A Post-Keynesian View of Chinese Banking

By

Jianying Zhao

(2824368)

Major Paper presented to the

Department of Economics of the University of Ottawa

in partial fulfilment of the requirements of the M.A. Degree

Supervisor: Marc Lavoie
Eco 7997

Ottawa, Ontario

September, 2003

1. Introduction

The dispute concerning whether changes in the supply of money play a *causal* role in economic phenomena, or whether their variations are an *effect* of economic activity, was central to the Banking and Currency school debate and has been a recurring theme in the evolution of monetary theory (Davidson and Weintraub, 1973).

While the Classical economists admitted that the relationship between money and nominal values was a two-way relation, their analysis did not lead to a theory of an endogenous money supply. The Banking School, as represented by Tooke, came much closer to an endogenous approach. Marx essentially adopted an endogenous approach to money, however, his work has not been of major importance in further development of the approach. Keynes argued in the *Treatise on Money* and elsewhere that the money supply is endogenously determined, but may have assumed that it was exogenously given in his exposition in the *General Theory*. The Post Keynesian economists claim that money is intimately involved with issues of credit, speculation and uncertainty (Trautwein, 1993). The evolutionary aspect to the relationship between the monetary and credit systems is suggested in Moore's (1988) distinction between *commodity money, fiat money* and *credit money* and Chick's (1986) identification of five stylised 'stages of banking' in the evolution of the English financial system. An exogenous money supply rule was adopted in the neoclassical synthesis (the textbook version of Keynes). Thus, the two major schools (textbook Keynesian and Monetarist) have long accepted an exogenous money supply as common ground, so that debate has been almost entirely over issues that follow from an exogenously determined money supply.

The aim of this paper is to show, as was presented by Post Keynesian theory, that

the money supply is endogenously determined by the market and that monetary policy in China sets the interest rate as an exogenous variable based on market situations; and that the money supply is an endogenous variable that accommodates the demand needs of the market. The total process can be explained very well by Post-Keynesian economic theory.

The structure of the paper is as follows. The second part is the theoretical background of the debate about endogenous money and exogenous money; the third part is an overview of the Chinese banking reform and the characteristics of the Chinese banking system and monetary policy; the fourth part has empirical tests with Chinese data: one is about the endogenous monetary theory using a Granger causality test, while the other is a revision of the Taylor rule relevant to the Chinese situation. The final part contains concluding remarks.

2. Theoretical Background

The origins of money lie, not so much in the need to eliminate the inefficiency of barter in a static exchange economy, but in the requirement to develop trustworthy credit relations in the real-world market economy in which both production for sale in the market and most exchange relations have a temporal dimension. According to Chick's "five stylized stages of banking", the evolution proceeds from an early stage in which banks are simply repositories for deposits of base money to a contemporary environment in which the banks themselves initiate lending and aggressively pursue both asset and liability management. The general idea is that money theory itself needs to evolve as the environment changes. In a paper published in 1967, Hicks (1967, p. 157-9) also argued

that relevant monetary theory must evolve with the continuing evolution of the financial system. Making a distinction between 'metallic money' and 'credit money', his view at that time was that: "In a world of banks and insurance companies, money markets and stock exchanges, money is quite a different thing from what it was before these institutions came into being'.

One type of theory is required under commodity money, when money consists literally of units of a physical commodity such as one of the precious metals, another under fiat money involving inconvertible paper currency issued by the state, and a third in a credit money environment when the exchange media consist primarily of the note and deposit liabilities of financial intermediaries. In the latter case, the banking system itself inevitably plays a major role in the creation and destruction of money on any reasonably comprehensive definition of the 'money supply'. An increase in bank lending will expand the asset side of bank balance sheets, causing a similar residual increase on the liabilities side, and a repayment of bank loans will have the opposite effect.

2. 1 COMMODITY & CREDIT MONEY

Colin Rogers (1989, p. 171) has explained the characteristics of commodity money in the following way:

> *"By commodity money most economists mean one or other of the precious metals such as gold or silver, although shells or other similar scarce items have served as commodity money in some societies. Two key characteristics of commodity money are that it is a commodity subject to the 'laws' of production and that it is in relatively inelastic supply."*

And also noted by Moore (1988):

"Because commodity money is a material thing rather than a financial claim, it is an asset to its holder but a liability to no one. Thus, the quantity of commodity money in existence denotes nothing about the outstanding volume of credit."

The above mean that when there is a quantity of commodity money, there is no corresponding change in the stock of financial assets and liabilities. The creation of commodity money is something apart from the world of saving and investment, borrowing and lending. Its supply typically is not highly sensitive to changes in demand for it. Commodity money carries no price or credit risks, pays no interest, and, because it represents immediately available purchasing power, is capital-certain and perfectly liquid.

Credit money, by comparison, is not so clearly exogenous. It is a generic term which refers to unbacked fiat money and credit in all its forms. The fundamental characteristic of credit money is that it has negligible costs of production relative to its purchasing power. Since the supply of credit money is furnished by the extension of credit, the supply schedule is no longer independent of demand but is perfectly elastic to the borrowers' demand for credit at the interest rate set by the authorities. Credit money is the liability of the issuing financial institution and, behind the institution, the institution's borrower. It need not possess all of the key characteristics associated with commodity or fiat money. It may carry a credit risk, it may pay interest, it may be capital-uncertain, and it may not always represent immediately available purchasing power. Most important, its supply will be sensitive to the demand for it, as changes in the demand for money are translated into changes in the demand for credit. An excess supply of bank money can be reduced simply through the repayment of bank credit, with credit money the dividing line between money and nonmoney assets becomes blurred.

2. 2 THE CREDIT-DRIVEN MONEY SUPPLY

In most textbooks, banks are presented as intermediaries that take in deposits, hold a small fraction of these on reserve, then lend out the remainder: 'deposits make loans'. Each bank loans only the amount of its excess reserves, while aggregate lending expands through the 'deposit multiplier'. Profitable loan opportunities are foregone if reserves are not available. Some allowance is made for discretion: the deposit multiplier is a function of interest rates and interest rate differentials, bank preferences regarding excess reserve holdings; public preferences regarding cash, time deposit and demand deposit ratios. But, as Brunner (1968) 'demonstrated', these factors are of only minor importance. Because the central bank supposedly controls the quantity of reserves, it is to control the money supply. Money is said to be 'exogenous' in the control sense, determined by the central bank. This has been called the 'verticalist' approach, because in most textbooks the money supply is presented as 'vertical' (perfectly inelastic with respect to interest rates).

Such a view overlooks the fact that the central rationale for the creation of central banks, and still by far their most important function, is to ensure the stability of the financial system. For the system as a whole, as evidenced by the financial crisis of the 1930s, liquidity is determined in the last resort solely by what the central bank stands willing to purchase a discount.

In reality, the business of banking is complicated and is in some respects not much different from that of other profit-seeking firms. Banks, like other firms, take positions in assets by issuing liabilities on the expectation of making profits. As we argue below, much bank activity can be analysed as a 'leveraging' of fiat money-but many

other firms engage in similar activity. For our purposes, however, the main difference between banks and other types of firms involves the nature of the liabilities. Banks 'make loans' by purchasing IOUs of 'borrowers'; this results in a bank liability (usually a demand deposit, at least initially) that shows up as an asset ('money') of the borrower. Thus the 'creditors' of a bank are created simultaneously with the 'debtors' to the bank. The creditors will almost immediately exercise their right to use the created demand deposit as a medium of exchange; bank liabilities are the money used by non-banks. The government accepts some bank liabilities in payment of taxes, and it guarantees that many bank liabilities will be redeemable at par against fiat money.

In turn, reserves are the 'money' used as means of payment (or interbank settlement) among banks and for payments made to the central bank; as bank 'creditors' draw down demand deposits, this causes a clearing drain for the individual bank. The banks may then operate either on its asset side (selling an asset) or on its liability side (borrowing reserves) to cover the loss of reserves. In the aggregate, however, such activities only shift reserves from bank to bank. Aggregate excess or deficiencies have to be rectified by the central bank.

Ultimately, then, reserves are not discretionary in the short run; the central bank can determine the price of reserves (admittedly, within some constraints) but then must provide reserves more or less on demand to hit its 'price' target (the Fed funds rate).

The approach outlined in this section has been called the 'horizontalist' approach, in the sense that the supply of bank money is determined 'endogenously' by the demand for bank loans, rather than 'exogenously' (Moore, 1988). According to those who adopt the horizontalist approach, any impact of monetary policy on the quantity of money is

very indirect and operates primarily through interest rate effects. Rather, it is mainly the private demand for loans, plus the willingness of banks to lend, that determines the quantity of loans, and thus of deposits, created. The demand for loans, in turn, is determined by spending decisions of private economic agents (including decisions regarding asset purchases); these can be affected, but only very indirectly, by the loan rate of interest. The supply of loans is then never independent of the demand; banks supply loans only because someone is willing to 'borrow' bank money by issuing an IOU to banks. One can think of the supply of bank money as 'horizontal' at the loan rate of interest, with banks supplying loans on demand.

2. 3 POST-KEYENSIAN VS NEO-CLASSICAL

It seems, therefore, that from a historical perspective, the distinguishing characteristic of credit money is that, as it is not produced, it is not subject to the 'laws' of production. Hence the classical principle of commodity money is not amenable to it. This ultimately, is the importance of the distinction between bank and commodity money for classical monetary theory. Similar conclusions apply to neoclassical monetary theory. Neoclassical economists base their theories on a barter economy operating under conditions of certainty. Money is introduced in the economy as an endowment from heaven or it can be in the form of one commodity serving as *numeraire*, or commodity money (gold and silver). The money supply in their theory is represented as a vertical line in the money-interest rate space. The underlying notion is that an excess supply of money is determined independently of the demand for it and the money supply can be controlled by the central bank. The monetary system never responds to the real sector of the

economy. When money is brought in, it is often in the form of the quantity theory of money where the money supply is *exogenously* determined by the central bank, and it is a *causal* factor in the growth of economy.

Post-Keynesian theory has no such starting points. The money supply function is horizontal and the quantity of money is credit-driven and demand-determined. The central bank determines short-term interest rates. Furthermore, the credit money is not like other commodities, it is supplied as the residual provider of the monetary system, that is, it is *endogenous* and must increases in the supply of credit money result from an increase in the demand for bank credit. An improvement in long-run investor expectations will lead banks to extend credit to those borrowers whose projects now appear more attractive. An increase in money wages or in the price of raw materials will cause business borrowers to demand more short-term credit for working capital purposes. Expectations of rising financial asset prices will similarly lead to increased credit demand for speculative purposes, with a view to reaping anticipated capital gains.

The *exogenous* money supply of neoclassical theory is simply another way to say that the central bank can adjust the overall volume of money, through its use of open market operations, the discount rate, and reserve requirements, in response to changes in the demand for it, to that level consistent with its policy objective. But in reality as argued by Nicholas Kaldor (*The Scourge of Monetarism*, p. 47, 1982):

> *"The Central Bank cannot refuse the discounting of "eligible bills" rendered to it ... If it did, by setting a fixed limit to the amount which the Bank is prepared to discount on a daily or a weekly basis ... the Bank would fail in its function as "lender of last resort" to the banking system which is essential to ensure that the clearing banks do not become insolvent as a result of a lack of liquidity. Precisely because the monetary authorities cannot afford the disastrous consequences of a collapse of the banking system... the "money supply" in a credit-money economy is endogenous, not*

exogenous—it varies in direct response to changes in the public "demand" to hold cash and bank deposits and not independently of that demand."

This is to say that the money supply is a perfectly elastic or horizontal curve with respect to any interest-rate level set and maintained by the central bank, which means the Central Bank has no choice but to accommodate a greater amount of money demand determined by the market at the price of its own choosing. Nicholas Kaldor pioneered this particular formulation of the theory of an endogenous money supply, one that many Post-Keynesians have accepted uncritically.

Lavoie (1984) argues that the major distinction between orthodoxy and the endogenous money approach is that neoclassical theory emphasizes money as stock, or as an asset in a portfolio, whose value is derived from its usefulness in facilitating exchange of goods that have already been produced. In Post-Keynesian theory, however, it is the flow of money, which is important. Any flow of production requires a flow of new credit or a renewal of past credit flows. Money cannot be introduced into a system after production has taken place, since money creation has to do with the production process itself. In this scheme, borrowers are the causal factor and the function of banks is to create money with credits that have not yet been repaid (Lavoie 1984, p. 771-4).

The endogenous money approach accepts two ideas. First, loans make deposits; and second, deposits make reserves. Thus, 'banks do not wait for the appropriate amount of resources to exist to provide new loans to the public…' (Lavoie 1985, p. 67-8).

2. 4 POST-KEYNESIAN VS MONETARIST

Monetarists do recognize that bank deposits *per se* are indeed an endogenous variable 'credit' when bank loans are extended, but they have argued that if only a strict

monetary base system of controlling the money supply were employed, then the supply of money could be made exogenous, so that it would not respond to changes in the demand for money or credit. The money supply is determined largely by the policy actions of the central bank. In this sense a modern monetary system could be made to resemble a commodity money system. The Post-Keynesians counter that the base itself is also endogenous in real-world central banking systems. The argument is that, in practice, central banks cannot 'window', as this would mean abandoning their responsibility for the liquidity of the system and the 'lender-of-last-resort' function (Moore, 1988, p. 14-8; Kaldor, 1986, p. 25; Dow and Saville, 1988; 1990, p. 141-52). The most basic obligation of all monetary authorities is to support, maintain, and encourage orderly conditions in financial markets generally, and in the commercial banking system in particular. In short a central bank's job is to maintain a perfectly elastic money supply. All they can do is change the terms on which they are prepared to make accommodations, that is, the discount rate or bank rate, and this variable, together with control over short-term rates more generally (via open market operations or other devices), then becomes the ultimate monetary policy instrument.

2. 5 THE ROLE OF CENTRAL BANKS

Credit money takes many forms. The attempt to control quantitatively any one category of monetary instruments will tend to direct financial flows elsewhere, thus diminishing the significance of the controlled category. With the broad usage of credit money, it cannot be distinguished both in theory and in practice. Broad credit money encompasses the total liabilities of all banking firms creating transactions deposits. The

nominal volume outstanding depends on the amount of bank lending, which in turn is dependent on the demand for bank credit.

Conventional analysis assumes that because these ratios are observed to be stable, the supply of credit money is set exogenously under the control of the central bank. This view confuses *ex post* identities with causal explanations. It also ignores the fact that the historical purpose of central banks was to ensure that the supply of money accommodated to changes in the demand for liquidity. While most have contented themselves with acquiring short-term securities and foreign exchange, they may in the future extend their "buyer of last resort" function to other assets such as corporate stock or, more likely, stock market indexes. The central point is that *the supportive responsibilities of central banks rank high above their stabilization functions*. The most basic obligation of all monetary authorities is to support, maintain, and encourage orderly conditions in financial markets generally, and in the commercial banking system in particular. Central banks cannot directly control the rate of expansion of bank credit and hence the money stock, but they have the ability to determine short-term interest rates, and so the level of administered bank lending rates, and that's the primary method for them to influence the money supply in the absence of credit controls.

The central bank has no direct control space—and very little indirect influence—over the quantity of bank money. The quantity of bank money is actually determined by the quantity of bank loans. Obviously an increase of bank money must be matched by an increase of bank loans (simply due to accounting); our argument is that the decision to increase loans is the result of private negotiation between banker and borrower. Because the demand for loans is inelastic, at least in the short run, interest rate changes play a

secondary role in the decision to borrow/lend. More importantly, it is the decision to spend that influences the quantity of bank money created. This view can be summarized fairly accurately as 'planned spending determines the demand for loans, the supply of loans substantially accommodates the demand, and this then determines the quantity of bank money created'; more succinctly, 'loans create deposits'. Thus the horizontal money supply is endogenously determined, while the short-term interest rate is exogenously determined.

2. 6 ENDOGENOUS INTEREST RATE VS EXOGENOUS INTEREST RATE

Central banks smooth nominal short-term interest rates so as to ensure "orderly money markets." Interest rate smoothing minimizes financial market stress associated with interest rate prediction errors and surprise asset price revaluations. As custodians of the financial system, monetary authorities prefer smooth interest rates to minimize unexpected large asset price declines, which raise the risk of bankruptcies and banking crises. Historically, central banks have utilized monetary policy to stabilize both the financial markets and the macroeconomy.

Neoclassical economists believed that money was neutral in the long run and interest rates acted as any other market-clearing price, the responsibility of which is to equate the supply and demand for loanable funds in financial markets. As a result, there will not existing a total flow supply of savings in excess of total investment demand for funds. Interest rates in competitive markets can always fluctuate automatically and sufficiently to maintain aggregate demand equal to aggregate supply. This vision can be applied to an economy with commodity or fiat money, where the money stock is

exogenous and all markets are perfectly competitive. In a commodity money economy where all prices are flexible, money is neutral in the long-run equilibrium. In such a world of *exogenous* money supply, only when economic units decide on balance to store money could aggregate demand fall below aggregate output. Neoclassical economists admitted that this could happen temporarily, when public confidence breaks down during crisis conditions. But in normal times, commodity money only serves as an exchange to buy the goods and services consumers need. As there is no interest for money saving in such a commodity economy, neoclassical economists believed money would always be dominated by interest-yielding financial assets in wealth portfolios as a permanent store of savings. An interest rate that brought saving and investment into balance was the key self-equilibrating market mechanism of neoclassical economics.

As developed by the Post Keynesian theory, banks are price setters and quantity takers in both their retail loan and deposit markets. The short-term supply function of nominal credit money is horizontal in interest-money space, at a level based on the supply price of liquidity (reserves) administered by the central bank. Whenever the central bank increases or reduces its marginal lending rate to the financial system in pursuing its ultimate policy goals, the horizontal money supply function shifts vertically up or down. A long-term money supply function independent of demand forces thus does not exist.

The supply of credit money is never quantity-constrained in the absence of credit controls. The nominal supply of credit money is perfectly elastic at a rate based on the central banks' administered minimum lending rate. Real forces of productivity and thrift

affect nominal interest rates only indirectly, by determining the upper and lower limits over which rates will be moved in pursuit of the central banks' ultimate policy goals.

Nominal interest rates, exogenously administered by the central bank, together with the expected inflation rate determine *ex ante* real rates of return that govern asset holder behaviour.

Since nominal short-term rates are administered exogenously by the central bank, and nominal long-term rates reflect financial markets' expected future short-term rates, interest rates are entirely a monetary phenomenon. As all other marginal efficiencies will eventually adjust to the level of this interest rate to get long-period equilibrium, the rate of interest therefore plays an important role in the production of capital goods. The purpose of monetary policy is to target the rate of interest, not the stock of money, which may be out of control in any event—the stock of money is demand-determined, i.e., all increases in the demand for money are fully accommodated by the central bank. As an experience we know that 'Unlike monetary targets, interest rate targets are almost invariably attained'.[1]

In order to show that the theory of Post Keynesian correctly reflects the process of monetary policy, not only in industrial countries but also in developing countries, I will take China as an example. First, by dealing with the Chinese history of banking reforms, we can see that the Central Bank determines the interest rate base. Then, by performing several tests, we can reinforce the conclusion that, just as Post Keynesian theory said, the money supply is endogenous and accommodates to the economy, while the interest rate is exogenously determined.

[1] This was said by Guttentag (1966) first and quoted by Moore (1988, P93) as a reason to show Central Banks will exogenously control the interest rate rather than the money supply.

3 Chinese Banking System Reforms

3. 1 GENERAL CONSIDERATIONS

Prior to the economic reform, the Chinese banking system was characterized by a monobanking system. The highly centralized People's Bank of China (PBC) acted both as a central bank and as a commercial bank, which controlled about 93% of total financial assets of the country (Yi, 1994, p.19). At the same time, there were two specialized banks—the People's Construction Bank of China (PCBC) and the Bank of China (BOC)—that operated as two special departments within PBC. The banking system was small relative to the economy and mainly played a role of social accounting. It worked as a cashier for the Ministry of Finance with the functions of settlement of enterprises' transactions, administration of funds for working capital and collection of household savings. The role of financial intermediation in resource allocation was very limited.

Since 1978, the Chinese government embarked on a comprehensive economic reform combining elements of planning controls and market mechanisms to achieve a socialist market economy. The financial development can be classified broadly into three distinct time periods: 1978-1984, 1985-1993, 1994-present.

In the first time period (1978-1984), the main objective of financial reform was decentralization. The PCBC and BOC started operating as independent specialized banks. The Agricultural Bank of China (ABC) was established to take over the PBC's rural banking business. Moreover, the first NBFI (non-bank financial institution), the China International Trust and Investment Corporation (CITIC), started business. From then on

the PBC has been responsible to the State Council for the formulation and implementation of monetary polices, but it continued to perform certain commercial activities during the period 1978-1984.

In 1984, to improve monetary control, the PBC became the central bank and its remaining commercial lending activities were transferred to the newly established Industrial and Commercial Bank of China (ICBC). Enterprise financing began to shift from direct grants from the budget to loans extended by the specialized banks. Thus, a two-tier banking system in China was created. Furthermore, the type of banking institutions became more various. Different commercial banks emerged and the number of non-bank financial institutions (NBFIs) was increased.

In November 1993, the Third Plenum of the Fourteenth Party Central Committee outlined a comprehensive reform strategy aimed at achieving the goal of establishing a structure conducive to the operation of a socialist market economy. Since then, the Chinese government has launched a series of thorough market-oriented reform of the financial sector. In accordance with this reform strategy, the first central bank law (PBC Law) was finally introduced on 18 March 1995; it gave the legal right to the PBC to formulate and implement effective monetary policy, and the sole authority to control and supervise the financial system. Following the PBC law, the Commercial Bank Law (CB law) was enacted on May 11, 1995, which aimed to transform major domestic banks, especially the four state banks, into independent commercial entities.

After about 20 years of reform, different types of financial institutions have emerged and thus the level of diversity in the financial sector has been increased. **Figure 1** shows the basic structure of the PBC. As a result of the financial sector development,

monetary policy acquired a key role and has become a crucial instrument in macroeconomic management.

Although the PBC was designated as a Central Bank, it was, however, still directly subordinated to the State Council, and lacks independence (Chen, K.*et al.*, 1992; Zhang, W., 1999). About 80% of total bank assets were controlled by the four specialized state-owned banks (the ICBC, the ABC, the PCBC and the BOC). This concentrated structure makes the state banking system a quasi-fiscal institution. As the only low-risk vehicle available for savings in the economy, it offers an extremely low real rate of return on bank deposits.

Despite the reliance on monetary policy in China's macroeconomic management, its performance has been rather poor. Although the PBC announced that its intermediate target is monetary aggregates, it could not actually control the money supply. In order to ensure a smooth transition, the PBC can use a variety of policy tools to implement monetary policy, from direct means of traditional credit quotas, to indirect monetary policy tools. Indeed, indirect policy tools, such as interest rates, deposit reserves, rediscounting and open market operation, can adequately serve the purpose.

3. 2 MONEY SUPPLY REFORM

Many former researchers have studied monetary policy reform in China. (Mohammad S. Hasan, 2001; Mohammad S. Hasan, 1999; Carsten A. Holz, 2000; Michael Ka-Yiu Fung, Wai-Ming Ho, and Lijing Zhu, 1999; Chien-Hsun Chen, 2002). Based on those studies, we provide a comprehensive picture of the reform procedures in what follows.

Prior to the reform, China had two separate monetary circuits—a bank transfer circuit for cashless enterprise transactions and a currency circuit for consumer cash payments—monetary policy was implemented through the credit plan (to command the transfer balance flow) and cash plan (to control the currency flow). See **Figure 2** of the circuits in economy before the reform. As the credit allocation decisions were made according to policy goals for major macroeconomic aggregates, the policy makers, not the bank managers, decided the amount and the owner of bank loans. Monetary policy was thus a passive instrument in the execution of the government's objectives.

The credit plan was compiled by the PBC each year under the direction of the State Council and in cooperation with the State Planning Commission. The preparation of the credit plan consisted of a two-stage process: a top-to-bottom process followed by a bottom-up one. In the first phase, the PBC drew up a tentative credit plan including the total size of new loans and the allocation of the credit among the state banks. Then the bottom-up phase was a feedback process from the "bottom", the PBC headquarter revised its initial credit plan, and the final credit plan was submitted to the State Council for final approval. But in practice the credit plan was poorly implemented and it was ineffective as a monetary policy instrument mostly due to the reform in China.

Following the reform in 1978, the content of the credit plan has experienced some considerable changes even though it continued to be the core policy instrument. It took into account the annual macroeconomic targets of inflation and real GDP growth. After decentralization, the deposit-loan balance at the branch level was set as a lever of monetary control in order to improve banking efficiency. Under such a monetary regime, a bank branch could lend more and earn more income if it attracted more deposits. The

new system was highly effective in stimulating bank competition, but it did not have an effective mechanism to cap the supply of aggregate credit. As a result, 1983-1984 saw a rapid expansion of credit, as the growth rate of M2 rose sharply from 18.74% in 1983 to 34.84% in 1984 when the first episode of inflation appeared. Furthermore, in 1984 as China's central banking system was established, the PBC imposed an overall credit quota on financial institutions set in the light of economic and monetary conditions. **Figure 3** shows the new circuits after this reform. While banks retained their discretionary power over working capital loans, lending for fixed asset investment was tightened. The new monetary control regime managed to slow down credit expansion gradually during the 1985-1987 periods. The growth rate of M2 fell to 22.4% in 1987. After the PBC law was enacted in 1995, the Chinese government planned to gradually phase out the credit plan system.

Although the implementation of the credit plan remained the core of the PBC's activities before 1998, a set of indirect policy instruments (PBC lending to banking institutions, rediscount policy, reserve requirements and market-based operations i.e. interest rate operation) were developed and increasingly used in the PBC's monetary management. They should have played an important role in executing monetary policy. Moreover, after the abolishment of the imperative credit plan in 1998, they should have replaced the credit plan as the main policy instruments. Interest rate regulation is the second major policy instrument for macroeconomic control in the economy, and the PBC manages and supervises interest rate policy.

The complete money supply has the following features:

1) The planning mechanism and market mechanism coexist in the money supply

process.

2) There is no interest rate transmission mechanism between the market for high-powered money and the macroeconomic money/credit market.

3) The PBC faces a vertical demand curve for high-powered money and it cannot set either its price or the quantity to affect the state banks' desire for high-powered money.

4) The interest relationship is determined ex-ante, and is not an ex-post result of the system.

Table 1 presents the amount of money supply and loans during the 1980s and 1990s using the data from *Financial Yearbook of China*. Also it is obvious from **Figure 4** that they have the same trend. The stock of broad money increased by 348% during the period from 1979 to 1985. In the first half of the 1980s, the annual increase of money in circulation was RMB 20 to 30 billion. However, in 1988 the figure surged to RMB 68 billion. As we can see from **Table 1,** the loans sharply increased by 332 billion in 1989, therefore, 1990 saw a rapid expansion of credit, the increasing of broad money rose sharply from 163 in 1989 to 437 in 1990 and 406 in 1991. Over 90 percent were loans in excess of deposits, and this overextension was the real culprit behind the surge in the money supply and prices that led to the Tiananmen incident. In response to the runaway inflation and the ensuring Tiananmen incident in 1989, an austerity policy was adopted to cut investment spending, to contract credit supply, and to reimpose numerous price ceilings. As a result, the economy plunged into a deep recession in 1989-1991.

In the post-Tiananmen tightening, the increase of money in circulation dropped by two-thirds to some RMB 21 billion, but subsequently soared to a new peak of RMB 116

billion in 1992 as liberalization and budget deficits combined to fuel economic overheating. As the economy slumped into a recession, inventories piled up and inter-enterprise arrears mounted. To prevent the economy from collapsing, large amounts of fresh liquidity were injected. The 3 years from 1990 to 1993 witnessed another period of rapid monetary expansion; the growth rate of broad money was 40.05% in 1990, 31.28% in 1992 and a rate of 37.31% in 1993; narrow money and currency in circulation were growing at a rate of 38.8% and 35.3%, respectively, by the end of the first quarter of 1993[2]. Although reserve requirements, credit ceiling, variable interest rate, and other administrative levers have been introduced to control monetary and credit aggregates in the post-reform period, their role and effectiveness were problematic. The post-reform economy has experienced insufficient control over monetary and credit aggregates.

3. 3 THE EVOLUTION OF THE INTEREST RATE SYSTEM[3]

Before the economic reform in 1978, with the high degree of centralisation of financial and investment, interest rates were completely controlled by the planning authority and did not played an active role in monetary policy. After 1979, China began to liberalize interest rates in order to improve the allocation of scarce investment funds. Therefore it became increasingly important as an instrument of monetary policy. The interest rate system has undergone the following main changes:(I) In order to take account of changing macroeconomic circumstance, interest rates have been adjusted more frequently since 1979 (and particularly since 1988). From 1979 to 1998, the PBC adjusted the banking institutions' deposit rates or lending rates 20 times. In particular,

[2] The growth rate and nominal increase of loans and broad money are calculated based on Table 1, in which the data are from Financial Yearbook of China. The analysis of the data is based on Harrold and Lall (1993).

these rates were adjusted 8 times in the three-year period from 1995 to 1998. [**See Table 2**] (II) Banking institutions have been allowed some flexibility in adjusting their lending rates within a margin set by the PBC above the administered rates. (III) Various interest rates have emerged in the financial markets. By the end of 1998, there were 24 kinds of deposit and 48 kinds of lending rates and all of them were set by the PBC.

To show that the interest rates were determined by the central bank, there are three concrete evidences. (1) PBC determines the lending rates to specialized banks, the discount rate to other financial institutions and the rates on deposits of the specialized banks. (2) PBC regulates the interest charged by the specialized banks and other financial institutions. (3) PBC provides guidance on rates charged to each other among financial institutions (similar to the federal funds rate).

3. 3. 1 Interest Rate Setting

Interest rate setting means the determination of different interest rates and thus shaping the interest rate structure. The central bank considers the following factors in regulating the interest rate: 1) Economic growth; 2) The average profit; 3) The price level; 4) Supply of and demand for funds; 5) The interest rates of world capital; 6) The interest rate should be calculated in terms of a 360-day year.

There are three characteristics in the setting of interest rates in China: (**I**) The process of the interest rate setting is in fact a process of vertically balancing the interests of the PBC, the state-owned commercial banks and the state-owned enterprises (SOEs), and horizontally the interests of different sectors and regions. (**II**) The bank deposit rates play the most important role in shaping the complete interest rates based on them. (**III**)

[3] This section of interest rate evolution is base on the ideas of Huang, Yanfen (2002)

These principles assume that all banking institutions, especially the state banks, and the SOEs would not make a loss. Also the differences between interest rates are not an indication of the risk of loans.

Under an intermediate interest rate target the central bank attempts to influence economic activity by triggering changes in interest rates and thereby keeping the interest rate at a determined level. To stimulate economic development, it will reduce the intermediate interest rate target and keep it at a lower level. On the contrary, to control inflation and to slow down economic growth, it will increase the interest rate target and keep it at a higher level.

3. 3. 2 Interest Rate Adjustment

The PBC's interest rate adjustment refers to changing the general level of interest rates according to the macroeconomic situation. In comparison with the setting of interest rates, the interest rate adjustment includes more features of a market economy. In general, the PBC considers a few macroeconomic variables in fixing the general level of interest rates and adjusting interest rates (Zhou, 1993, p.232; Ping Xie, 1997, p.106): (I) The general supply-demand situation of funds in the economy. (II) The average cost and average profit level of the SOEs. (III) The profit margins of the state banks. (IV) The price level. It is clear that interest rates are used consciously by the PBC as a monetary policy instrument to influence the macroeconomic situation as well as the credit and investment activities of various economic entities. When inflation becomes a severe problem in this partially reformed system, the government makes a serious attempt to reduce the growth rate of the money supply by tightening up bank credits and raising interest rates on government bonds and bank deposits to soak up excess liquidity from the

public.

Interest rates influence the loans of banks, and hence they influence the whole economy. The demand for bank credit is negatively related to the real interest rate. Whenever the increase in bank credit is rapid than normal, in a Wicksellian framework, this would imply that the *ex ante* interest rate charged on bank credit is too low. Similarly, if bank credit increases slower than normal or even decreases, it implies the *ex ante* real interest rate charged by banks is too high.

As a conclusion, the short run nominal interest rates are the most important policy instrument for a government's macroeconomic objectives. A rise in nominal interest rates, given the state of expectations, will cause a decline in borrowing and an increase in lending; conversely, a reduction in nominal short-term interest rates, given expectations, will stimulate borrowing and contract lending. Therefore monetary authorities will be able to move nominal aggregate demand toward a target objective by administering nominal interest rate, while the effectiveness of rate changes will depend on the interest elasticity of demand for bank credit.

3. 4 PRELIMINARY CONCLUSION

At present, almost all central banks in developing and industrial countries adopt interest rate targeting. From the analysis above, we can see that in China the interest rate is like an exogenous variable since it is determined arbitrarily by PBC, while the money supply acts as an endogenous variable and changes according to the interest rate and credit demand in the economy. Changes in short-term interest rates influence the cost of borrowing, affecting the willingness of make loan. Increases of interest rates contract the

loan and money supply, whereas decreases in rates operate in the opposite direction. The money supply process starts with the behaviour of the non-banks and banks that determines the amount of money demand, and then the PBC will accommodate this amount. There is no doubt that the interest rate in China acts as an exogenous variable according to the situation and some other factors showed above in the economy. Changes in the demand for credit need not have any effect on the loans rate, unless the Central Bank chooses to do so. Demand-determined money supply may be viewed as *horizontal*, at an interest rate exogenously administered by the Central Bank (Moore, 1991, p.405).

So far from the theoretical part of Chinese banking system, we can show that the features of the Chinese banking system correspond to those described by Post-Keynesian theory. In order to strengthen this, I will do several tests in the next section, that will examine how interest rates are set in China. Once again, the results of these tests will reinforce the view that the Chinese monetary system is well described with the help of Post-Keynesian theory.

4. The empirical tests

4. 1 GRANGER CAUSALITY TESTS

Money and banking textbooks invariably use the concept of the money multiplier to demonstrate the determination of the quantity of money. The multiplier links a change in the monetary base (reserves plus currency—what we have been calling fiat money) to a change in the money supply, where the money supply equals the base times a multiplier. In the simplest models, the multiplier equals the inverse of the required reserve ratio. No matter what the legally required reserve ratio was, the standard example

always assumed 10 per cent so that the mathematics was simple enough for college students to calculate a money multiplier equal to 10.

In the real world, banks make loans independent of reserve positions, and then borrow reserves to meet requirements. Bank managers generally neither know nor care about the aggregate level of reserves in the banking system. Certainly, no loan officer ever checks the bank's reserve position before approving a loan. Bank lending decisions are affected by the price of reserves and expected returns, not by reserve position. If the spread between the rate of return on an asset and the Fed funds rate is wide enough, even a bank that is already deficient in reserves will be purchasing (borrowing) reserves in the Fed funds market.

The money multiplier concept reverses the direction of causation: changes in the money supply cause changes in bank reserves and the money base, not vice versa. The various empirical studies that purport to show a high correlation between changes of reserves and changes of the money supply are really proof of Fed accommodation.

We can test this direction using an empirical test. In econometrics a variable is endogenous if it is jointly determined with other variables within the system. A variable is exogenous only if it is independent of other variables and so is the disturbance term in the equation. The issues of statistical exogeneity and central bank control are clearly quite distinct. Exogeneity in the control sense is not the relevant test of exogeneity in the statistical sense. For statistical exogeneity it must be shown that the base does not respond endogenously to changes in the demand for money and credit. In our condition, if central banks permit the monetary base to accommodate changes in the demand for

money and credit, the base and the money stock must be regarded as endogenous variables in the statistical sense.

4.1.1 Technical definition of Granger causality

As noted by Granger and Newbold (1974), association between two time series may be influenced by association (autocorrelation) within the individual series. One effect of such autocorrelation is often a tendency to overstate the extent of existing relationships and to "find" relationships that do not exist. The development of filters to remove serial correlation in individual series is thus crucial for causality testing. If the residual series are not white noise, the usual significance tests are invalid, often resulting in exaggerated ***F***-statistics and erroneous conclusions of causality.

Granger (1969) defined causality as follows: "We say that Y_t is causing X_t if we are better able to predict X_t using all available information than if the information apart from Y_t had been used" (p.428). Granger acknowledged the operational unreality of the phrase "all available information" and proceeded to place the validity of his definition in a two-variable model:

$$X_t = \sum_{j=1}^{m} a_j X_{t-j} + \sum_{j=1}^{m} b_j Y_{t-j} + U_t$$

$$Y_t = \sum_{j=1}^{m} c_j X_{t-j} + \sum_{j=1}^{m} d_j Y_{t-j} + V_t$$

where time series X_t and Y_t are assumed to be stationary and the U_t and V_t are white-noise residuals (Granger, 1969, p.431). In this model Y is unidirectional causal of X if it is found that some b_j are not zero, while the c_j as a group are zero. For X to cause Y would require the converse conditions. If it is found that some b_j and some c_j are not zero, a feedback relationship exists. Put most simply, Y is said to "Granger cause" X if past

values of Y can be used to obtain forecasts of future values of X that are more accurate than those using only past values of X.

4.1.2 Empirical Evaluation

The main purpose of this section is to extend the evidence of money supply endogeneity to China. As structural change can complicate the test for trends, a policy regime change can result in a structural break that makes an otherwise stationary series appear to be nonstationary. Sample range is from 1983 to 2002, which is a period after the main reform of PBC, to make the results more reliable and reflect the current situation of the Chinese economy. Direct Granger causality tests were run on the monetary base, various definitions of the money supply and bank lending inside the economy. If the endogenous money hypothesis is valid, Granger Causality should run from bank lending to the money supply to the monetary base.

The procedure followed had two stages. First, since stationary is a requirement for the implementation of Granger Causality tests (Granger, 1969, p.431), each of the five variables (in log form) is checked for stationary. This was done through checking whether each series has unit root. Second, if the results in the first step show the variables are nonstationary, we will continue the Granger causality tests by taking the first differences of them, otherwise we will go on with the variables in levels.

Annual data on the following variables are obtained from the *Financial Yearbook of China.* They are also given in Appendix. Logarithmic values are used in tests. The variable definitions are as follows:

B= monetary base

M0=currency in circulation

M1=M0+demand deposits of resident sectors other than central government and banking institutions

M2=M1+time, savings, and other deposits of resident sectors other than central government and banking institutions

LOANS=total loans from banking system

A casual glance at **Figure 4** clearly indicates that the chosen variables are upward trending in levels although with different directions.

The following tests are based on small samples due to the limitation of obtaining data, therefore the results may not so precisely as those with large samples.

4.1.2.1 Unit Root Tests

Since all time series exhibit a trend, the appropriate unit root test format is the one that attempts to discriminate empirically between a trend-stationary process and a difference-stationary process (Johnston and DiNardo, 1977, p.224). The unit root tests implemented were using a newly Modified Augmented Dickey-Fuller (name ERS: Elliott-Rothenberg-Stock DF-GLS test) tests. This test is more powerful than ADF tests, and it is available only in the latest software of EViews 4.1. The results are compiled in **Table 3** that printed out from EViews 4.1 automatically. In the tables, all the variables take the first difference, like D (LM2) =LM2-LM2$_{-1}$ means the first difference of log M2.

The number of lag length in the test was chosen to examine the autoregression of each variable, by setting the maximum lag at 7; the lag length of zero was chosen automatically by EViews, on the basis of AIC information tests, and it means that there is no autoregression in the variables. All of the variables are performed with a constant. As results showed, each of the five variables is nonstationary in levels, but the unit root

hypothesis can be rejected for the first differences of LM0, LM1 at the 5% level of significance, LM2 and LLoans at 1% level of significance. These results allow us to proceed to the causality analysis by using the first difference of the variables.

Additionally, we perform the unit root test of broad money (M2) and monetary base as a preparation of Granger Causality tests on these two variables. This sample period is from 1985 to 1997. Test results are listed in **Table 3** also.

This time, the two variables of LB and LM2 are still nonstationary in levels but not in the first difference forms. Hence, when we test for Granger Causality in the case of base money and money supply, we will also use their first difference.

4.1.2.2 Granger Causality Tests

For the Granger Causality test, I choose the lag length of the equation by making use of the AIC test, the "Akaike Information Criteria"; on that basis, a lag of length two measured to be the most appropriate. The results of the causality tests are reported in **Table 4**.

By looking at the F-statistics and P-values in the table, the P-values of the first two rows are high, which suggests that we cannot reject the null hypothesis in either direction. It implies the presence of strong bi-directional Granger Causality between loans and M0, M1. In the third row, the P-value of "DLM2 does not Granger Cause DLLOANS" is 31.5%, we still cannot reject the null hypothesis, whereas, P-value of "DLLOANS does not Granger Cause DLM2" is only 0.85%, which means we can reject the null hypothesis at 1% level of significance. The most important finding of this test is that of unidirectional causality running from loans to M2. It gives strong support for the endogenous money hypothesis that causality runs from bank loans to money supply.

We then test the causality between M2 and monetary base. The test result didn't show a unidirectional causality between the two variables.

4.1.3 Conclusion of Granger tests

This section provided an empirical test of the Post-Keynesian hypothesis that the money supply is endogenous. With data from the post reform period of China (1983-2002), we run two Granger Causality tests sequentially. The first one is between various definitions of money and loans; the second one is between broad money and the monetary base. The empirical evidence is consistent with the position that, at least over the period studied, the direction of causality runs from bank lending to the money supply. The results also provide empirical support for the Horizontalist view of the endogeneity of the monetary aggregates. Changes in the money stock are attributable primarily to changes in the demand for bank credit. Control over the volume of bank credit would appear to be a necessary condition for central banks to control the supply of credit money.

4.2 TAYLOR'S RULE

According to Post-Keynesian theory, Central Banks set interest rates to influence the economy, which determines bank lending and then money supply. Moreover, by observing the fact that PBC changed interest rates frequently in the last few years, we can examine the PBC's rule of setting interest rates by using a Taylor-type rule, which has attracted much attention in recent years.

Taylor (1993) suggests a very specific and simple rule for monetary policy. His rule sets the level of the nominal federal funds rate equal to the rate of inflation (in effect,

making it an equation for the ex post real funds rate) plus an "equilibrium" real funds rate (a "natural" rate that is seen as consistent with full employment) plus an equally weighted average of two gaps: (1) the deviations of current inflation from an inflation target, and (2) the percent deviation of real GDP from an estimate of its potential level:

(1) $$i_t = \pi_t + r^* + 0.5(\pi_t - \pi^*) + 0.5(y_t)$$

where i= federal funds rate,

r*= equilibrium real federal funds rate,

π= average inflation rate over the contemporaneous and prior three quarters (GDP deflator),

π*= target inflation rate

y= output gap (100-(real GDP –potential GDP) /potential GDP).

Taylor did not econometrically estimate this equation. He assumed that the weights the Fed gave to deviations of inflation and output were both equal to 0.5; thus, for example, if inflation were 1 percentage point above its target, the Fed would set the real funds rate 50 basis points above its equilibrium value. Furthermore, Taylor assumed that the equilibrium real interest rate and the inflation target were both equal to 2 percent.[4]

The Taylor equation describes in a mathematical way the hypothesis that central banks raise the real interest rate in response to a rise in inflation or output, while they reduce it otherwise. As a consequence, the real rate of interest should be higher than the neutral rate if inflation is above its target value or output is above its potential level, and it should be lower than the neutral rate otherwise. In this way, central banks can keep the

values of inflation and of output as close as possible to their target or potential value.

4.2.1 Testing the original Taylor Rule

In order to test the Taylor rule, we need the data on interest rates, inflation rates and output. The data range available is 1978 to 2001. The real interest rate is the difference between the nominal rate and the inflation rate. Data is obtained from the *Financial Yearbook of China* and a web site provides economic statistics—<http://www.econstats.com/global/acn.xls>

In this paper, the output gap is computed in growth terms of the real GDP. By using a Hodrick-Prescott filter (using a damping measure of 100) in EViews, we estimate the potential growth rates of each year. The gap used to estimate the Taylor rule reaction functions is then constructed as the percentage deviation of the real growth rate measure from the real estimated potential growth rate, as shown in **Figure 6.** This difference is called Y in the regression output of **Table 5** and **Table 6**, PAI is the inflation rate, and RR (-1) denotes the process of first-order autoregression.

A brief look at the real interest rate in **Figure 7** showed that it does not have a trend.

The regression result of Taylor rule test is reported in the appendix of **Table 5**. The operating procedure implies that although all relevant information is used for conducting monetary policy, there's not a single pair of the variables that is consistent with the Taylor rule theory; the variables have the wrong sign or are not statistically significant, even with leads or with lags. It implies that there is no explicit instrument rule, that is, the current instrument setting is not a prescribed explicit function of the

[4] For a complementary analysis, see Taylor (1997)

relevant information. We can infer from the procedure results that the real interest rate in China is not determined as a Taylor rule, which is an endogenous reaction function of the inflation and growth rate gap.

4.2.2 Testing an alternative Taylor Rule

In fact, as was discussed in the review section of Chinese reform, the PBC intends to influence the economic activities by keeping the inflation rate at a determined level. However, instead of the contemporaneous or expected value, it bases the feedback function of interest rate on past inflation and output level. Having judged the inflation rates from 1994 to 1998 by the above approach, PBC launched policies 7 times to change the interest rates in that period. Therefore, the Chinese reaction function will not act according to the Taylor-type rule[5], rather the PBC concentrated more on the nominal interest rate than on the real one, taking all past information into account. Certainly, the PBC also included the output gap to stabilize the economy. The above assumption can also be verified from the comparison of **Table 5** and **Table 6** in the Appendix. **Figure 8** shows the changes of nominal interest rate in the years we study.

For a correct result, the coefficients should be positive, because in order to stimulate economic development, the PBC will reduce the interest rate and keep it at a lower level. On the contrary, to control inflation and to slow down economic growth, it will increase the interest rate and keep it at a higher level. The real interest rate will not necessarily rise with the rise of nominal interest rate. Instead, it may even fall, and vice versa.

[5] where a Taylor-type rule denotes a reaction function rule that the real interest rate is a linear function of current inflation and the output gap.

This time we get a good result in **Table 6**, **Panel 6.3.3** (lag pai and lag y). The constant is at a reasonable level of 1.635, and is nearly significant at a level of 10%, while the coefficients are 0.127 and 0.21 for lagged inflation and output gap, respectively (pai, y). These two variables are significant at the 10% level. This result is consistent with the claim that the PBC determines the nominal interest rate by focusing more on the past inflation rates and output gaps than on the future ones. This kind of monetary policy is due to a lack of forecasting ability.

Additionally, the estimated coefficients of both the inflation gap and the output gap are not so big as those endorsed by the original Taylor Rule, that is, they have some influence on nominal interest rate setting, yet allow some other factors to influence it as well. The constant term in the regression result is not a regular estimated value of natural or neutral interest rate. As we know from **Figure 8**, there's not a constant level for the nominal interest rate; it shows huge changes all the time, which also indicates the PBC has no target level of nominal interest rate, but rather "leans against the wind".

Another point worth mentionning here is the average value of the real interest rate infers a looser monetary policy than that of other countries. The average Chinese real interest rate of 1.7 percent is smaller than those of the US and some European countries. It implies that the PBC maintained a lower interest rate in order to reach a higher inflation rate and to help the economy to boom in the 1990s.

4.3 PRELIMINARY CONCLUSION

In this section, we studied the feasibility of the Taylor rule from both the theoretical aspect and the practical aspect. A new model is developed based on the

assumption that the PBC follows a rule of setting the nominal interest rate according to past inflation rates and output gaps. This new model explains how the PBC determines the interest rate and thereafter influences the economy. The monetary authorities adjust the short-term nominal interest rate in response to past changes in inflation and output gap. This behavior of the PBC is distinct when compared to the behavior of central banks in the other countries.

The Taylor rule performs well in describing the behavior of the Federal Reserve and several other central banks according to some former literature. However, the situation is a little different in the case of China. The empirical study in this paper shows that by replacing the real interest rate by a nominal interest rate, and by replacing the current inflation and output gap by those of past, a revised version of the Taylor rule can approximate the behavior of the PBC from 1978 to 2001. The estimated coefficients of both the inflation gap and the output gap are statistically significant but are less than 0.5, the value suggested by Taylor (1993), probably because there are other factors[6] taken into account in China's case.

Together with the result of Granger causality tests, can we draw a conclusion that the central bank of China exogenously determines the nominal interest rate based on past information from the economy and then endogenously matches the amount of money supply that the economy needed. The whole process is consistent with the Post-Keynesian view, as we discussed in the first part of this essay.

5. Overall Conclusion

[6] For the other factors how PBC setting and adjudting interest rates, see page 22 to 23 in this paper.

In this paper, we compare the neo-classical and Post-Keynesian monetary theories. The former regards the money supply as an exogenous variable while the latter regards it as an endogenous one. We take China as an example showing that the Post-Keynesian theory correctly reveals the money supply process and the determination of monetary policy.

Two tests were performed in the model, the first being the Granger causality test between loans, money supply and monetary base. The result shows that causality runs from bank lending to money. It is impossible for the central bank to determine the money supply exogenously; it needs to accommodate the economy. The second test was based on the Taylor rule, and discussed how the PBC sets interest rates in order to influence the economy. The result of the test does not support the strict Taylor rule. It is a characteristic of China as a transition economy that the central bank adjusts the short-term nominal interest rate, rather than the real interest rate, in response to past changes of inflation and output.

Chinese monetary policy is thus better understood from a Post-Keynesian perspective. Moreover, we can accept Post-Keynesian theory with more confidence, based on the fact that it fits not only western countries but also transition countries like China.

But unfortunately there is as yet no well-developed body of alternative "Post-Keynesian" theory that would correspond to neoclassical, Keynesian, monetarist, or even new classical macroeconomics. Nevertheless, as stated by Moore (1988, p.366), there are features of the prevailing orthodoxy that are uniformly rejected by a still relatively small

group of dissenting economists, and from these rejected features it is possible to outline the distinguishing features of a new macroeconomic paradigm, which include:

1. the explicit recognition of historical time (with its implications for the rejection of general equilibrium analysis);

2. the acceptance of uncertainty in the real world;

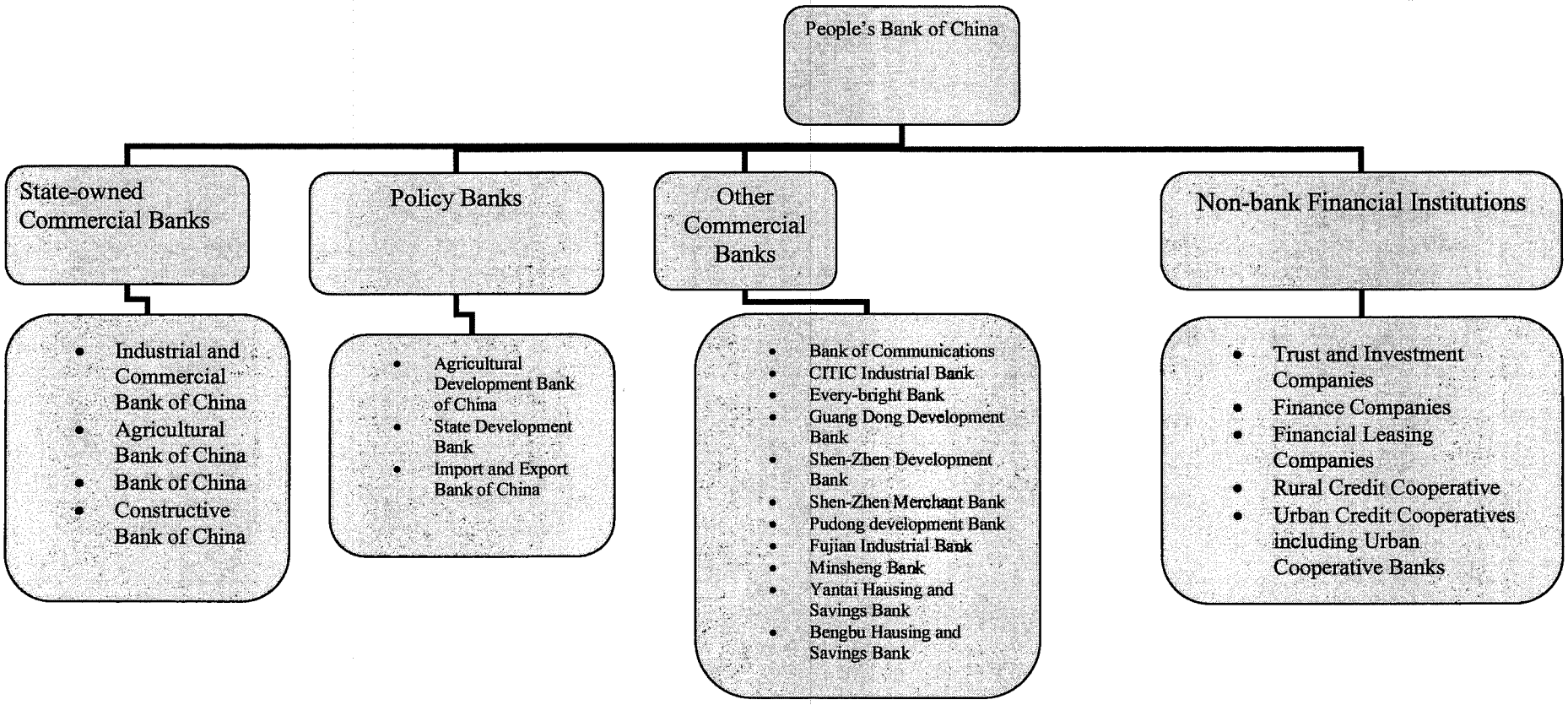
3. the centrality of bank finance for investment behaviour;

4. the endogeneity of the credit money supply;

5. the non-neutrality of credit money; and

6. the autonomous role of wages in the inflation process and the rejection of the equilibrium price-auction model.

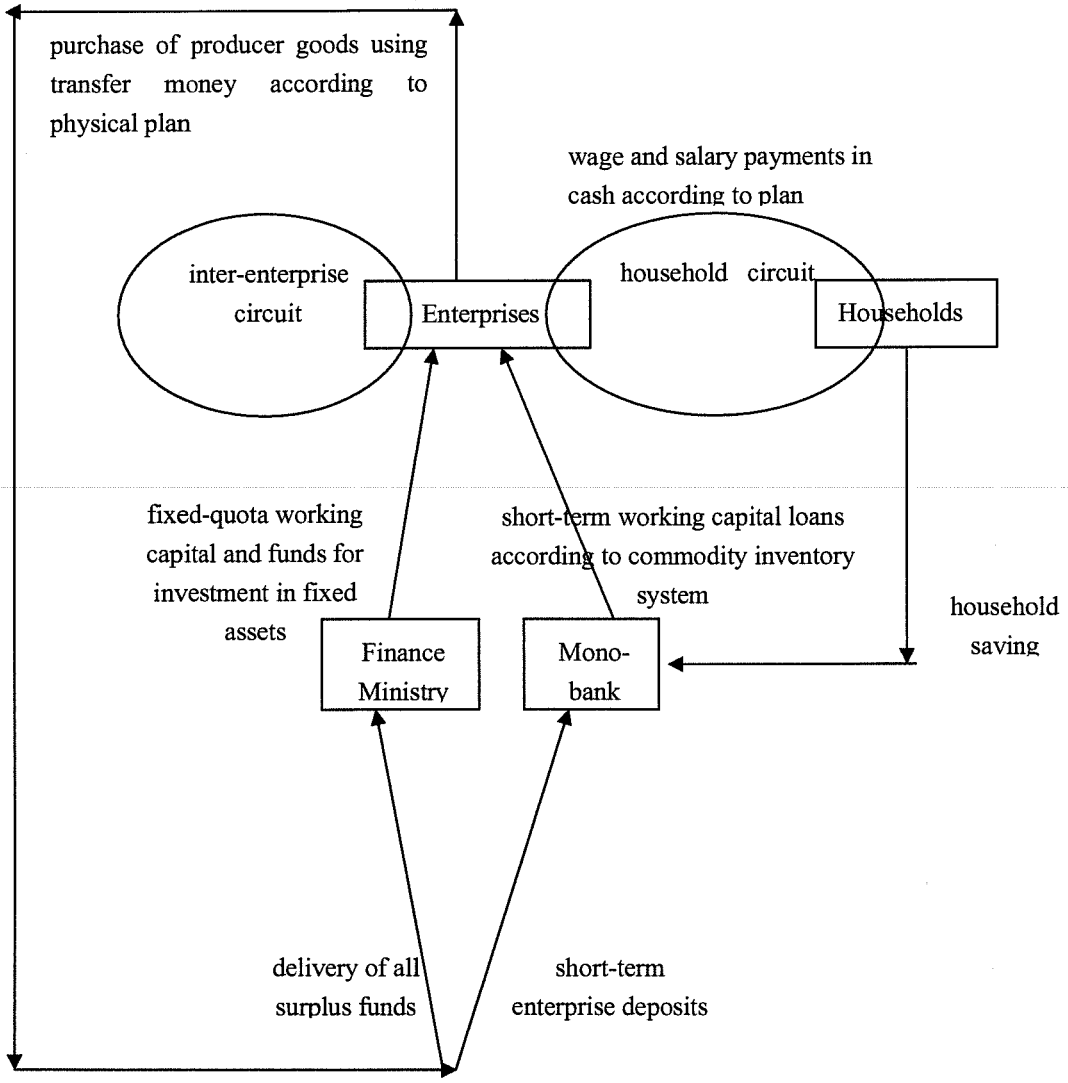
Figure 1: Structure of the People's Bank of China in 1998



Source: Modified from Huang, Yanfen. (2002), p.17

Figure 2

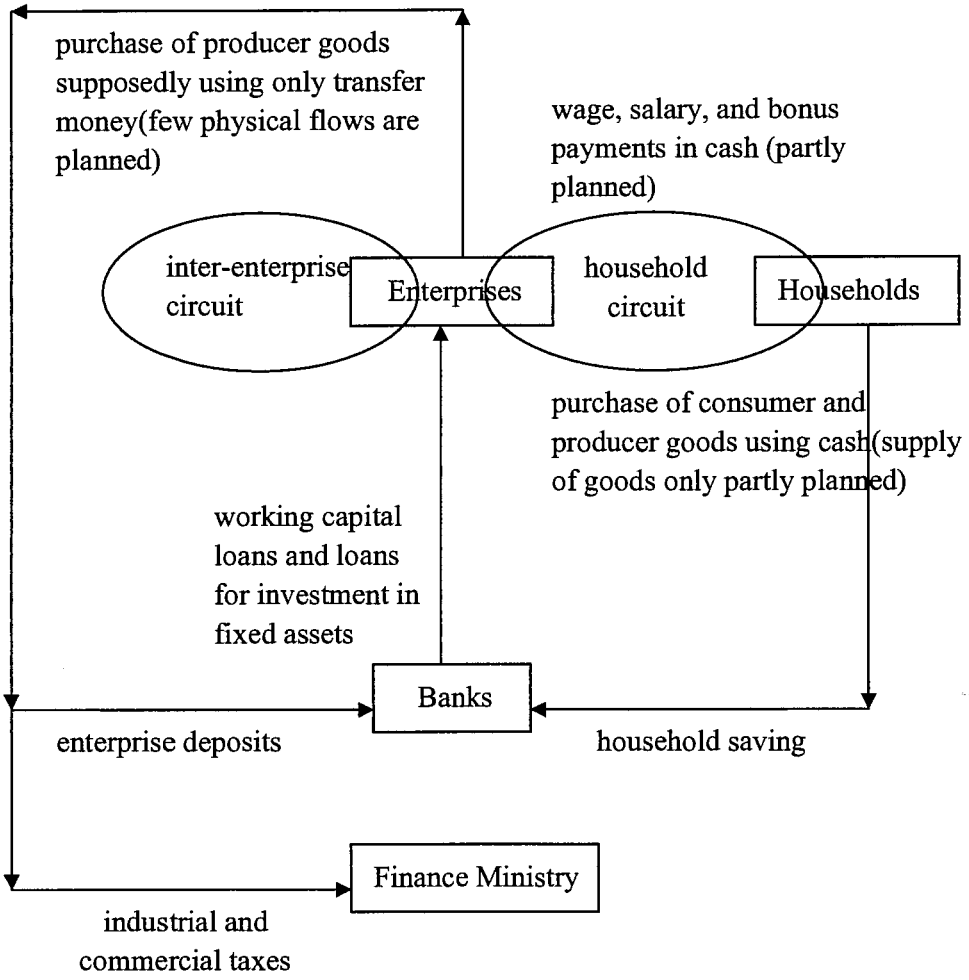
Inter-Enterprise and Household circuits in Central Planned Economy



Source: Holz, Carsten A. (2000), "The Changing Role of Money in China and Its Implications"

Figure 3

Inter-Enterprise and Household Circuits After 1983/84



Source: Holz, Carsten A. (2000), "The Changing Role of Money in China and Its Implications"

Figure 4: upward trend of money and loan

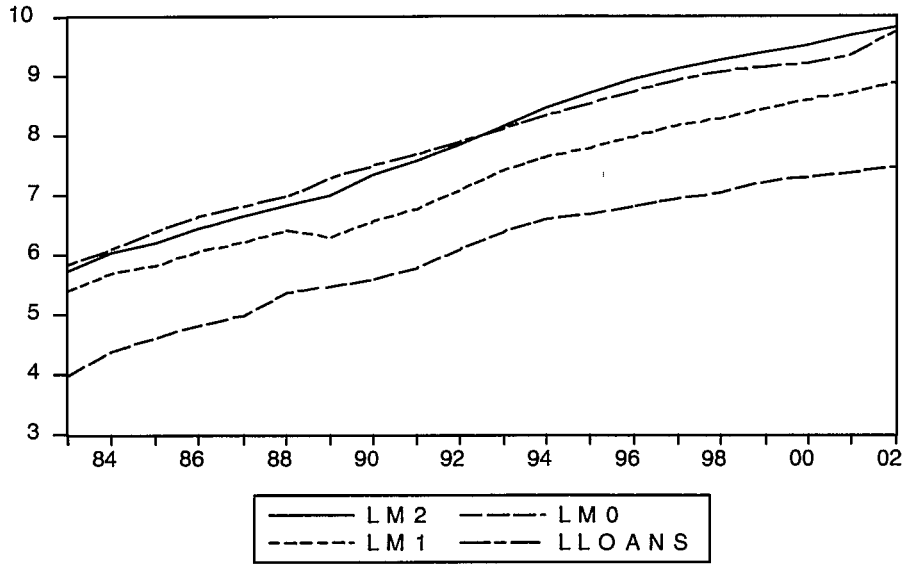
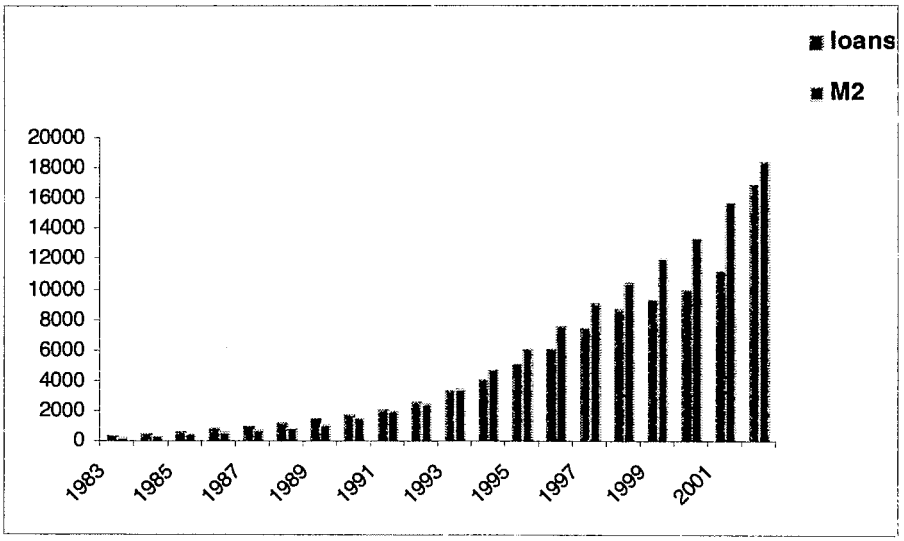
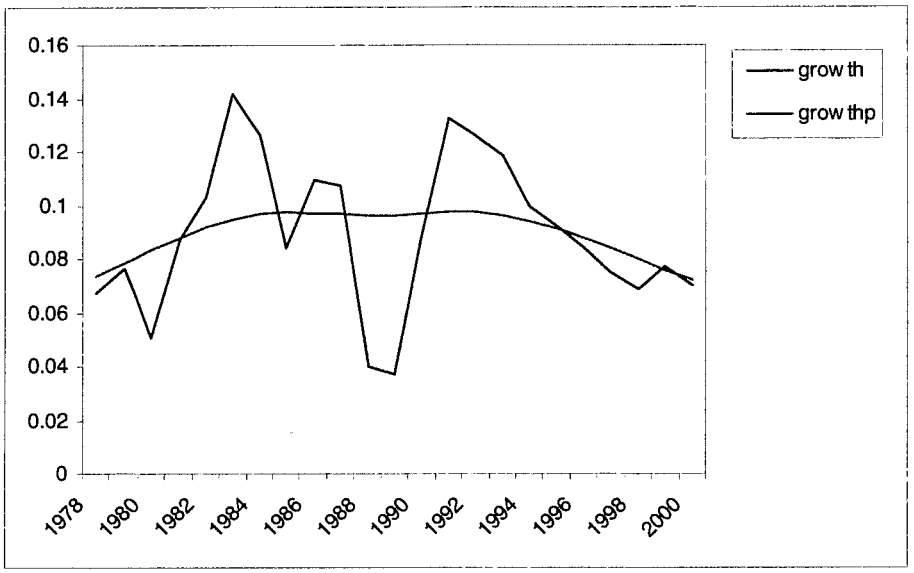


Figure 5: Change of M2 and loans



Notes : This graph is consistent with **Table 1**

Figure 6: Real growth rate and potential real growth rate



Source: The data of real GDP is from *http://www.econstats.com/global/acn.xls*, from which real growth rate and its potential value were calculated.
Data range from 1978 to 2001.

Figure 7: Changes of real interest rate.

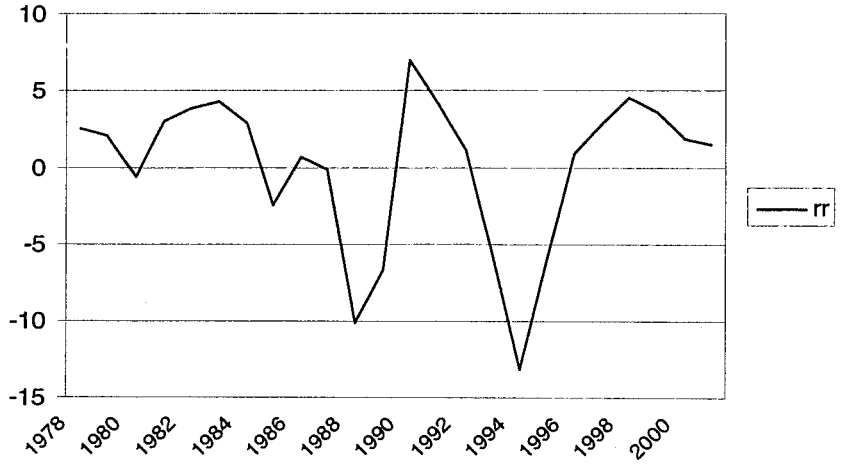


Figure 8: Changes of nominal interest rate.

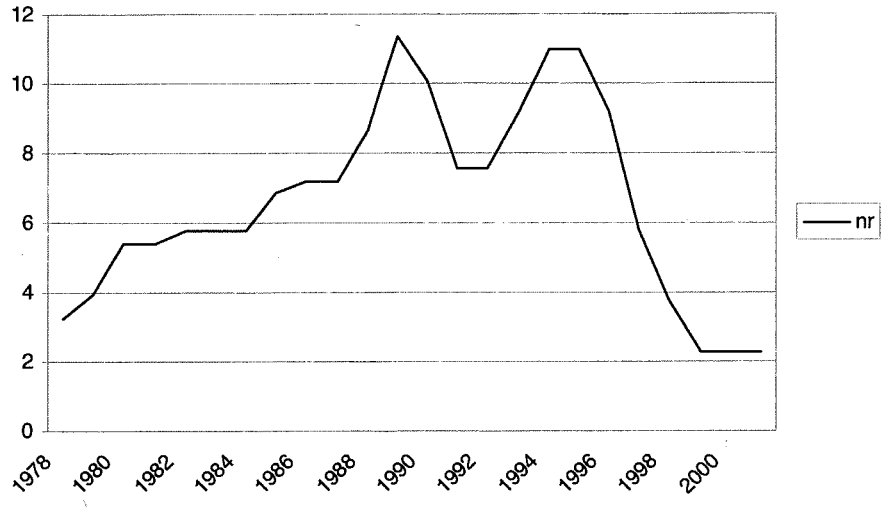


Table 1:Financial deepening in China, 1978-2002

Year	Loans	M2	M1	M0
1983	343	308	218	53
1984	442	415	293	79
1985	643	488	334	99
1986	835	626	423	122
1987	1027	767	495	146
1988	1222	929	599	213
1989	1436	1092	538	234
1990	1768	1529	695	264
1991	2134	1935	863	318
1992	2632	2540	1173	434
1993	3294	3488	1628	587
1994	4081	4692	2054	729
1995	5054	6075	2399	789
1996	6115	7610	2852	880
1997	7491	9100	3483	1018
1998	8652	10450	3895	1120
1999	9373	11990	4584	1346
2000	9937	13461	5315	1465
2001	11232	15830	5987	1569
2002	16891	18325	7088	1728

Notes:
M0 is currency in circulation
M1 is defined as M0+demand deposits of resident sectors other than central government and banking institutions
M2 is defined as M1+time, savings and other deposits of resident sectors other than central government and banking institutions
The money supply of the table before 1992 is according to China national bank and rural credit union, and that since 1992 is according to *Banking Survey*. Data are modified to decimals from the original as billion in RMB.

Source: *Financial Yearbook of China*,

Table 2: Changes of interest rate from 1978 to 1998

Time and date of interest rate change (month/day/year)	One-year nominal deposit rate (1)	One-year nominal working capital lending rate (2)	Spread on one-year loans (2)-(1)	Inflation rate (3)	one-year real deposit rate (1)-(3)	One-year rate working capital lending rate (2)-(3)
1978	3.24	5.04	1.8	0.7	2.54	4.34
4/1/1979	3.96	5.04	1.08	2	1.96	3.04
4/1/1980	5.4	5.04	-0.36	6	-0.6	-0.96
1981	5.4	5.04	-3.06	2.4	3	2.64
4/1/1982 (1/1/1982)	5.76	7.2	1.44	1.9	3.86	5.3
1983	5.76	7.2	1.44	1.5	4.26	5.7
1984	5.76	7.2	1.44	2.8	2.96	4.4
4/1/1985	6.84	7.92	1.08	8.8	-1.96	-0.88
8/1/1985	7.2	7.92	0.72	8.8	-1.6	-0.88
1986	7.2	7.92	0.72	6	1.2	1.92
1987	7.2	7.92	0.72	7.3	-0.1	0.62
9/1/1988	8.64	9	0.36	18.8	-9.86	-9.8
2/1/1989	11.34	11.34	0	17.8	-6.46	-6.46
4/15/1990 (3/21/1990)	10.08	10.08	0	3.1	7.98	7.98
8/21/1990	8.64	9.36	0.72	3.1	5.54	6.26
4/21/1991	7.56	8.64	1.08	3.4	4.16	5.24
1992	7.56	8.64	1.08	6.4	1.16	2.24
5/15/1993	9.18	9.36	0.18	14.7	-5.52	-5.34
7/11/1993	10.98	10.98	0	14.7	-3.72	-3.72
1994	10.98	10.98	0	24.1	-13.12	-13.12
1/1/1995	10.98	10.98	0	17.1	-6.12	-6.12
7/1/1995	10.98	12.06	1.08	17.1	-6.12	-5.04
5/1/1996	9.18	10.98	1.8	8.3	0.88	2.68
8/23/1996	7.47	10.08	2.61	8.3	-0.83	1.78
10/23/1997	5.67	8.64	2.97	2.8	2.87	5.84
3/25/1998	5.22	7.92	2.7	-0.8	6.02	8.72
7/1/1998	4.77	6.93	2.16	-0.8	5.57	7.73
12/7/1998	3.78	6.39	2.61	-0.8	4.58	7.19

Source: *Financial Yearbook of China*

Table 3: Test results of unit root test

3.1 Results for Loan M0, M1 and M2

Null Hypothesis: D(LM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=8)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.426977
Test critical values:	1% level	-2.699769
	5% level	-1.961409
	10% level	-1.606610

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Null Hypothesis: D(LM1) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=7)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-3.974868
Test critical values:	1% level	-2.699769
	5% level	-1.961409
	10% level	-1.606610

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Null Hypothesis: D(LM0) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=7)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.986115
Test critical values:	1% level	-2.699769
	5% level	-1.961409
	10% level	-1.606610

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Null Hypothesis: D(LLOANS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=7)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.190388
Test critical values:	1% level	-2.699769
	5% level	-1.961409
	10% level	-1.606610

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Note: The above sample ranges from 1983 to 2002

3.2 Results for M2 and Base Money

Null Hypothesis: D(LM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=3)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.472214
Test critical values:	1% level	-2.792154
	5% level	-1.977738
	10% level	-1.602074

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Null Hypothesis: D(LB) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on Modified AIC, MAXLAG=3)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-3.080535
Test critical values:	1% level	-2.792154
	5% level	-1.977738
	10% level	-1.602074

*MacKinnon (1996)
Warning: Test critical values calculated for 20 observations
and may not be accurate for a sample size of 11

Note: The above sample ranges from 1985 to 1997.

Table 4: Test results of Granger Causality test

4.1 Causality between M0, M1, M2 and Loans

Pairwise Granger Causality Tests
Date: 07/02/03 Time: 03:17
Sample: 1983 2002
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DLM0 does not Granger Cause DLLOANS	17	1.42734	0.27791
DLLOANS does not Granger Cause DLM0		1.35647	0.29437
DLM1 does not Granger Cause DLLOANS	17	1.24334	0.32305
DLLOANS does not Granger Cause DLM1		1.07468	0.37211
DLM2 does not Granger Cause DLLOANS ✓	17	1.27346	0.31511
DLLOANS does not Granger Cause DLM2 ×		7.27167	0.00854
DLM1 does not Granger Cause DLM0	17	0.38899	0.68599
DLM0 does not Granger Cause DLM1		1.77732	0.21083
DLM2 does not Granger Cause DLM0 ✓	17	0.95924	0.41071
DLM0 does not Granger Cause DLM2 ×		4.88568	0.02804
DLM2 does not Granger Cause DLM1	17	1.05381	0.37876
DLM1 does not Granger Cause DLM2		3.77110	0.05361

M2 ⇏ LOAN
LOAN ⇒ M2

M2 ⇏ M0
M0 ⇒ M2

Note: the sample rangers from 1983 to 2002.

4.2 Causality between M2 and Monetary Base

Pairwise Granger Causality Tests
Date: 08/14/03 Time: 14:43
Sample: 1985 1997
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DLM2 does not Granger Cause DLB	10	0.47371	0.64804
DLB does not Granger Cause DLM2		0.59152	0.58806

Note: The sample ranges from 1985 to 1997.

Table 5: Test results of Taylor Rule

5.1.1 One year forward pai, current y

RR=C(1)+C(2)*PAI(1)+C(3)*Y+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.308654	1.198508	1.926274	0.0700
C(2)	-0.338294	0.135514	-2.496376	0.0225
C(3)	-0.457321	0.408004	-1.120874	0.2771
C(4)	0.542200	0.172754	3.138570	0.0057

5.1.2 One year forward pai, one year forward y

RR=C(1)+C(2)*PAI(1)+C(3)*Y(1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	3.276953	0.910706	3.598256	0.0021
C(2)	-0.482981	0.093335	-5.174723	0.0001
C(3)	0.802915	0.283440	2.832753	0.0110
C(4)	0.265263	0.140578	1.886942	0.0754

5.1.3 One year forward pai, one year lag y

RR=C(1)+C(2)*PAI(1)+C(3)*Y(-1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.233373	0.993212	2.248637	0.0381
C(2)	-0.335151	0.102556	-3.267991	0.0045
C(3)	-0.762182	0.291476	-2.614905	0.0181
C(4)	0.345352	0.137247	2.516276	0.0222

5.2.1 One year lag pai, current y

RR=C(1)+C(2)*PAI(-1)+C(3)*Y+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2.196738	2.748973	-0.799112	0.4341
C(2)	0.318459	0.386519	0.823916	0.4202
C(3)	-1.125276	0.358242	-3.141103	0.0054
C(4)	1.130234	0.550583	2.052793	0.0541

5.2.2 One year lag pai, one year forward y

RR=C(1)+C(2)*PAI(-1)+C(3)*Y(1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.060706	3.981847	-0.015246	0.9880
C(2)	-0.002103	0.553046	-0.003803	0.9970
C(3)	0.522097	0.474251	1.100887	0.2855
C(4)	0.362879	0.794327	0.456838	0.6533

5.2.3 One year lag pai, one year lag y

RR=C(1)+C(2)*PAI(-1)+C(3)*Y(-1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.600278	3.022608	0.529436	0.6030
C(2)	-0.240726	0.420164	-0.572934	0.5738
C(3)	-1.167580	0.353461	-3.303278	0.0040
C(4)	0.007586	0.590310	0.012851	0.9899

5.3.1 Current pai, current y

RR=C(1)+C(2)*PAI+C(3)*Y+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	5.093282	0.584789	8.709610	0.0000
C(2)	-0.754664	0.072369	-10.42806	0.0000
C(3)	-0.051797	0.171235	-0.302490	0.7656
C(4)	-0.171508	0.108892	-1.575024	0.1318

5.3.2 Current pai, one year forward y

RR=C(1)+C(2)*PAI+C(3)*Y(1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	5.322539	0.443516	12.00079	0.0000
C(2)	-0.771374	0.050346	-15.32153	0.0000
C(3)	0.252207	0.118395	2.130216	0.0472
C(4)	-0.241108	0.070734	-3.408678	0.0031

5.3.3 Current pai, one year lag y

RR=C(1)+C(2)*PAI+C(3)*Y(-1)+C(4)*RR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	4.760505	0.502188	9.479524	0.0000
C(2)	-0.698972	0.059969	-11.65559	0.0000
C(3)	-0.326986	0.133335	-2.452364	0.0246
C(4)	-0.171148	0.072353	-2.365451	0.0294

Table 6: Test results of an alternative Taylor Rule

6.1.1 current pai and current y

NR=C(1)+C(2)*PAI+C(3)*Y+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.346624	0.456199	2.951834	0.0082
C(2)	0.211199	0.028164	7.498919	0.0000
C(3)	-0.079641	0.068430	-1.163831	0.2589
C(4)	0.585170	0.073496	7.961953	0.0000

6.1.2 current pai and forward y

NR=C(1)+C(2)*PAI+C(3)*Y(1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.399358	0.514108	2.721917	0.0140
C(2)	0.206280	0.031325	6.585197	0.0000
C(3)	0.023219	0.075295	0.308380	0.7613
C(4)	0.586116	0.080046	7.322243	0.0000

6.1.3 current pai and lag y

NR=C(1)+C(2)*PAI+C(3)*Y(-1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.250872	0.507812	2.463258	0.0241
C(2)	0.220735	0.037998	5.809112	0.0000
C(3)	-0.066310	0.091564	-0.724189	0.4783
C(4)	0.587389	0.086551	6.786618	0.0000

6.2.1 forward pai and current y

NR=C(1)+C(2)*PAI(1)+C(3)*Y+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.777015	0.782887	0.992499	0.3341
C(2)	0.164887	0.048110	3.427308	0.0030
C(3)	-0.212228	0.130934	-1.620870	0.1224
C(4)	0.718312	0.114065	6.297377	0.0000

6.2.2 forward pai and forward y

NR=C(1)+C(2)*PAI(1)+C(3)*Y(1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.606330	0.718279	0.844143	0.4097
C(2)	0.131530	0.035897	3.664095	0.0018
C(3)	-0.240450	0.096366	-2.495163	0.0225
C(4)	0.776791	0.098337	7.899247	0.0000

6.2.3 forward pai and lag y

NR=C(1)+C(2)*PAI(1)+C(3)*Y(-1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.544402	0.853638	0.637743	0.5321
C(2)	0.089448	0.042764	2.091653	0.0518
C(3)	0.193363	0.115025	1.681057	0.1110
C(4)	0.825130	0.117150	7.043356	0.0000

6.3.1 lag pai and current y

NR=C(1)+C(2)*PAI(-1)+C(3)*Y+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.397248	0.878761	2.727986	0.0134
C(2)	0.231609	0.071244	3.250931	0.0042
C(3)	0.209480	0.114519	1.829214	0.0831
C(4)	0.410034	0.176004	2.329683	0.0310

6.3.2 lag pai and forward y

NR=C(1)+C(2)*PAI(-1)+C(3)*Y(1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.533133	1.130890	2.239948	0.0380
C(2)	0.181307	0.086359	2.099453	0.0501
C(3)	-0.032776	0.134693	-0.243336	0.8105
C(4)	0.448919	0.225598	1.989910	0.0620

6.3.3 lag pai and lag y

NR=C(1)+C(2)*PAI(-1)+C(3)*Y(-1)+C(4)*NR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.635139	0.993431	1.645952	0.1171
C(2)	0.127114	0.073147	1.737795	0.0993
C(3)	0.210025	0.116171	1.807895	0.0874
C(4)	0.624696	0.194015	3.219828	0.0048

Note : In this panel, constant means if PAI=Y=0 and NR=NR(-1), then the current nominal interest rate NR=1.635/(1-0.624)=4.35.

REFERENCES

Brunner, Karl. (1968), "The Role of Money and Monetary Policy", *Federal Reserve Bank of St. Louis Review,* 50(7), July, p. 9-24

Chen, Chien-Hsun. (2002), "Interest rates, savings and income in the Chinese economy", *Journal of Economic Studies,* Vol.29 No. 1, p. 59-73

Chick, V. (1986), "The evoution of the banking system and the theory of saving, investment and interest", *Economics et Societes*, 20, 111-26

Davidson, Paul, and Weintraub, Sidney, "Money as Cause and Effect," *Economic Journal, 83, 332* (December 1973), 1117-32

Ding, Jing-ping. (1995), *China's domestic economy in regional context*, Washington, D.C.: Center for Strategic & International Studies, c1995

Dow, J.C.R and I.D. Saville (1988,1990), *A critique of Monetary Policy: Theory and British Experience,* Oxford: Clarendon Press

Fung, Michael Ka-Yiu; Ho, Wai-Ming; and Zhu, Lijing. (1999), "The impact of Credit Control and Interest Rate Regulation on the Transforming Chinese Economy: An analysis of Long-Run Effects", *Journal of comparative Economics,* Vol. 28, p.293-320

Granger, C.W.J. (1969), *Investigating Causal Relationships by Econometric Models and Cross Spectral Methods.* , Econometrica, 1969,37, p.425-435

Granger, C.W.J., and Newbold, P. (1974), "Spurious Refressions in Econometrics." *Journal of Econometrics,* 1974, 2, p. 111-120

Guttentag, Jack, "The Strategy of Open Market Operations." *Quarterly Journal of Economics,* (February 1966), 486-90

Harrold, Peter, and Lall, Rajib, (1993), China: Reform and Development in 1992–93. World Bank Discussion Paper No. 215, Washington DC, The World Bank, 1993.

Hasan, Mohammad S. (1996), "Monetary Growth and Inflation in China: A Reexamination", *Journal of Comparative Economics* 27, p. 669-685 (1999)

Hasan, Mohammad S. (2001), "The behavior of the currency-deposit ratio in mainland China", *Applied Financial Economics,* 2001,11, p. 659-668

Hicks, J.R. (1967), "Monetary Theory and History: an Attempt at Perspective",

Critical Essays in Monetary Theory, p. 155-173. (1967)

Holz, Carsten A. (2000), "The changing Role of Money in China and Its Implications", *Comparative Economic Studies,* XLII, No. 3, p. 77-100

Huang, YanFen. (2002), *The money supply process and monetary policy in China,* Frankfurt: Peter Lang, 2002

Johnston, J., and DiNardo, J. (1977), *Econometric methods*, McGraw-Hill, 1977

Judd, John P; Rudebusch, Glenn D. (1998), "Taylor's Rule and the Fed: 1970-1997.", *Federal Reserve Bank of San Francisco Economic Review.* Vol. 0 (3). p 3-16. 1998

Kaldor, N. (1986), *The Scourge of Monetarism*, Oxford: Oxford university Press. (1986)

Lavoie, Marc. (1984), "The endogenous flow of credit and the Post Keynesian theory of money", *Journal of Economics Issues*, 18, September, p.771-97

Lavoie, Marc. (1992), *Foundations of post-keynesian economic analysis*, Aldershot : Edward Elgar, c1992

Lavoie, Marc. (1995), "Horizontalism, Structuralism, Liquidity Preference and the Principle of Increasing Risk.", *Ottawa : University of Ottawa, Faculty of Social Sciences,* 1995

Li, Kui Wai. (1994), *Financial repression and economic reform in China*, Westport, Conn.: Praeger, 1994

Moore, Basil J. (1988), *Horizontalists and verticalists : the macroeconomics of credit money*, Cambridge [England] ; New York : Cambridge University Press, 1988

Moore, Basil J. (1991), "Has the demand for money been mislaid?", *Journal of Post Keynesian Economics*, 14, Fall, 125-33

Rambaldi, Alicia N. and Doran, Howard. (1996), "Testing for Granger Non-Causality in Cointegrated Systems", *Working Papers in Econometrics and Applied Statistics, department of Econometrics,* No.88-August 1996

Rambaldi, Alicia N. (1997), "Multiple Time Series Models and Testing for Causality and Exogeneity: A Review", *Working Papers in Econometrics and Applied Statistics, department of Econometrics,* No.96-May 1997

Rogers, Colin. (1948), *Money, interest and capital: a study in the foundations of monetary theory*, Cambridge University Press. (1989)

Rousseas, Stephen William. (1986), *Post Keynesian monetary economics*, London : Macmillan, (1986)

Smithin, John. (1994), *Controversies in monetary economics: ideas, issues, and policy*, Edward Elgar Publishing limited Glensanda House, (1994)

Trautwein, H-M. (1993), " A fundamental controversy about money: Post Keynesian and new monetary economics", in G. Mongiovi and C. Ruhl (eds), *Macroeconomic Theory: Diversity and Convergence.* Aldershot: Edward Elgar
Vera, Alfonso Palacio. (2001), "The endogenous money hypothesis: some evidence from Spain (1987-1998)", *journal of Post Keynesian Economics* Spring 2001, Vol.23 No.3 p. 509

Wang, Qi. (2002), "The Taylor Rule: An exploration in Theory and Practice", *Unpublished paper, University of Ottawa, department of Economics*, 2002

Wray, L.R. (1953), *Money and Credit in Capitalist Economies: the Endogenous approach*, Aldershot, Hants, England ; Brookfield, Vt., USA : E. Elgar, c1990

Wray, L. Randall. (1953), *Understanding modern money: the key to full employment and price stability*, Edward Elgar Publishing limited Glensanda House, (1998)

Yi, Gang. (1994), *Money, banking, and financial markets in China*, Boulder, CO: Westview Press, 1994

Zhang, W. (1999), "An analysis of the independence of the PBC in China's transitional economy", *Jingji Yanjiu Ziliao (Economic Research Data)*, No.8, August, p.11-18