

DISCUSSION PAPER SERIES

No. 9721

**UNDERSTANDING MONEY DEMAND
IN THE TRANSITION FROM A
CENTRALLY PLANNED TO A MARKET
ECONOMY**

Anne-Laure Delatte, Julien Fouquau and
Carsten Holz

FINANCIAL ECONOMICS



Centre for Economic Policy Research

www.cepr.org

Available online at:

www.cepr.org/pubs/dps/DP9721.php

UNDERSTANDING MONEY DEMAND IN THE TRANSITION FROM A CENTRALLY PLANNED TO A MARKET ECONOMY

Anne-Laure Delatte, CNRS-Economix, OFCE and CEPR
Julien Fouquau, Neoma Business School, CGEMP LEDa
Carsten Holz, Hong Kong University of Science and Technology

Discussion Paper No. 9721
November 2013

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programme in **FINANCIAL ECONOMICS**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Anne-Laure Delatte, Julien Fouquau and Carsten Holz

ABSTRACT

Understanding Money Demand in the Transition from a Centrally Planned to a Market Economy

Fundamental changes in institutions during the transition from a centrally planned to a market economy present a formidable challenge to monetary policy decision makers. For the case of China, we examine the institutional changes in the monetary system during the process of transition and develop money demand functions that reflect these institutional changes. We consider seasonal unit roots and estimate long run, equilibrium money demand functions, explicitly taking into consideration the changes in the institutional characteristics of China's financial system. Using a newly compiled dataset that covers an unprecedented long time period of 1984-2010 at the quarterly frequency, we are able to draw conclusions on the transitions in households', firms', and aggregate money demand, on the role of the credit plan and interest rates, on the mechanisms of macroeconomic control during economic transition, and on theoretical questions in the development and money literature.

JEL Classification: C51, E41, O11, P24 and P52

Keywords: Chinese economy, cointegration, complementary hypothesis, money demand and seasonal unit root

Anne-Laure Delatte
University Paris-Défen
EconomiX
Bat G, 313 E
200 avenue de la République
92001 Nanterre Cedex
FRANCE

Julien Fouquau
Neoma Business School
1 Rue du Maréchal Juin
BP 215
76825 Mont Saint Aignan Cedex
FRANCE

Email:
annelaure.delatte@sciencespo.fr

Email: jfq@rouenbs.fr

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=167608

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=177757

Carsten Holz
SOSC
HKUST
Clear Water Bay
Kowloon
HONG KONG

Email: socholz@ust.hk

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=177758

Submitted 29 October 2013

Introduction

In a centrally planned system, the volume of output is determined by the authorities and prices are fixed. The central bank controls the quantity of money held by households and firms. Money demand is not a meaningful concept. In contrast, in a market economy, economic agents exhibit demand for money: they autonomously decide the quantity of cash and deposits they want to hold along with the number of transactions they wish to carry and the opportunity cost of the different monetary aggregates. How does the transition from a planned economy to a market economy operate? When does the concept of money demand become meaningful? What drives money holdings in a transition economy? In this paper, we examine the transition process from a centrally planned to a market-based monetary system in the case of China in order to have a rigorous understanding of the emergence of money demand and its economic implications.

This question has important implications. From a theoretical perspective, the Chinese experience offers a fascinating case to observe the changes in the functions of money and their impact on the financial structures and monetary policy. From a practical perspective, a rigorous understanding of the monetary transition may improve the conduct of monetary policy in transition economies. In fact, money can play a useful role in monetary policy only if there is a strong and linear relationship between money and the goal variable - inflation or nominal income. Our findings may contribute to a more accurate analysis of this essential economy.

Economic theory predicts a number of developments for money demand during economic transition. First economic transition may imply monetization (Mukherjee,

1967). It refers to the share of monetized transactions to total transactions (either by cash or deposit transfers). It implies an increasing volume of monetary transactions affecting all monetary aggregates, a fact that may imply a drastic increase in money demand in the early stages of reform that then levels off progressively over time. Second, the complementarity hypothesis between money and capital (McKinnon, 1973) states that, in developing economies with limited access by households and small enterprises to external finance, money is accumulated to self-finance investment (money is a complement rather than a substitute for physical capital). Third, when controls over money holdings are relaxed, households can allocate their savings alternatively to cash or interest-bearing assets. The opportunity cost of holding money thus emerges in a money demand function.

Earlier literature on money demand in China is abundant but fails to address important issues¹. In this paper we bridge three gaps left by previous works to better understand the monetary mechanics of the ongoing transition process. First previous works do not give full play to the idiosyncracies of economies in transition. Details of the underlying financial structure and its evolution -the factors that determine the meaning of money demand are widely ignored. In contrast, we build a rigorous theoretical framework by examining the institutional details of China's financial transition. An important institutional feature is that money in pre-reform China did not constitute a uniform aggregate. There were two different circuits of money, each of the two circuits was subject to different types of controls exercised by the planning authorities. It is only in the course of the reform period that the

¹Seminal works include Chow (1987) and Feltenstein and Farhadian (1987). Most works are based on a standard money-demand equation; they include Huang (1994), Hafer and Kutan (1994), Chen (1997), Chow and Shen (2004), Gerlach and Kong (2005), Mehrotra (2006), Laurens and Maino (2007), Bahmani, Oskee and Wang (2007). Few works have added institutional factors, including Qin (1994), Girardin (1996), Xu (1998), Hasan (1999), and Yu and Tsui (2000)

two circuits began to merge. Consequently, we first consider the demand for money separately for the household-enterprise and the inter-enterprise circuits before we move on to aggregate formulations of money demand².

Second, we use a meticulously compiled set of quarterly data and are able to start our analysis as far back as 1984 (and go through 2010). The length of this time span, unprecedented in the literature at the quarterly frequency, allows us to shed a new light on the first years of the transition period and considerably increases the power of the empirical tests.

Third, Chinese macroeconomic data are characterized by high seasonal effects, notably but not exclusively because of the Chinese new year. Ghysels and Perron (1993) showed that failing to account for seasonal unit roots leads to biased (underestimated) coefficients, while prefiltering the series using period-to-period differences alters the stochastic structure of the series (Franses, 1997). We use an alternative stationarity test accounting for seasonal effects (as developed by Hylleberg et al., 1990) that allows us to disentangle seasonal effects from non-stationary dynamics. The consideration of seasonal unit roots invalidates the findings of much of the earlier literature, none of which considered seasonal unit roots.

Our contributions to the literature are threefold. First we show that usual stationary tests mis-conclude that M_0 is non-stationary. Our alternative stationarity tests indicate that household money holdings are stationary once seasonal factors are taken into account. This finding suggests that there is still a significant State influence over households' allocation choices. Second, in contrast, we find that the enterprises have gained decision-making autonomy over their deposits. Third, in comparison with previous literature our disaggregate analysis uncovers a significant determinant ignored by previous literature: we find that a strong motivation of enterprises for

²In the literature, only Xu (1998) gives some thought to financial sector idiosyncrasies.

holding money deposits is to finance investment. Complementarity holds in China: enterprises save in order to accumulate the funds necessary for investment. This effect holds in the disaggregate as well as in the aggregate. Our findings also confirm earlier findings that the transactions motive and opportunity costs are relevant to China.

The following section reviews the salient features of the institutional developments in China's financial system. Section 2 examines the stationarity properties of money holdings in the enterprise-household and inter-enterprise circuits. We proceed to the estimation of long run money demand functions in Section 3 where we comment our findings. Section 4 concludes.

1 Adapting the monetary system to the reforms in the real sphere

1.1 The monetary system in the transition process

In the pre-reform, socialist system, the volume of output was determined by the physical plan. Prices were fixed. Money strictly followed the physical plans. In this Section we describe the main features of the monetary system before the reform and the way it was adapted once economic reforms in the real sphere began.

The pre-reform monetary system is illustrated in Figure 1. There were two distinct circuits of money, the household-enterprise circuit which was mainly cash, and the inter-enterprise circuit which was exclusively deposit accounts. There were significant barriers between the two circuits, so they were rather independent³.

³On the concept of two circuits also see Dembinski (1988) and Holz (2000) and for the real economy Kornai (1979).

Specifically, workers were paid in cash and could spend their salary buying consumer goods, saving it in a banking account or marginally holding it in cash privately. The quantity of cash used to make all wage and salary payments by enterprises to households was determined by a cash plan and coming from China's central bank, the People's Bank of China (PBC). In an economy of scarcity, the cash plan was easily implemented. Indeed the sales of consumer goods and services were easily determined by their (planned) availability. With household income barely above subsistence level, the supply of consumer goods had to meet little more than the demand for food and everyday household goods.

Excess cash was siphoned off into the banking system through savings campaigns. In sum the circulation of cash was so strictly controlled that private cash holdings remained low. To illustrate monetary flows before the reform and during the transition process, Table 1 tallies cash outflows (disbursements) and inflows (receipts) by state banks. For example, in 1978 wages, salary payments and agricultural procurement accounted for 55.1% of all cash disbursements (columns 1 and 2). And 79.2% of cash receipts came from sales of goods and services (columns 4 and 5). Depositing and withdrawal of savings as share of total cash disbursements and receipts accounted for 9.6% and 10.7% in 1978 (Table 1, column 10).

In the inter-enterprise circuit, enterprises bought producer goods from other enterprises. All payments were made through the transfer of deposits between bank accounts. Enterprises had access to their deposits in bank accounts only to purchase producer goods, and only if the physical transaction had been approved by the relevant state organ; enterprises were prohibited from purchasing consumer goods. Therefore imbalances between the demand and supply of producer goods could not

arise as long as all transactions followed the physical plan. The main channel of enterprise credit was a centrally administered real bills system called the "commodity inventory system": enterprises would be granted deposit credits which they transferred to other enterprises directly as payment for inputs. As these inputs were transformed into goods and sold to other enterprises, the deposits received would be used to repay the deposits created⁴. Any excess, in either direction, flowed back to the central authorities, so there was no rising stock of deposit money. In sum it was a monobank system based on the People's Bank of China (PBC). Between 1969 and 1977, the PBC was integrated into the Finance Ministry. The only other source of financial resources was the state budget which provided all funding for investment in fixed assets as well as a certain amount of "fixed-quota" working capital.

In total money - cash for households and deposits for enterprises - thus strictly followed the physical plans. The People Republic of China's pre-reform period financial system was inherently stable. But once economic reforms in the real sphere began, the monetary system had to adapt.

The transition monetary system is illustrated in Figure 2. Several factors made the monetary reform necessary. First the total wage bill increased and became more difficult to plan ahead. In fact in the early 1980s, enterprises began to supplement planned wage and salary payments with bonus payments. The share of easily planned food and everyday household good purchases in total household expenditures declined as illustrated in Table 1. The share of sales of goods and services in all cash receipts of state banks dropped from 79.2 to 22.1% between 1978 and

⁴The commodity inventory system specifies that (working capital) credit be extended directly to the user in accordance with specific plans and for specific purposes on the basis of material inventories held by the economic unit. Enterprises were required to promptly pay back their loans when the commodities that were used to back the loan are transferred outside the enterprise. (See De Wulf 1986.) The commodity inventory system represents the socialist economy's application of the "real bills principle"

1995. Second, the growth of the individual-owned economy and the rural township and village enterprises, with much of their transactions outside the banking system, further rendered the cash plan difficult to implement. Furthermore cash was increasingly used illegally by enterprises developed for the purchase of producer goods in the enterprise circuit as well as for the purchase of consumer goods (enterprises and state units would purchase consumer goods for their employees, while formally adhering to the official wage and salary scales). Subsequently imbalances in the household-enterprise circuit became more prominent. Excess cash was withdrawn by setting nationwide uniform interest rates on household deposits: between 1978 and 1999, deposit interest rates were adjusted eighteen times⁵. As a result, the depositing and withdrawal of savings as share of total cash disbursements and receipts rose from 9.6% and 10.7% in 1978 to 51.1% and 54.3% in 1995 (Table 1). By the late 1980s, with prices successively freed, imbalances led to rapidly rising consumer goods prices⁶.

Meanwhile however monitoring of the cash plan and attempts at enforcing the cash plan continued. Table 1 illustrates the cash flows during the reform period. The stock of cash outstanding has tended to grow (column 14), but over time the gross flows also increased relative to the stock (column 0 relative to column 14). It seems that PBC thought about this increase in the stock of cash through the lens of the quantity theory of money, and so focused on increasing in line with consumer income and spending at given (administered) prices.

⁵The PBC today still sets all interest rates, subject to State Council approval, at nationwide uniform levels (albeit some, nowadays, with a bandwidth).

⁶A first bout of double-digit inflation in 1988-1989 led to panic purchases of consumer goods and the withdrawal of household savings deposits. The PBC responded by inflation-indexing household deposits (but not enterprise deposits) with maturities of three years and longer for the period 10 September 1988 to 1 December 1991. A second period of inflation-indexing began on 11 July 1993, with the inflation subsidy dropping to zero in May 1997. See Jinrong shibao 97/10/28 and 99/12/6, Finance Yearbook 1997, p. 493, and Statistical Yearbook 1998, p. 533.

In the inter-enterprise circuit, the expansion of enterprise-based decision-making and the growth of the non-state economy made the planning of physical transactions impossible. Beginning in 1985, prices for producer goods were partially freed; by 1993, market-determined prices governed 81.1% of the value of all producer goods sales⁷. Enterprises making their own production decisions did no longer submit all surpluses to the finance departments. In 1979, enterprises were allowed to retain funds through partial profit retention. A "tax instead of profit delivery" reform (ligaishui) followed in 1983 through 1985.

With the gradual decline of output planning starting in the early 1980s, new macroeconomic control instruments were needed. This led to the creation of an elaborate credit plan system of which we describe the main features and evolution in the following.

1.2 The rise and fall of the credit system

The loss of control mechanisms in the real sphere (partial abandonment of the physical plan and of price controls) was compensated for by an elaborate credit plan system. Many of the lending decisions incorporated into the credit plan were made outside the financial system by the traditional planning and production hierarchy. The credit plan covered loans for investment in fixed assets (capital construction and technological updating and transformation) and working capital loans (see Figure 2). Officially, the credit plan system remained in place until the late 1990s.

In 1984-86, banks faced both a credit and a deposit plan with refinancing of the

⁷See Price Yearbook 1997, p. 482.

difference guaranteed by higher-level branches of the same bank and ultimately by the central bank. Deposits attracted in excess of the deposit plan could be freely turned into working capital loans by the bank branch itself (*duocun duodai*). This created incentives for banks to attract more deposits in order to lend more. The policy affected all aspects of the two circuits. In the household circuit, additional loans could pay for bonus payments to households. In the enterprise circuit, loans were no longer necessarily tied to the commodity inventory system, and money in the enterprise circuit thus no longer had a direct correspondence to production.

In 1987, refinancing through the central bank became no longer guaranteed - financial institutions were to use the local/ regional interbank money market - and binding credit limits were instituted. In 1991, guidelines were issued on which industries enjoyed priority in lending, in accordance with sectoral policies in the real sphere. In addition to lending guidelines, banks also faced explicit external decisions on policy loans⁸.

Key financial sector reform decisions were passed by the State Council in 1993. The decision stated that the PBC's intermediate and operational targets would be money supply, credit volume, interbank money market rate and a "safety deposit requirement". Starting 1994, the state commercial banks were to adopt prudential ratios. Even though the 1993 reform decision mentioned money supply targeting and the adoption of prudential ratios, by 1995, the then highly centralized credit

⁸According to Montes-Negret (1995, p. 31), the Industrial and Commercial Bank of China in the early 1990s could autonomously decide on less than 20% of its lending. Xiao "policy loans" (1997, p. 371) reports that approximately 40% of all state bank loans in 1991 were (defined in the source as particular lending categories), while Hui (1994) claims that 20% of all Industrial and Commercial Bank of China loans are policy loans; for the Agricultural Bank of China the share is 30%, for the Bank of China 15%, and for the Construction Bank of China 45%. And yet, by 1993 the PBC explicitly encouraged banks to refuse loans to projects which are not economically viable.

plan was still very much relevant⁹. The switch to money supply targeting officially occurred in the second half of the 1990s¹⁰. In terms of monetary tools, it appears that only in the second half of the 2000s has the PBC adopted routine open market operations, presumably largely in response to capital inflows, and begun to frequently change the reserve requirements. While the credit plan system has never been officially dismantled, the underlying loan classification system has been abandoned - loans are now classified by maturity, and not by type (capital construction loans, etc.) - and whatever lending limits and loan allocations in place are now, presumably, determined bank-internally.

In total the transition towards a market-economy has changed the monetary system. The transition from credit limits to money supply targeting suggests that a stable money demand function has finally established. Economic reforms would suggest increasingly autonomous agent decisions on the allocation of their money balances. Yet monitoring of the cash plan for the households-enterprise circuit has continued during the transition period. And in the inter-enterprise circuit, the credit plan system has never been officially dismantled, with credit limits resurfacing at unusual times¹¹. The fact that controls have been pervasive during the transition period raises the following question: to which extent do money holdings result from

⁹The national economic and social development plan of 1995 (NPC 18 March 1995a) reported only one monetary target for 1995: this was the total increase in bank credit, by no more than 570bn yuan (with quarter-by-quarter limits for individual banks). Prudential ratios were not enforced for many years to come. Money supply data appeared for the first time in 1993, in the back pages of the PBC's monthly magazine *Zhongguo jinrong*, together with all other quarterly financial statistics. The People's Bank of China Quarterly Statistical Bulletin, which started publication in 1996, carries retrospectively created data on M1 from 1990 onward.

¹⁰The South China Morning Post on 1 February 1996 reported Chinese growth targets for M_1 and M_2 in 1996 of 18% and 25%. The 1998 national economic and social development plan stated that credit limits on lending by the state commercial banks have now ended. It does not report any monetary targets for 1998, except an increase in currency in circulation of 150bn yuan (NPC, 6 March 1998). The 1999 national economic and social development plan for the first time issued M_1 and M_2 growth targets, of approximately 14% and 14-15 % (NPC 6 March 1999).

¹¹For example, in early 2010, the head of the China Banking Regulatory Commission, Liu Mingkang, said that overall credit growth in 2010 will be restricted to 7.5 trillion yuan.

a free decision-making process by agents in China? The first step of our empirical investigation answers to this question. To determine whether money demand has become a meaningful concept, in the following we test the deterministic dynamic of money holdings.

2 Money holdings: deterministic or random walk?

Examining the properties and dynamics of money holdings is a first key step. In particular the stationarity property of money holdings can be interpreted as an indication of centralized plannification. In fact a stationary series is characterized by a mean or trend-reverting process with time-constant variance. If money holdings were stationary, it would suggest that they follow a deterministic trend planned by the monetary institution.

First the monies in use in the household circuit are cash and household deposits. Household deposits are the aggregate of household deposits of differing maturities. Second the money in use in the inter-enterprises circuit is enterprise deposits. All deposits earn interest. Our data are obtained from a wide variety of sources. We work with quarterly and monthly data to obtain quarterly series. When only monthly data are available, these are aggregated into quarterly data. In the case of stock rather than flow values, our quarterly values are mid-quarter values, obtained as the arithmetic average of end-period and beginning-period values. We collect data from 1978 onwards, but then start our analysis with the year 1984 because data on some series are not available for the earlier years. The period of estimation ends in December 2010. Appendix 1 offers a brief summary of data sources and data manipulations. All data used are plotted in Figure 5.

Several of the data series exhibit strong seasonality (Figure 5). Ghysels and Perron (1993) showed that failing to account for seasonal unit roots leads to biased (underestimated) coefficients, while prefiltering the series using period-to-period differences alters the stochastic structure of the series (Franses, 1997). To address prefiltering issues, we apply a seasonal unit-root test (HEGY) developed by Hylleberg et al. (1990) that has the advantage of testing for unit roots at zero frequency (long-run behavior) and for seasonal unit roots. In fact standard stationarity tests on data with stochastic seasonality may lead us to misconclude that our series are nonstationary because they do not disentangle seasonal effects from non-stationary property. Appendix 2 provides a technical presentation of our stationarity test strategy and a detailed explanation of the results.

The seasonal unit-root tests in Table 2 reveal that both M_0 and household deposits are stationary. In other words, the two aggregates vary steadily along an upward trend. This property suggests that they are planned rather than the result of free rational choice. For example, household deposits show no response to interest rate changes; household money demand is thus constrained by supply. These findings suggest that cash administration has been an item high on the agenda of policy makers. Cash administration regulations were issued in 1977 and revised in 1988. Reminders to adhere to the regulations were issued in other years. For example, as recently as in mid-1997, the Agricultural Bank of China prided itself on having strictly adhered to the cash disbursement plan in the first half of the year. As a result, the official deposit interest rate, set by the PBC, likely provides little incentive to save. A comparison with the inflation rate (Figure 3) shows that real deposit

rates are not consistently positive (the 1-year deposit rate was not inflation-indexed in the two high-inflation periods).

Our first finding is important because it confirms the pervasive influence of the state over household decision on the allocation of their wealth. Interestingly the three usual stationary tests (mis)conclude that M_0 is non-stationary (see Table 2)¹². This underlines the importance of properly accounting for seasonality to disentangle seasonal peaks from a pure random walk, which the standard stationary tests cannot do (and which the literature on money demand in China has ignored).

We turn to enterprise deposits and M_1 stationarity property. The results in Table 2 indicate that the null hypothesis of non-stationarity is not rejected. Contrary to the money in use in the household-enterprise circuit, money holdings in the inter-enterprise circuit follows no deterministic trend or a time-constant trend-reverting process, as it would be the case if they were following plannification. This is an important indication that economic reforms led to increasingly autonomous enterprise decisions on deposits. Table 2 indicates that M_1 is nonstationary too, a statistically consistent result given the fact that enterprise deposits, one of its components is nonstationary.

In total, we find that household money holdings are stationary once seasonal factors are taken into account, a result suggesting that they do not respond to

¹²The HEGY result suggests that the standard unit root tests wrongly reject the variable's stationarity because of the presence of a seasonal unit root. Indeed the HEGY test suggests that M_0 is stationary in the zero-frequency but has a unit root in the semi-annual frequency, i.e., the dynamic of the variable differs between the first and the second half of the year. This may be due to the Chinese New Year holiday in the first quarter of the year, with a surge in household purchases and the use of newly printed cash for presents; the excess currency in circulation is then later withdrawn by the PBC.

standard drivers of money holdings such as transaction motives and opportunity cost. In contrast, we find that the enterprises have gained decision-making autonomy over their deposits. This finding leads us to our second empirical step where we will explore the determinants of money demand in the inter-enterprise circuit and at the aggregate level.

3 What determines money holdings in China?

In a market economy, primary determinants of money demand are the transactions motive and the opportunity costs of holding money. In the case of China, given the institutional background presented in Section 1, further factors may come into play and we present a total of five potential determinants of money demand in the following. We then analyze money demand in China for the inter-enterprises circuit before moving on to aggregate money demand in form of M_1 .

3.1 Choice of the determinants

We are guided by economic theory to identify five potential determinants of money holdings in China after the reform. Two potential determinants are those of the market economy (the transactions motive and opportunity costs), two are common to economies in transition and emerging economies (monetization and complementarity) and one is specific to China (credit plan). Whenever feasible, we use alternative variables to reflect each of the five potential determinants of money demand. All variables are in logarithms except for interest rates and growth rates.

1. The transactions motive that has always been relevant in China is captured through a variable related to the economic activity: nominal industrial output,

investment, GDP.

2. Monetization is a potential determinant of money demand in a transition economy (Mukherjee, 1967). It is related with the transactions motive as it refers to the share of monetized transactions to total transactions (either by cash or deposit transfers). It implies an increasing volume of monetary transactions affecting all monetary aggregates, a fact that may imply a drastic increase in money demand in the early stages of reform that then levels off progressively over time. To account for the non-linear effect of transaction motives, we include a quadratic monetization trend in our estimation, consisting of the squared transactions variable (nominal industrial output, investment, GDP).
3. The opportunity costs to holding money became relevant only when economic reforms created investment opportunities for enterprises. Capturing the opportunity cost of holding money is not an easy task in China as interest rates have remained under the government control over the period. We include five different measures of opportunity costs found in previous studies to compare (Laurens and Maino, 2007, Bahmani-Oskoei and Wang 2007, Mehrotra 2006, Hafer and Kutan, 1994): 5-year deposit interest rate with a retail price indexation, 1-year deposit interest rate, 1-year loan interest rate, the nominal effective exchange rate and a China-US interest rate spread.
4. Complementarity is another potential explanation. Mc Kinnon's (1973) complementarity argument runs that in developing economies with limited access by households and small enterprises to external finance, money is accumulated to self-finance investment. As a result, investment and bank deposits are not substitutes, but complements. In the case of China, the argument has

two aspects. (i) If investment occurs solely according to plan and with state funding (either through the budget or the state banking system), there is no complementarity. (ii) For private and collective-owned enterprises with possibly limited access to bank loans, complementarity may have been relevant all along in the reform period. The complementarity hypothesis holds if the demand by the real growth rate of industrial output, or alternatively the real 5-year deposit interest rate.

5. Credit plan in China may have played a role. We showed in the institutional Section that the volume of loans became a major monetary policy instrument in the early 1980s and has been progressively replaced by money supply targeting in the second half of the 1990's. Therefore, we will test if the volume of loans is a significant determinant of money holdings. The effect of the credit plan constraint is tested with the introduction of short-term loans. Two reasons motivate the choice of this series: first short-term is a maturity specific to the production sector. Second using total banking loans would raise an endogeneity issue with deposits. As a result, we have no alternative variables for credit plan.

Before proceeding to the estimations, we need to test the stationarity of all explanatory variables. To do so, we use HEGY tests mentioned previously to disentangle non-stationarity dynamics from seasonal effects. Results are reported in Table 2. Most series are non-stationary and/ or hold seasonal unit roots. To check the robustness of our results, we apply the standard tests ADF, PP or KPSS which yield similar conclusions as the HEGY test. We can now proceed to the empirical analysis of the determinants of money demand (see Appendix 2 for an interpretation of HEGY tests).

3.2 Estimation results

We want to test whether the determinants mentioned before are relevant factors of money demand in China. Given that all time series are non-stationary we follow the standard procedure and check the existence of a long-run relationship in a cointegration framework. The cointegration tests for the specification rely on Engle and Granger (1987), using Phillips and Ouliaris (1990) critical values. To eliminate serial correlation, we proceed to the estimation using Stock and Watson strategy with two leads and lags of ΔX_t as follows:

$$y_t = \beta_0 + \beta' X_t + \sum_{k=-2}^2 \theta'_k \Delta X_{t-k} + u_t \quad (1)$$

where X_t is the vector of explanatory variables and u_t the residuals of the relationship¹³.

To avoid multi-collinearity issue X_t include one out of the alternative variables presented to measure each of the five potential determinants: transactions, monetization, opportunity cost, complementarity hypothesis and credit plan. Results are presented in Table 4. For each motive, we select the series that are cointegrated with money holdings and comment the coefficient sign.

3.2.1 The inter-enterprise circuit

In the inter-enterprise circuit, only five specifications out of sixteen tested are found to be cointegrated. The estimation results of the five specifications are displayed in table 4:

1. Transactions motive. Cointegration is accepted in all specifications including

¹³Usually the number of leads and lags, k , is two or three. Here, $k = 2$ to avoid too many coefficients to estimate. We have removed all insignificant lead and lag terms with backward stepwise strategy

nominal industrial output and rejected in all specifications not including it. It suggests that the transactions motives, when proxied by industrial output, is a relevant factor of money holdings in China. As expected, the coefficient is significant and positive (0.339 in spec 1a).

2. Monetization. Squared nominal industrial output is found either not significant or positive and close to zero. Figure 6 plotting the monetization trend added to the transactions motive ($\beta_1 \text{ nominal industrial output} + \beta_2 \text{ nominal industrial output}^2$) there is no significant quadratic effect of the transaction motives on the deposits of enterprises. The impact of transactions motive has been linear during the period. The fact that the volume of monetary transactions (as a ratio of the number of transactions) has not increased after the reform is probably due to the fact that deposits were already used in the inter-enterprises circuit in pre-reform system as detailed in Section 1.
3. Opportunity costs. Enterprise deposits and the different interest rates tested (one-year loan interest rate and one-year deposit interest rate) is significant with a negative sign (-0.689 spec 4b or -0.286 spec 4d). This suggests that enterprises face an opportunity cost to holding deposits, a finding confirming previous studies based on aggregate estimations (see among others Bahman-Oskoe and Wang, 2007).
4. Complementarity hypothesis. The expected sign is positive. The real growth of industrial output is positively cointegrated with enterprise deposits, which implies the existence of a complementarity effect. It suggests that a motive to hold deposits in the corporate sector is to finance investment in fixed assets. We will comment this result in the next subsection.

It is worth noting that when we use the alternative variable, the real 5-year deposit interest rate as a proxy for the real return of capital, it is significant with a low and negative coefficient (-0.005 spec 1a) or not significant (spec 4c and 4e). It means that this variable does not capture properly the complementarity effect. The negative sign suggests that it plays the role of opportunity costs rather than of complementarity.

5. Credit plan. The variable short loans is never significant in our estimations, a result that suggests that the credit plan has not driven the demand for deposits in the corporate sector. This result suggests that the implementation of the credit plan was difficult and private enterprises found way to bypass the credit plan restrictions. Our finding invalidates Xu (1998)'s that the main cause for the rise in the demand deposits is the rise in the bank loans. However Xu's estimations were based on 16 annual observations, a small sample size which poses a serious handicap, while ours are based on 104 quarterly observations. This finding then suggests the success of the transition away from the credit plan system that occurred during the mid-1990s.

To summarize, the results are robust within the five specifications. They confirm that economic reforms implied increasingly autonomous enterprise decisions about their deposits. Deposits come to fund production; complementarity holds: enterprises save in order to accumulate the funds necessary for investment. Last the opportunity costs to holding money matter while the credit plan is not a significant driver of deposits in the inter-enterprise circuit. We move on the aggregate estimation of money demand.

3.2.2 Aggregate money demand

The gradual abandonment of the concept of two circuits by policy makers and the adoption of Money supply targeting in the late 1990's has created space for a more standard analysis of aggregate money demand. As previously, we test alternative specifications to explore the robustness of the findings. As we saw in Section 1 that authorities have issued M_1 and M_2 growth targets, the estimations are run for both aggregates (see Tables 5 and 6). Estimation results are robust as only minor differences appear among both aggregates. For the sake of brevity we comment only the estimation results of M_1 . Overall the aggregate estimations uncover that the determinants playing in the inter-enterprises circuit are relevant for the aggregate money demand:

1. Transactions motive. We find that GDP is significant and positively correlated with M_1 , the coefficient is around 0.3.
2. Monetization. The monetization trend (squared GDP) is either not significant or negative and close to zero. Figure 6 plotting the monetization trend added to the transactions motive ($\beta_1 GDP + \beta_2 GDP^2$) confirms that there is no significant quadratic effect. Since M_1 includes M_0 , our result indicates that there was no cash monetization neither, probably due to the fact that cash was already broadly used in the pre-reform period.
3. Opportunity costs. Interest rates are negatively correlated, whatever maturity tested, with similar estimated coefficients (-0.3 using interest rates on loans). The estimated coefficient of the nominal effective exchange rate (NEER) is also found significant, two results that confirm the opportunity cost effect detected in the inter-enterprise circuit. The alternative, the spread between Chinese

and US interest rates, included in the estimations are not significant, a result that is perhaps not surprising given China's capital controls (spec 1d-4d).

4. Complementarity hypothesis. As for enterprise deposits, in the case of M_1 cointegration is rejected for the real 5-year interest rate, while cointegration is found when the real growth of industrial output is included in the specification. The estimated coefficient is positive, from 0.58 to 1.95 depending on the specification. It is worth noting that the estimated coefficient is high in comparison to other developing economies. For example Pentecost and Moore (2006) and Thornton and Pouydal (1990) found significantly lower coefficients for India Pakistan respectively.
5. Credit plan. We include the variable short loans in ten specifications and only four are found cointegrated with M_1 . Then this variable is found not significant in two out of four specifications. We conclude that similarly to the inter-enterprises circuit, the credit plan plays no significant role in the aggregate monetary sphere.

In total, financing investment appears a major reason for holding money in the production sector, a determinant that was neglected in previous studies. Presumably, this is due to limited access to credit. The typical enterprise finances much of its investment with own funds: the share of own funds in total funding of investment in fixed assets in China has been invariably high at around 50%. In 1993, the first year for which the data are available, own funds accounted for 47% of all funding for capital construction and technological updating and transformation (with no data available on total investment in fixed assets); in 2009, own funds accounted for 61% of all funding of investment in fixed assets (Statistical Yearbook).

The importance of self-financing is also probably related with our finding that enter-

prises have become less sensitive to credit tightening (and to the credit plan). For private and collective-owned enterprises with possibly limited access to bank loans, complementarity has been relevant all along in the reform period. Low interest rates may have contributed to this development: enterprises can earn a significantly higher real return on investment than on interest-bearing assets. In this sense, the Chinese economy shares a common pattern with most emerging economies due to the absence of deep financial markets (Pentecost and Moore, 2006).

In addition one aspect of the importance of self-financing in China - besides the private sector self-financing - could be that state-owned enterprises face incentives to hoard funds rather than pass them on to their owners (the state). Policy implications of our results are discussed in the conclusion.

4 Conclusion

This paper investigates the transition process from a centrally planned to a market-based monetary system. We estimate long run, equilibrium money demand functions for China from 1984 to 2010, explicitly taking into consideration the changes in the institutional characteristics of China's financial system. To do justice to the origins of China's current monetary system, we examine the disaggregate money balances in both enterprises-household and inter-enterprise circuits. Then we estimate the demand for M_1 and M_2 . To do so, we use a constructed dataset with quarterly frequency spanning from 1984 to 2010. Given the seasonal patterns in several series, we use the seasonal unit-root test developed by Hylleberg et al. (1990) to disentangle seasonal peaks from a pure random walk.

Several of our findings are new in the discussion of money demand in China. First, in the disaggregate approach, the stationarity of household money holdings (once

seasonal factors are taken into account) suggests that there is still significant state influence over households' allocation choices. Enterprises, in contrast, have gained decision-making autonomy over their deposits. Money demand of enterprises stems primarily from a desire to self-finance. The credit plan has not been a significant driver of enterprise money demand and enterprises are conscious of the opportunity cost to holding money. In sum, our estimations suggest that the enterprise sector- whether state-owned enterprises with newly found autonomy or the growing private sector- quickly adjusted to the end of the command economy, much quicker and to a more significant extent than households. The findings for the corporate sector carry over into aggregate money demand.

Last our findings confirm the relevance of McKinnon's complementarity hypothesis for the case of China. The development of China's financial system follows a pattern similar to that of many other developing countries. In fact, complementarity may hold even more strongly in China than elsewhere. The role of opportunity costs in money demand has been significant but weak in comparison with complementarity, suggesting that saving is independent of the interest rate. Thus, while standard money demand functions can be reliably estimated for China, the importance of different explanatory factors is not the same as in market economies.

The need for Chinese policy makers to maintain control over the economy through the monetary sphere has important implications. In particular, an environment of negative or low real interest rates limits the scope for monetary policy. Market-based interest rates are necessary to gain leverage over the money demand of households, and to play a more important role in the money demand of enterprises. Develop-

ment of government and corporate bond markets, for example, could advance the transition towards market-based interest rates. But ultimately, it requires a direct government decision to end the traditional practice of state-determined, centrally regulated interest rates.

References

- Austin, D., Ward, B., Dalziel, P., 2007. The Demand for Money in China 1987 - 2004: A Non-linear Modelling Approach. *China Economic Review* 18, 190-204.
- Bahmani-Oskoei, M., Wang, Y., 2007. How Stable is the Demand for Money in China? *Journal of Economic Development*, 32(1), 21-33.
- Chen, B. 1997 . Long-run Money Demand and Inflation in China. *Journal of Macroeconomics* 19, 609-617.
- Choi, I., Saikkonen, P., 2004. Cointegrating Smooth Transition Regressions. *Econometric Theory* 20, 301-340.
- Choi, I., Saikkonen, P., 2004b. Testing Linearity in Cointegrating Smooth Transition Regressions, *Econometrics Journal* 7, 341-365.
- China Financial Statistics 1952-1987. *Zhongguo jinrong tongji (1979-1985)*. Beijing: Zhongguo jinrong chubanshe, 1987.
- China Financial Statistics 1949-2005. *Zhongguo jinrong tongji (1949-2005)*. Beijing: Zhongguo tongji chubanshe, 2007.
- China Quarterly GDP Time Series 1992-2005. Compiled by the NBS National Income Accounts Division. Beijing: Zhongguo tongji chubanshe, 2008.
- Chow, G., 1987. Money and Price Level Determination in China. *Journal of Comparative Economics* 11, 319-333.
- Chow, G., Shen, Y., 2005. Money, Price Level and Output in the Chinese Macroeconomy. *Asia-Pacific Journal of Accounting and Economics* 12(2), 91-111.
- Delatte A.L., Fouquau, J. 2010. Smooth Transition in China: New Evidence in the Cointegrating Money Demand Relationship. *Economics Bulletin* 30 (1) 265-273.
- Dembinski, P.H., 1988. Quantity Versus Allocation of Money Problems of the Centrally Planned Economies Reconsidered. *Kyklos* 41(2), 281-300.

- De Wulf, L., Goldsborough, D., 1986. The Evolving Role of Monetary Policy in China. *International Monetary Fund Staff Papers* 33, no. 2, 209-242.
- van Dijk, D., Franses, P., Teräsvirta, T. 2002. Smooth Transition Auto-Regressive Models: A Survey of Recent Developments. *Econometrics Review* 21, 1-47.
- Engle, R. and Granger C.W.J. 1987. Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55, 251-276.
- Engle, R., Granger, C.W.J., Hylleberg. S., and Lee H.S. 1993. Seasonal Cointegration: the Japanese Consumption Function. *Journal of Econometrics* 55, 275-298.
- Fan, G., Shuguang, Z., and Limin, W., 1993. Shuanggui yu "shuanggui tiaokong" (shang): gaige yilai wo guo hongguan jingji bodong tedian yanjiu, dual tack transition and dual track macroeconomic management (Part I): A study of the characteristics of China's economic fluctuations since the reform). *Jingji Yanjiu* (10), 15-26.
- Feltenstein, A., Farhadian, Z., 1987. Fiscal Policy, Monetary Targets, and the Price Level in a Centrally Planned Economy: An Application to the Case of China, *Journal of Money, Credit, and Banking* 19(2), 137-56.
- Finance Yearbook. *Zhongguo jinrong nianjian* (China Finance Yearbook). Various years. Beijing : Zhongguo jinrong chubanshe.
- Franses, H.B.F. 1997. Are Many Current Seasonally Adjusted Data Downward Biased? Discussion Paper, EUR-FEW-EI-97-17/A, Erasmus University at Rotterdam.
- Gerlach, S. Kong, J. 2005. Money and Inflation in China. Hong Kong Monetary Authority, Research Memorandum 04/2005.
- Girardin, E. 1996. Is There a Long-run Demand for Currency in China? *Economics of Planning* 29, 169-184.
- Ghysels, E., Perron, P., 1993. The Effect of Seasonal Adjustment Filters on Tests for a Unit Root. *Journal of Econometrics* 55(1-2), 57-98.

- Hafer, R.W., Kutan. A. M., 1993. Further Evidence on Money, Output, and Prices in China. *Journal of Comparative Economics* 17, 701-709.
- Hasan, M.S., 1999. Monetary Growth and Inflation in China: A Reexamination. *Journal of Comparative Economics* 27, 669-685.
- Holz, C.A. 1992. *The Role of Central Banking in China's Economic Reforms*. Ithaca, N.Y.: Cornell University East Asia Program.
- Holz, C.A. 2000. The Changing Role of Money in China and Its Implications. *Comparative Economic Studies* XLII (3), 77-100.
- Hylleberg, S., Engle, R., Granger C. W. J. and Yoo B. S. 1990. Seasonal Integration and Co-integration. *Journal of Econometrics* 44, 215-238.
- Huang, G. 1994. Money Demand in China in the Reform Period: an Error Correction Model. *Applied Economics* 26, 713-719.
- Hui Xiaobin (PCBC Shenzhen municipal branch). 1994. - Zhongguo jingji shichanghua jincheng zhong de yinhangye biange moshi xuanze (Choice of bank transformation model during China's economic marketization). *Jingji Yanjiu*, 17-23, 50.
- Kornai, J. Resource-Constrained Versus Demand-Constrained Systems. *Econometrica* 47, no. 4 (July 1979): 801-19.
- Laurens, B. Maino, R. 2007. China: Strengthening Monetary Policy Implementation. *International Monetary Fund Working Paper /07/14*. Washington.
- Lee, Chien-Chiang, Mei-Se Chien. 2008. Stability of Money Demand Function Revisited in China. *Applied Economics* 40, 3185-3197.
- McKinnon, R.I. 1973. *Money and Capital in Economic Development*. Washington DC: Brookings Institution.
- Mehrotra, A. 2006. Demand for Money in Transition: Evidence from China's Disinflation. *BOFIT Discussion Papers* 10. Helsinki.

Montes-Negret, F. 1995. China's Credit Plan: An Overview. *Oxford Review of Economic Policy* 11(4), 25-42.

NPC (National People's Congress).

31 March 1993. Di ba jie quanguo renmin daibiao dahui di san ci huiyi guanyu 1992 nian guomin jingji he shehui fazhan jihua zhixing qingkuang yu 1993 nian guomin jingji he shehui fazhan jihua de jueyi (Resolution by the third meeting of the eighth NPC on the implementation of the 1992 National Economic and Social Development Plan and on the 1993 National Economic and Social Development Plan). Accessible on the web at various addresses.

11 March 1994, 18 March 1995(a), 6 March 1998, 6 March 1999: Annual plans for specific year and NPC, otherwise with titles as above for 31 March 1993. Accessible on the web at various addresses.

Park, J. Y., Hahn, S. B., 1999. Cointegrating Regressions with Time Varying Coefficients. *Econometric Theory* 15, 664-703.

Park, J.Y., Phillips P.C.B. 1999. Asymptotics for Nonlinear Transformations of Time Series. *Econometric Theory* 15, 269-298.

Park, J.Y., Phillips P.C.B., 2001. Nonlinear Regressions with Integrated Time Series. *Econometrica* 69, 117-116.

Pentecost, E.J., Moore, T. 2006. Financial Liberalization in India and a New Test of the Complementarity Hypothesis. *Economic Development and Cultural Change* 54(2), 487-502

Price Yearbook. *Zhongguo wujia nianjian*. Beijing: Zhongguo wujia chubanshe, various years.

PBC (People's Bank of China).

12 Sept. 1988. *Xianjin guanli zanxing tiaoli shishi xize* (Detailed implementing

- instructions on the temporary cash administration regulations).
- Qin, D. 1994. Money Demand in China: The Effect of Economic Reform. *Journal of Asian Economics* 5, 253-271
- SC (State Council).
- 28 Oct. 1977. *Guowuyuan guanyu shixing xianjin guanli de jueding* (SC decision on the implementation of cash administration).
- 8 Sept. 1988. *Xianjin guanli zanxing tiaoli* (Temporary cash administration regulations). SC decree #12.
- 25 Dec. 1993. *Guowuyuan guanyu jinrong tizhi gaige de jueding* (SC decision on reform of the financial system). Guofa #91/1993.
- Statistical Yearbook. *Zhongguo tongji nianjian* (China Statistical Yearbook). Various years. Beijing: Zhongguo tongji chubanshe.
- Statistical Abstract 2011. *Zhongguo tongji zhaiyao* 2011 (China Statistical Abstract 2011). Beijing: Zhongguo tongji chubanshe, 2011.
- Thorntonm J., Puydal, S.R. 1990. Money and Capital in Economic Development: a Test of the McKinnon Hypothesis for Nepal. *Journal of Money Credit and Banking* 22, 395-399.
- Xiao G. 1997. *Chanyan yu zhongguo de jingji gaige* (Property Rights and China's Economic Reforms). Beijing: Zhongguo shehui kexue chubanshe.
- Xu, Y. 1998. Money Demand in China: A Disaggregate Approach. *Journal of Comparative Economics* 26, 544-64.
- Yu, Q. Tsui, A. K. 2000. Monetary Services and Money Demand in China. *China Economic Review*, 11, 134-148.
- Zuo, H., Park, S.Y. 2011. Money Demand in China and Time-varying Cointegration. *China Economic Review*, doi:10.1016/j.chieco.2011.04.001.

Appendix

Dataset

Deposit and loan data are obtained from the monthly magazine *Xinhua yuebao* for the years through 1985, the financial statistics page in the PBC's monthly magazine *Zhongguo jinrong* for the years 1986-1989, *China Financial Statistics* 1949-2005 for the years 1990-2005, and the *PBC Quarterly Statistical Bulletin* and the PBC website (<http://www.pbc.gov.cn/>) for the years since 2006. The transitions between the different sources are not always smooth: minor adjustments to loan data are required for 1988 and 1989.

The sources of money supply data for M_0 (currency in circulation) are the same as for deposits and loans. Quarterly M_1 data for the years through 1990 are obtained from the International Monetary Fund's *International Financial Statistics* (IFS); since then, they are obtained from the PBC *Quarterly Statistical Bulletin* and the PBC website.

Interest rates are obtained from the *Finance Yearbook* and, for 2009 and 2010, from individual announcements on the PBC website. In contrast to the IFS, which seems to use end-month values, we calculate average monthly interest rates (and then average quarterly interest rates)¹⁴. We take into consideration that interest rates on household time deposits (but not on enterprise time deposits) of 3-year or longer duration were inflation-indexed from 10 September 1988 through 1 December

¹⁴The average monthly interest rate is the arithmetic mean of the daily interest rates, and the average quarterly interest rate is the arithmetic mean of the monthly interest rates.

1991, and then again starting 11 July 1993. The spread between U.S. and China's lending rates is the percentage point difference between the U.S. Bank Prime Loan Rate and the China lending rate, both series as published in the IFS.

Exchange rate data are obtained from the IFS through 1986, and then from the *Finance Yearbook* and the PBC website. The nominal effective exchange rate (NEER) is obtained from the IFS.

For data on the real economy, our default source is a series of three statistical magazines published by the National Bureau of Statistics: *Zhongguo tongji yuebao* (July 1985 - 1989), *China Statistics Monthly* (1988 - early 1990s), and *China Monthly Statistics* (starting early 1990s). We also resort to the statistics page in the NBS monthly magazine *Zhongguo tongji* and to the NBS website (www.stats.gov.cn). For the numerous manipulations involved in the creation of quarterly GDP, industrial output, and investment series, we conducted extensive reliability checks before proceeding as we did.

The CPI and the retail price index are published as a monthly year-on-year (yoy) growth rate. We create a price index by setting all monthly CPI (and retail price index) values of the year 2002 equal to 100, and then applying the published CPI (and retail price index) growth rates to this base in order to obtain a continuous index that covers the complete time period. From this continuous index we obtain quarterly yoy growth rates¹⁵.

¹⁵We can equally well obtain quarterly yoy growth rates from the published monthly yoy growth rates. The difference between these two series is exceedingly small. Because we obtain real series of other variables by using 2002 as the base year, we take the same approach for the price indices. The choice of 2002 followed careful examination of the price indices in all years. 2002 was a year with average monthly CPI inflation of -0.8% (and a standard deviation of 0.3 percentage points)

The retail sales data have a number of missing data points which then require (minor) approximations. The raw GDP data are from the *China Quarterly GDP Time Series 1992-2005* and the NBS website. Quarterly values for the years prior to 1992 are obtained by relying on the quarterly proportions of the industrial output data. All final quarterly GDP data are based on the most recently revised annual GDP series (from the *Statistical Yearbook 2010* and the *Statistical Abstract 2011*) to which the quarterly GDP shares of the raw GDP data (prior to 1992 industrial output values) are applied. We create a real series by taking all four quarterly nominal values of 2002 to also be real values.

Industrial output values are based on the available real and nominal data on gross output value, sales output value, and value-added, for whichever aggregate of industry these data are available (total; directly reporting industrial enterprises, with its changing definition). In addition to the default sources, we consulted the PBC Quarterly Statistical Bulletin. From these raw data, we create a monthly yoy real growth index. We also use these series to determine the share of each month or quarter in annual output. Data in levels are based on the annual industrial valued added published in the national income accounts (*Statistical Yearbook 2010* and the *Statistical Abstract 2011*) to which these monthly or quarterly shares are applied. A series of real value added is obtained by taking all 2002 nominal values to also be real values, and then applying the earlier derived real growth rates to the 2002 base (which can then also be readily used to back out a quarterly yoy growth rate series).

and it followed two years of near-stable prices.

The investment data are based on the economy-wide annual investment values published in the *Statistical Yearbook*, to which monthly or quarterly shares are applied. The monthly or quarterly shares are based on a large variety of different investment data available at different points in time (capital construction and technological updating and transformation, investment by state-owned units, urban investment).

Household income is limited to urban household income in 35 or 36 cities (with the exact number of cities depending on year). Our default variable is disposable income, our second choice is living expenditures. A real series is obtained by deflating with the CPI (using 2002 as the base year).

Stationarity tests robust to seasonality: HEGY tests

In view of the Figure 5, several of the data series seem to exhibit strong seasonality. Prefiltering seasonal series by seasonal dummies assumes that seasonality is a purely deterministic phenomenon and does not allow for stochastic seasonality. The alternative, prefiltering with an ARIMA X-12 procedure, accounts for stochastic seasonality but assumes stationarity. In sum, filters alter the stochastic structure of a series because they impose a particular stochastic structure (Franses, 1997). Unit root tests on linear seasonal filtered data tend to over-reject the null hypothesis of a unit root.

To address the issue, we apply a seasonal unit-root test (HEGY) developed by Hylleberg et al. (1990) that has the advantage of testing for unit roots at zero frequency (long-run behavior) and for seasonal unit roots. To do so, the test de-

composes a quarterly series y into the seasonal and the zero-frequency components:

$$(1-L^4)y_t = \gamma_1(1+L+L^2+L^3)y_{T-1} + \gamma_2(1-L+L^2-L^3)y_{T-1} + \gamma_3(1-L^2)y_{t-1} + \gamma_4(1-L^2)y_{t-2} + \epsilon_t \quad (2)$$

where L is the lag operator. The value of γ_i ($i=1$ to 4) determines the existence of a unit root in the different frequencies. To check the significance of γ_i , the test proceeds as a standard ADF test with critical values simulated by Hylleberg et al. (1990). If $\gamma_1 = 0$, the variable has one non-seasonal (long-run) unit root. If, in addition, γ_i ($i=2$ to 4) = 0, then the variable has also a seasonal unit root. It corresponds to a unit root in the semi-annual frequency if $\gamma_2 = 0$, and in the quarterly frequency if $\gamma_3 = \gamma_4 = 0$ (joint F-test). In sum, this test allows us to identify the frequency at which the data have a unit root.

Table 2 reports the results of the HEGY test and of standard unit root tests. For all tests we have to specify the number of lagged difference terms of the dependent variable to be added to the test regression. As is common practice, we include the number of lags that is sufficient to remove serial correlation in the residuals.

The HEGY test identifies which variable has a unit root in the zero-frequency, a prerequisite to studying cointegration relationships. The test reveals that the following variables are stationary: cash (M0), household deposits, real growth of disposable income, CPI inflation rate, real 5-year fixed term deposit interest rate, real growth rate of industrial output, investment, US vs. China Interest rate spread. The remaining variables are nonstationary.

We continue by investigating the presence of stochastic seasonal characteristics. The variables GDP, retail sales and CPI index are found to have a unit root both in the zero-frequency and semi-annual frequency ($\gamma_2 = 0$). The variable industrial output has a unit-root both in the zero-frequency and quarterly frequency ($\gamma_3 = \gamma_4 = 0$), using a Fisher test. The other variables have no seasonal unit roots.

To check the robustness of our results, we apply the standard tests ADF, PP or KPSS which yield similar conclusions as the HEGY test in the zero frequency, with the exception of M0 where the classical tests find nonstationarity. The HEGY test suggests that M_0 is stationary in the zero-frequency but has a unit root in the semi-annual frequency, i.e., the dynamic of the variable differs between the first and the second half of the year. This may be due to the Chinese New Year holiday in the first quarter of the year, with a surge in household purchases and the use of newly printed cash for presents; the excess currency in circulation is then later withdrawn by the PBC. The HEGY result suggests that the standard unit root tests wrongly reject the variable's stationarity because of the presence of a seasonal unit root.

To conclude the statistical analysis, we filter the data based on the information about the unit root frequency of the data. If the series have a unit root in the zero-frequency only (and no seasonal unit root), we use this variable in levels. If the series has a zero-frequency unit root and a seasonal unit root, we cannot use the standard procedure of Engle and Granger (1987); to focus only on the long-run relationship, we eliminate the seasonal unit root and keep only the unit root in the zero-frequency. Specifically, we work with seasonal component $S_1 = (1 + L + L^2 + L^3)y_{t-1}$ as in Engle, Granger, Hylleberg and Lee (1993). With this component, we can use the

traditional cointegration test. Following the proper treatment of seasonality and integration order of the series, we continue with stationary and non-stationary series to examine the linear empirical specifications.

Figure 1: Enterprise and Household Circuits in the Centrally Planned Economy

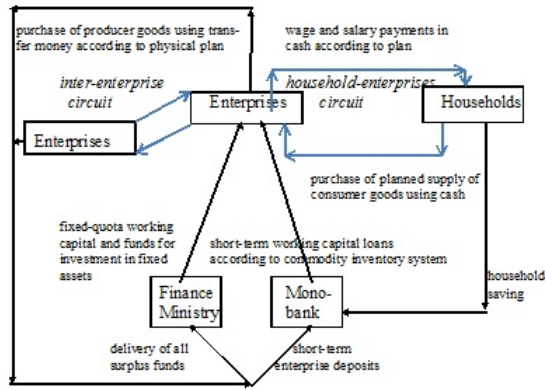


Figure 2: Enterprise and Household Circuits after Reform

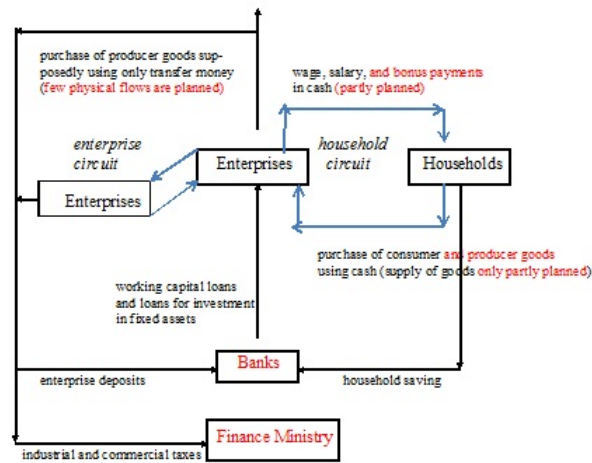


Figure 3: Lending Rate, Deposit Rate, and CPI

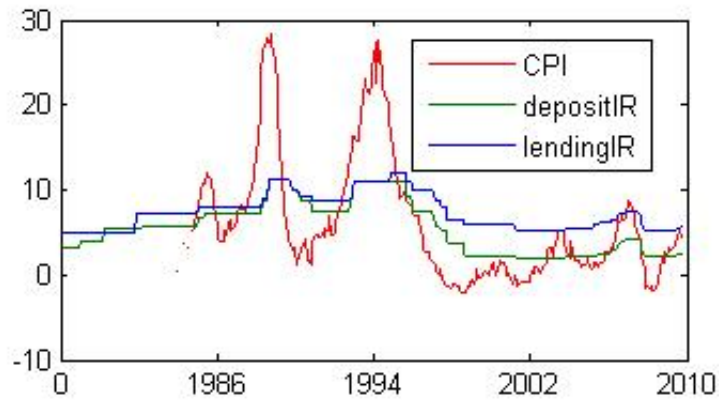


Figure 4: Dataset (in billion yuan unless obviously otherwise)

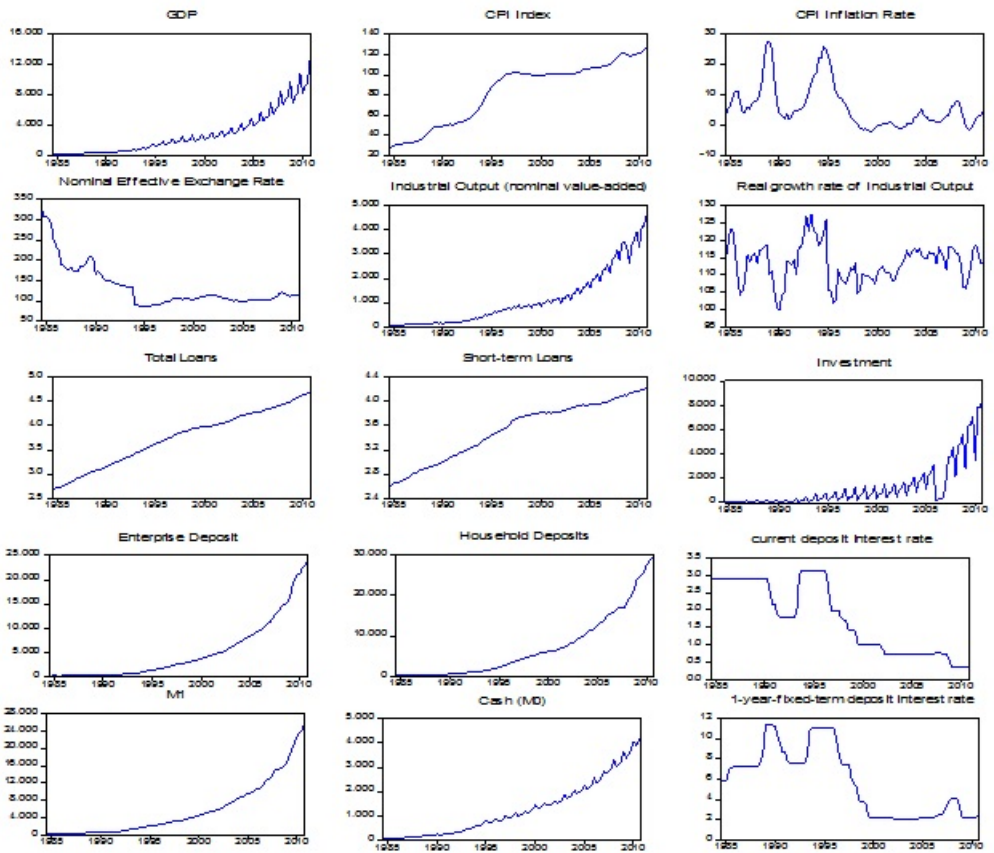


Figure 5: Dataset (in billion yuan unless obviously otherwise)

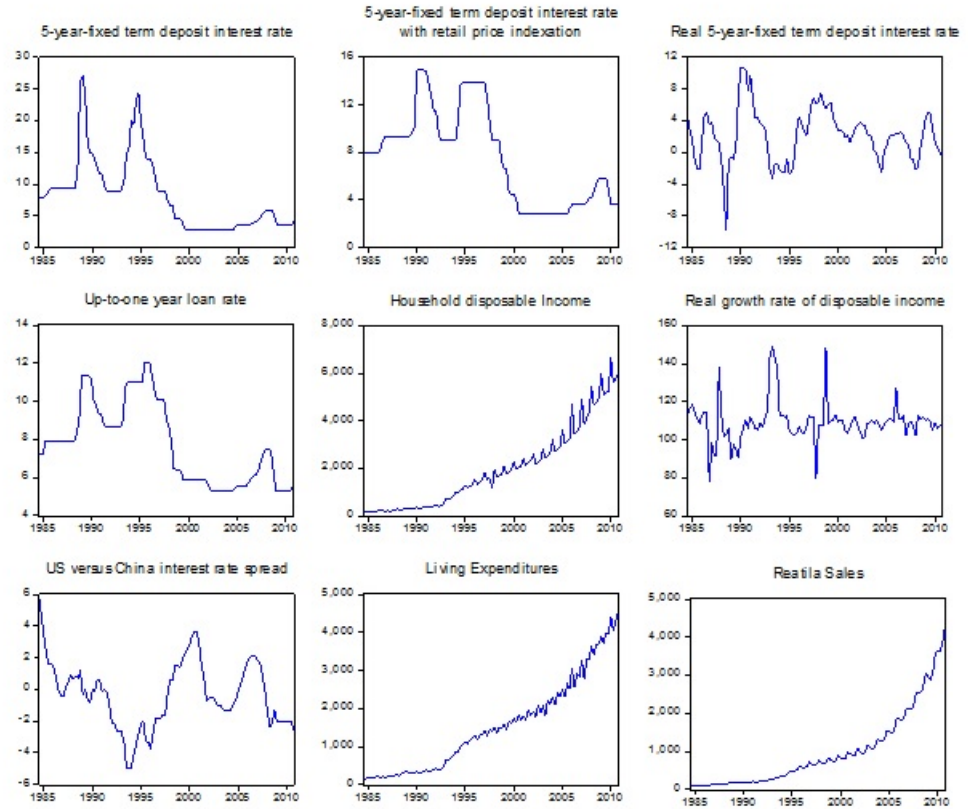
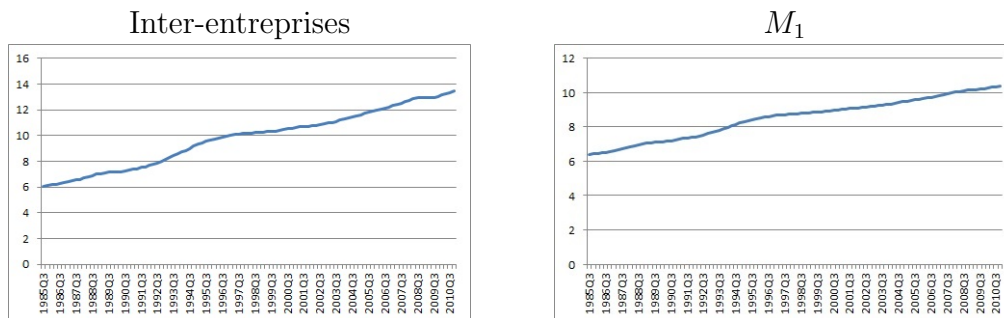


Figure 6: Dual impact of transactions motive and monetization in both circuits



Note: β_1 transactions motive + β_2 transactions motive²

Table 1: Disbursements and Receipts of Cash by State Banks

Disbursements Receipts	Total (bn yuan)	In % of total disbursements (or receipts) per annum													Curr. in circul. (bn yuan)	D-R (bn yuan)					
		1	2	3	4			5			6	7	8	10			11	12	13	14	15
		Sal., wages	Agr. proc.	Admin units	Goods	Ser- vices	Tax	RCC	TVE ent.	Self- empl.	Sav- ings	UCC	Re- mit.	Others							
1978 D	13526	45.6	9.5	6.5	X	X	X	21.9	X	X	9.6	X	2.8	4.0							
1978 R	133.60	X	X	X	71.3	7.9	0.4	4.1	X	X	10.7	X	2.0	3.7	21.20				1.66		
1985 D	56948	31.4	14.7	6.4	X	X	X	19.2	3.0	1.0	17.7	X	1.6	5.0							
1985 R	54991	X	X	X	52.1	5.8	0.7	10.6	1.5	0.7	22.6	X	1.5	4.6	98.78				19.57		
1986 D	68439	31.5	14.8	6.0	X	X	X	17.9	3.2	1.0	19.2	X	1.6	4.8							
1986 R	66133	X	X	X	49.6	5.8	0.7	10.5	1.5	0.6	25.1	X	1.4	4.7	121.84				23.06		
1987 D	90157	27.9	13.2	5.9	X	X	X	16.9	3.6	1.3	23.4	0.8	1.5	5.7							
1987 R	87796	X	X	X	44.4	5.6	0.7	10.2	1.7	0.8	29.2	0.8	1.5	5.1	145.45				23.61		
1988 D	13490	23.6	11.1	5.9	X	X	X	14.3	3.4	1.3	30.1	1.4	1.5	7.4							
1988 R	12811	X	X	X	40.7	5.1	0.6	8.2	1.8	0.9	33.8	1.1	1.5	6.3	213.40				67.95		
1989 D	15268	24.1	10.1	6.1	X	X	X	11.8	3.0	1.3	32.9	1.5	1.5	7.8							
1989 R	15058	X	X	X	36.4	5.2	0.7	7.3	1.6	0.8	38.0	1.4	1.5	7.0	234.40				21.00		
1990 D	17471	23.9	10.0	6.3	X	X	X	11.1	2.9	1.2	33.3	1.5	1.6	8.1							
1990 R	17171	X	X	X	33.1	5.6	0.7	7.9	1.6	0.8	40.2	1.6	1.7	6.7	264.44				30.04		
1991 D	21999	22.1	8.5	6.3	X	X	X	11.1	3.0	1.3	36.1	1.6	1.6	8.3							
1991 R	21465	X	X	X	30.8	5.6	0.7	7.7	1.7	0.9	41.9	1.9	1.9	6.9	317.78				53.34		
1992 D	32406	18.8	5.7	6.4	X	X	X	10.3	3.0	1.4	41.1	1.9	1.8	9.5							
1992 R	31248	X	X	X	26.6	5.3	0.6	6.6	1.7	0.8	45.4	2.0	2.0	8.8	433.60				115.82		
1993 D	50413	15.8	4.5	6.8	X	X	X	8.4	2.7	1.5	45.3	2.6	1.7	10.7							
1993 R	48884	X	X	X	23.0	5.0	0.6	5.9	1.8	0.9	48.5	2.6	1.7	10.2	586.47				152.87		
1994 D	72671	15.4	4.3	6.5	X	X	X	6.1	2.8	1.7	47.4	2.9	1.7	11.2							
1994 R	71247	X	X	X	20.2	4.8	0.5	4.7	2.1	1.2	51.7	3.2	1.8	9.8	728.86				142.39		
1995 D	96726	13.3	3.7	5.8	X	X	X	4.8	2.7	1.9	51.1	3.0	1.7	12.0							
1995 R	97322	X	X	X	17.8	4.3	0.5	3.8	2.2	1.5	54.3	3.7	1.9	10.0	788.54				59.68		

Notes:

- 1: Salaries and wages
- 2: Procurement of agricultural and sideline products
- 3: Management expenses of administrative units
- 4: Sales of goods
- 5: Sales of services
- 6: Tax income
- 7: Rural credit cooperatives (cash disbursements vs. receipts)
- 8: Township and village enterprises (expenditures vs. receipts in cash)
- 9: Business-related expenses vs. receipts of self-employed
- 10: Savings withdrawals vs. deposits
- 11: Urban credit cooperatives, since 1994 "other banking institutions" (cash disbursements vs. receipts)
- 12: Remittances (outgoing vs. incoming)
- 13: Other disbursements vs. receipts
- X: Entry not meaningful or values below 0.05%.

Sources: China Financial Statistics 1952-1987; Finance Yearbook 1994; Statistical Yearbook 1996.

Table 2: Standard and Seasonal Unit Root Tests

	ADF			Phillips Perron			KPSS			HEGY		
	γ_1	γ_2	γ_3	γ_1	γ_2	γ_3	γ_1	γ_2	γ_3	γ_1	γ_2	γ_3
GDP	-1.86 (c)	-7.55*** (c)	0.18** (c)	-1.97 (e)	-2.31	0.30	-3.35***	-2.31	0.30	-3.35***	-2.31	5.68*
Industrial output	-2.32 (c)	-4.35*** (c)	0.18** (c)	-2.40 (e)	2.73*	-1.9	-1.78*	2.73*	-1.9	-1.78*	2.73*	3.46
Entreprise deposits	-0.43 (b)	-0.56 (b)	1.16*** (b)	-1.75 (e)	-9.27***	-2.90	-5.58**	-9.27***	-2.90	-5.58**	-9.27***	22.3***
Household deposits	-1.43 (b)	-4.56*** (b)	0.30*** (c)	-3.22** (d)	-2.83*	-2.59	-4.60	-2.83*	-2.59	-4.60	-2.83*	15.7***
Cash (M0)	-2.02 (c)	-1.98 (c)	0.29*** (c)	-2.83* (d)	-2.05	-3.09	-2.82**	-2.05	-3.09	-2.82**	-2.05	9.65**
M1	-2.12 (c)	-2.02 (c)	0.25*** (c)	-1.94 (e)	-10.8***	-2.58	-5.63***	-10.8***	-2.58	-5.63***	-10.8***	21.4***
M2	-2.49 (b)	-3.45*** (b)	0.29*** (c)	-1.84 (d)	-5.45**	-3.49**	-6.24**	-5.45**	-3.49**	-6.24**	-5.45**	26.5**
CPI index (level)	-3.28* (c)	-1.99** (a)	0.07 (c)	-3.25* (c)	-6.12***	-1.57*	-9.53***	-6.12***	-1.57*	-9.53***	-6.12***	50.7***
Current deposit interest rate	-2.39 (c)	-2.18 (c)	0.14** (c)	-2.38 (c)	-7.33***	-3.78***	-6.12***	-7.33***	-3.78***	-6.12***	-7.33***	33.6***
1-year fixed term deposit interest rate	-1.05 (a)	-1.07 (a)	0.92*** (b)	-2.02 (c)	-7.18***	-3.45***	-6.76***	-7.18***	-3.45***	-6.76***	-7.18***	36.5***
5-year fixed term deposit interest rate	-3.43** (c)	-2.78 (c)	0.10 (c)	-2.70 (c)	-5.57***	-2.57**	-8.16***	-5.57***	-2.57**	-8.16***	-5.57***	43.7***
5-year fixed term deposit interest rate with retail price indexation	-3.72** (b)	-3.41*** (b)	0.06 (b)	-4.09*** (b)	-4.15***	-3.33***	-4.19***	-4.15***	-3.33***	-4.19***	-4.15***	14.0***
Real 5-year fixed term deposit interest rate	-2.24 (c)	-0.84 (a)	0.12* (c)	-4.25*** (b)	-4.32***	-3.04***	-4.65***	-4.32***	-3.04***	-4.65***	-4.32***	15.5***
Up to-1-year short term loan rate	-2.36 (c)	-2.14 (c)	0.13* (c)	-1.82 (b)	-4.72***	-3.52***	-3.80***	-4.72***	-3.52***	-3.80***	-4.72***	13.7***
Real growth rate of industrial output	-3.77*** (b)	-3.88*** (b)	0.08 (b)	-2.75* (c)	-5.58***	-7.14***	-6.11***	-5.58***	-7.14***	-6.11***	-5.58***	44.9***
Real growth rate of disposable income	-6.37*** (b)	-6.45*** (b)	0.11 (b)	-4.90** (c)	-6.74***	-9.21***	-1.58*	-6.74***	-9.21***	-1.58*	-6.74***	47.2***
US vs. China interest rate spread	-2.02** (a)	-1.94** (a)	0.10 (b)	-2.34** (a)	-5.61***	-4.85***	-7.65***	-5.61***	-4.85***	-7.65***	-5.61***	-
CPI inflation rate	-2.56 (c)	-3.32** (b)	0.11 (b)	-3.28* (c)	-6.16***	-2.02**	-9.58***	-6.16***	-2.02**	-9.58***	-6.16***	53.5***
Investment	-3.52** (c)	-9.40*** (c)	0.06 (c)	-3.74** (e)	-4.05***	-6.24***	-4.77***	-4.05***	-6.24***	-4.77***	-4.05***	45.5***
Household disposable income	-1.17 (b)	-1.36 (b)	1.13*** (b)	-0.99 (d)	-3.99***	-6.01***	-1.34	-3.99***	-6.01***	-1.34	-3.99***	19.0***
Living expenditures	2.58 (a)	-2.61 (c)	0.23*** (c)	-1.08 (d)	-3.94***	-4.43***	2.74**	-3.94***	-4.43***	2.74**	-3.94***	13.6***
Total loans	-1.72 (b)	-2.02 (c)	0.26*** (c)	-1.90 (c)	-9.18***	-3.61***	5.38**	-9.18***	-3.61***	5.38**	-9.18***	25.4***
Short-term loans	-2.45 (b)	-2.88** (b)	0.27*** (c)	-1.81 (b)	-4.72***	-3.53***	-3.80***	-4.72***	-3.53***	-3.80***	-4.72***	13.9***
Retail sales	-3.10* (c)	-4.20*** (c)	0.11* (c)	-2.54 (e)	-2.38	-3.53***	-3.28***	-2.38	-3.53***	-3.28***	-2.38	12.7***
Nominal effective exchange rate	-3.49*** (b)	-3.38** (b)	0.28 (c)	-2.52 (d)	-6.32***	-6.09***	-5.25***	-6.32***	-6.09***	-5.25***	-6.32***	48.5***

Specification includes: (a) no intercept no trend, (b) intercept, (c) intercept and trend (d) intercept and seasonal dummy, (e) intercept, trend and seasonal dummy. Null hypothesis: unit root in Dickey Fuller and Philips Perron tests; stationarity in KPSS. ***, **, *, *: rejection of the null hypothesis at the 1%, 5%, 10% significant level.

Table 3: Explanatory Variables for the Estimation of Money Demand

Transaction	Monetization	Complementarity	Opportunity cost	Credit plan
Enterprise circuit (enterprise deposits)				
Nominal industrial output, Investment	Squared industrial output, Squared investment	nominal industrial output, invest-	Real growth of industrial output, Real 5-year deposit interest rate	1-year deposit interest rate, 1-year loan interest rate
Aggregate money demand (M1)				
GDP	Squared GDP	Real growth of industrial output, Real 5-year deposit interest rate	1-year deposit interest rate, 1-year loan interest rate, Real 5-year deposit interest rate indexed to inflation, NEER, U.S.-China spread	Short-term loans

Table 4: Explanatory Variables for the Estimation of Money Demand

	Spec 1a	Spec 1b	Spec 1c	Spec 1d	Spec 1e	Spec 2a	Spec 2b	Spec 3a
Enterprise deposits	Spec 1a	Spec 1b	Spec 1c	Spec 1d	Spec 1e	Spec 2a	Spec 2b	Spec 3a
Cointegration test	-4.77*	-3.51	-4.3	-3.51	-4.39	-4.37	-4.35	-3.14
Nominal industrial production	0.339 (7.06)	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Investment								
Nominal industrial production ²	-0.001 (-0.82)	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Investment ²								
One-year deposit interest rate		Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
One-year loan interest rate	-0.767 (-16.12)				Incl.	Incl.		
Real growth of industrial output			Incl.		Incl.	Incl.	Incl.	Incl.
Real 5-year deposit interest rate	-0.005 (-2.05)	Incl.		Incl.		Incl.		
Short term loans	-0.097 (-1.15)	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Schwartz crit.	-2.82							
Cointegration test	Spec 3b	Spec 3c	Spec 3d	Spec 4a	Spec 4b	Spec 4c	Spec 4d	Spec 4e
Nominal industrial production	-3.18	-3.77	-3.78	-2.01	-4.52**	-4.95**	-4.45*	-4.40*
Investment	Incl.	Incl.	Incl.		0.27 (21.1)	0.272 (21.5)	0.198 (13.08)	0.197 (13.92)
Nominal industrial production ²					0.001 (2.05)	0.004 (1.69)	0.002 (6.12)	0.002 (6.61)
Investment ²	Incl.	Incl.	Incl.					
One-year deposit interest rate								
One-year loan interest rate	Incl.		Incl.		-0.689 (-18.81)	-0.65 (-26.7)	-0.286 (-17)	-0.294 (-19.27)
Real growth of industrial output	Incl.				-0.374 (-1.62)		0.609 (3.59)	
Real 5-year deposit interest rate		Incl.	Incl.			-0.001 (-0.28)		0.001 (0.39)
Short term loans	Incl.	Incl.	Incl.	Incl.				
Schwartz criterion					-3.06	-3.16	-2.91	

This table reports cointegration statistic tests, the estimated coefficient value of the explanatory variables obtained with lead and lags methodology and in parenthesis are t-statistics. “*” : cointegrated at 10% significance level, “**” at 5% and “***” at 1% (Phillips and Ouliaris critical values). “Incl.” denotes variables initially included in a vector in which cointegration was rejected.

Table 5: Linear Demand for M1

	Spec 1a	Spec 1b	Spec 1c	Spec 1d	Spec 1e	Spec 2a	Spec 2b	Spec 2c	Spec 2d	Spec 2e
M1										
Cointegration statistics	-6.24***	-6.05***	-4.75*	-4.27	-5.95***	-6.17***	-5.89***	-4.73**	-4.17	-5.82***
GDP	0.293 (6.92)	0.366 (7.13)	0.243 (3.59)	incl.	0.400 (7.95)	0.319 (27.3)	0.356 (28.18)	0.411 (10.1)	incl.	0.295 (23.21)
GDP ²	-0.0003 (-0.66)	-0.001 (-2.3)	0.000 (0.01)	incl.	-0.001 (-2.2)	-0.001 (-2.94)	-0.001 (-5.32)	-0.002 (-2.67)	incl.	0.000 (-0.63)
One-year deposit interest rate	-0.149 (-12.16)					-0.139 (-12.61)				
One-year loan interest rate		-0.363 (-11.28)					-0.327 (-12.52)			
NEER			0.191 (3.14)	incl.				0.171 (2.41)	incl.	
Spread										
5-year nominal interest rate					-0.137 (-10.83)					-0.127 (-11.68)
Real growth of output	0.691 (5.85)	0.581 (4.56)	1.08 (5.92)	incl.	0.809 (6.5)	0.812 (6.2)	0.626 (5.08)	1.95 (9.79)	incl.	0.770 (6.16)
Real 5-year deposit interest rate	0.043 (0.63)	-0.009 (-0.11)	0.281 (2.88)	incl.	-0.181 (-2.20)					
ST loans	-3.63	-3.47	-2.87		-3.46	-3.64	-3.51			-3.51
Schwartz Criterion										
Cointegration Statistics										
GDP	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
GDP ²	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
One-year deposit interest rate	incl.					incl.				
One-year loan interest rate		incl.					incl.			
NEER			incl.					incl.		
Spread				incl.					incl.	
5-year nominal interest rate										incl.
Real growth of output										
Real 5-year deposit interest rate	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
ST loans	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Schwartz Criterion										

This table reports cointegration statistic tests, the estimated coefficient value of the explanatory variables obtained with lead and lags methodology and in parenthesis are t-statistics. “*” : cointegrated at 10% significance level, “**” at 5% and “***” at 1% (Phillips and Ouliaris critical values). “Incl.” denotes variables initially included in a vector in which cointegration was rejected.

Table 6: Linear Demand for M2

M2	Spec 1a	Spec 1b	Spec 1c	Spec 1d	Spec 1e	Spec 2a	Spec 2b	Spec 2c	Spec 2d	Spec 2e
Cointegration statistics	-5.85***	-5.86***	-4.91**	-4.41	-6.26***	-5.89***	-5.91***	-4.63**	-4.05	-6.40***
GDP	0.492 (11.81)	0.57 (13.17)	0.539 (9.26)	incl.	0.581 (12.6)	0.518 (47.0)	0.549 (51.1)	0.604 (19.3)	incl.	0.500 (45.4)
GDP ²	-0.003 (-6.79)	-0.004 (-8.48)	-0.004 (-4.95)	incl.	-0.004 (-7.76)	-0.004 (-18.9)	-0.004 (-21.1)	-0.005 (-9.09)	incl.	-0.003 (-17.13)
One-year deposit interest rate	-0.102 (-7.50)					-0.107 (-9.46)				
One-year loan interest rate		-0.241 (-8.84)				-0.234 (-9.97)				
NEER			0.004 (0.06)	incl.				0.144 (2.63)	incl.	
Spread					-0.099 (-8.00)					-0.100 (-9.71)
5-year nominal interest rate										
Real growth of income output	1.15 (7.42)	1.055 (6.87)	1.516 (11.0)	incl.	1.297 (7.77)	1.161 (8.18)	1.028 (7.19)	1.804 (13.0)	incl.	1.190 (7.88)
Real 5-year deposit interest rate	0.030 (0.45)	-0.033 (-0.50)	-0.021 (-0.25)	incl.	-0.13 (-1.75)					
ST loans	-3.65	-3.73	-3.29		-3.7	-3.68	-3.77	-3.23		-3.72
Schwartz Criterion										
Cointegration statistics										
GDP	-3.24	-3.44	-3.03	-2.91	-2.32	-3.28	-3.45	-3.54	-2.96	-2.36
GDP ²	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
One-year deposit interest rate	incl.									
One-year loan interest rate		incl.					incl.			
NEER			incl.					incl.		
Spread									incl.	
5-year nominal interest rate				incl.						incl.
Real growth of income output										
Real 5-year deposit interest rate	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
ST loans	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Schwartz Criterion										

This table reports cointegration statistic tests, the estimated coefficient value of the explanatory variables obtained with lead and lags methodology and in parenthesis are t-statistics. *** : cointegrated at 10% significance level, ** at 5% and * at 1% (Phillips and Ouliaris critical values). "Incl." denotes variables initially included in a vector in which cointegration was rejected.