.9
Median	0.078	1.14	7.2	7.92
Max	0.17	1.66	11.3	12.06
Min	0.03	0.9	1.9	5.3
St Dev	0.025	0.22	3.4	2.1
Skewness	1.23	0.59	0.08	0.25
Kurtosis	5.6	2.07	1.54	1.72

Table A5: Dummy coding

	Policy direction	Dummy variable
Q4 1985	Tight	1
Q1 1986 to Q4 1988	Ease	0
Q1 1989 to Q4 1990	Tight	1
Q1 1991 to Q4 1992	Ease	0
Q1 1993 to Q4 1997	Tight	1
Q1 1998 to Q4 2002	Ease	0
Q1 2003 to Q1 2007	Tight	1

A.2 F-statistics for Structural Changes

The data series are not long enough to estimate the second regression of the separate regressions for a test of structural change. Fisher (1970) has shown that in such circumstances, a way to proceed is to compute a F statistics using:

$$F[n_2, n_1 - K] = \frac{(e'_* e_* - e'_1 e_1)/n_2}{e'_1 e_1/(n_1 - K)}$$

where $e'_* e_*$ is the residual sum of squares when the equation is fitted to all sample observations, $e'_1 e_1$ is the residual sum of squares when the equation is fitted to n_1 observations, and K is the number of estimated coefficients. This F-statistic follows an exact finite sample F-distribution if the errors are independent, and identically, normally distributed.