Chinese monetary policy – from theory to practice

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1. Introduction

Economics is a difficult science. Models are abstractions from the real world, yet they are supposed to inform those using them about what is going on. Making matters worse, there are many models of different varieties which come to differing conclusions. The practitioner is then confronted with the task to choose the right model that fits the specific research topic and provides the most “correct” while still simplified view of reality.

One marked example of this clash between theory and practice continues to be the monetary policy of China. The People’s Bank of China (PBoC) fixed the exchange rate of the yuan to the US dollar in the middle of the 1990s. What represented a 50% depreciation in 1995, was upheld at 8.28 Yuan Renminbi (RMB) to the dollar for over ten years — in spite of currency turmoil and depreciation among China’s neighbouring countries during the Asian crisis in 1997/98. After 2005 the RMB exchange rate was only allowed to appreciate on tiptoes at 5% a year to the dollar before the Great Financial Crisis broke out in 2008. Until today practitioners are wondering how long the fixed exchange rate regime will be sustainable.

Textbook Mundell–Fleming theory tells us that in a fixed exchange rate regime with perfect or semi-perfect capital mobility the money supply is turned into an endogenous variable. The central bank is required to provide domestic money or foreign money depending on whether there is an excess demand for domestic currency from trade surpluses or capital inflows (FDI) or vice versa. The former puts upward pressure, the latter downward pressure on the domestic currency. This pressure can be alleviated by the central bank by either selling or buying foreign currency, thus expanding or contracting the money supply respectively. The managed exchange rate regime run by the PBoC has been in operation for more than a decade and a half now by virtue of which the Chinese have created the world’s largest foreign reserves valued at US$3.800 billion (about €3.000 bn) by mid-2012. With the dollar peg still in place and a weakly negative correlation between the growth of foreign exchange reserves and the money supply, it seems a different theory is needed to explain the persistence of the Chinese monetary regime.

A contender to the standard theory view is the so-called ‚compensation thesis' as proposed by Lavoie and Wang (2012). According to this view, a central bank is able to offset a rise in the money supply by different operations on its balance sheet other than inverted open market operations. Therefore, the acquisition of net foreign assets through an export-led growth strategy will not lead to an increase in the money supply and will consequently leave the price level unaltered. Changes in the price level depend rather on credit than on money, which develops independently from the central bank's compensation of net foreign asset growth within the banking system.

In the remainder of this article we will explain the two theories, examine their assumptions and evaluate them in the light of empirical data. We find that the textbook view is not supported by Chinese data. On the other hand, our examinations of the balance sheets substantiate the compensation thesis.

2. The theory of exchange rate stabilization

The two theoretical frameworks, while dealing with the same issue, take very different angles. Whereas the Mundell–Fleming model imagines a simple central bank engaged in exchanging foreign money into domestic money, the compensation thesis assumes that the central bank has more options and is trying to insulate the growth of credit from disturbances arising from the net acquisition of foreign assets. Also, the Mundell–Fleming model assumes an asset-based banking system whereas the compensation thesis is usually based on an overdraft banking system. In such a system, banks do not settle inter-bank payments by exchanging money or government bonds, but through their overdraft account with the central bank. Banks are indebted vis-à-vis the central bank at all times; the banking system in continental Europe is characterised by this system (Godley and Lavoie 2004, 4). The endogenous creation of credit within the banking system is supposed to be the driver of changes in the price level, whereas in the Mundell-Fleming model this role is reserved for central bank money. This different view of the conduct of central bank policy is what makes the difference. In the following, the two models are introduced and examined with respect to assumptions, causality and the underlying mechanism that connects the balance of payments with the price level.

2.1 The Mundell–Fleming model

The Mundell–Fleming model (1962) is based on the canonical IS–LM model and adds international capital flows by introducing a balance of payments locus. It is therefore sometimes referred to as the IS–LM–BP model. Its most general version assumes capital to be perfectly mobile or at least semi-perfectly mobile, but the model can also feature closed capital accounts. We use the open capital account version in which different interest rates in countries equilibrate capital flows. Table 1 below shows the balance sheet of a central bank, in our case the People's Bank of China, according to the Mundell–Fleming model view.

Table 1 Balance sheet of the PBoC (Mundell–Fleming)

Assets	**Liabilities**
(Net) Foreign reserves ↑ (c)	Currency in circulation ↓↑ (b/d)
Claims on domestic government ↓ (a)	Bank reserve balances

The central bank holds two types of assets, foreign reserves and domestic government securities. The liability side consists of currency in circulation and bank reserves (deposits by banks from reserve requirements). Together they constitute the money supply.

If, say, the central bank wants to contract the money supply by selling domestic government securities (a) for domestic currency to the public, it thereby reduces currency in circulation (b). According to the Mundell–Fleming model, an increase in the interest rate following a contraction in the money supply will trigger foreign capital flows into the country. Higher interest rates in one country create an excess demand for domestic currency causing its exchange rate to appreciate. If a central bank like the PBoC wants to keep the exchange rate stable, it needs to increase the domestic money supply (currency in circulation) when foreign currency holders want to exchange their foreign into domestic currency. To this end, the PBoC sells yuan by "printing" money (d) and buys foreign currency, e.g. US dollars (c). Since currency in circulation plus bank reserves together equal money supply, their increase puts downward pressure on the interest rate. Eventually both money supply and the interest rate are back to where they started, with the notable difference of foreign

assets and claims on domestic government having changed on the asset side of the central bank's balance sheet.

Monetary policy is hence neutralized by international capital flows. A central bank operating fixed exchange rates and semi-open capital accounts therefore neither has discretionary control over the interest rate nor over the money supply. This constitutes "Mundell's trilemma" of being able to target only two of the three desirable attributes open capital accounts, an independent monetary policy and fixed exchange rates at the same time (Mundell 1960).

2.2 The compensation thesis

The compensation thesis states that foreign capital flows are compensated by changes in the central bank's balance sheet so that the money supply is not affected. The balance sheet of the PBoC below shows that a rise of foreign reserves (a) may be compensated through at least three different balance sheet operations (b, c, d):

Table 2 Balance sheet of the PBoC (compensation thesis, Fulwiler 2010: 47)

Assets	**Liabilities (and capital)**
(Net) Foreign reserves ↑ (a)	Currency in circulation
Claims on domestic government	Bank reserve balances
Claims on domestic banks ↓ (b)	Government deposits ↑ (c)
Other assets	Central bank bills ↑ (d)
	Central bank capital/equity

Before going into more detail, it should be noted that this balance sheet is longer than the one assumed in the Mundell–Fleming model. With claims on domestic banks there is now a third asset on the balance sheet of the central bank. The reason is that the banking system is assumed to be of the so-called overdraft variety. Banks are indebted toward the central bank because they are able to get loans directly from the central bank, providing them with liquidity for interbank payments settlements, depending on certain rules.

On the liabilities side, there are three additional entries. The government holds deposits at the central bank, which it can spend at will, constituting a liability for the central bank. The central bank is able to issue bills (and bonds) in order to mop up what it regards as excess money in the banking system. It can thereby influence liquidity and thus affect the amount of funding available in the banking system. In addition, the central bank has equity or own capital.

Now, according to the compensation thesis, capital inflows from abroad will not necessarily increase the money supply. In the presence of a fixed exchange rate target, inflowing foreign exchange will increase reserve holdings (a) by central bank acquisition of, e.g., US dollars as above. However, there are now three different routes by which this increase can be compensated so that the money supply remains unaffected by the capital inflow. First, claims on domestic banks can be reduced. As banks are indebted to the central bank, an increase in the domestic money supply as the result of an exchange of foreign for domestic money by the central bank may induce domestic banks to reduce their loans drawn from the central bank (b). Since loans from the central bank are costly to banks and newly created domestic currency has been created, banks can reduce central bank loans and acquire currency in order to reduce their funding costs. Alternatively, the central bank itself may impose a reduction of the amount of loans to domestic banks.

A second option for the central bank is to increase the amount of deposits the government holds with the central bank. The last option is the emission of central bank bills, a concept known as sterilization. In these cases the money supply is initially increased, leaving banks with cash to invest which they prefer to store in safe interest-bearing assets rather than hold in cash. If banks use their reserves to buy safe central bank bills, the money supply is being reduced again. Alternatively, the banking sector could be coerced into taking newly created central bank bills onto its balance sheet (financial repression).

In consequence, all three options above result in the money supply not being changed by an increase of foreign reserves. This is clearly a different result to the one in the Mundell–Fleming model where the central bank cannot autonomously

determine the money supply since it cannot insulate itself from capital inflows. If the compensation thesis is applicable, the central bank has gained room to conduct monetary policy compared to Mundell–Fleming being able to change the money supply and/or interest rates. At the same time, a partly open capital account and a fixed exchange rate could be maintained.

In the next section, we will turn to some empirical evidence from China for the two competing views. First we scrutinize the assumptions of both models, then we look at the connection between foreign reserves and money supply and finally we turn to the conduct of monetary policy in the case of the compensation thesis and the use of quantitative instruments like reserve requirements and the loan-to-deposit ratio.

3. Chinese monetary policy in practice

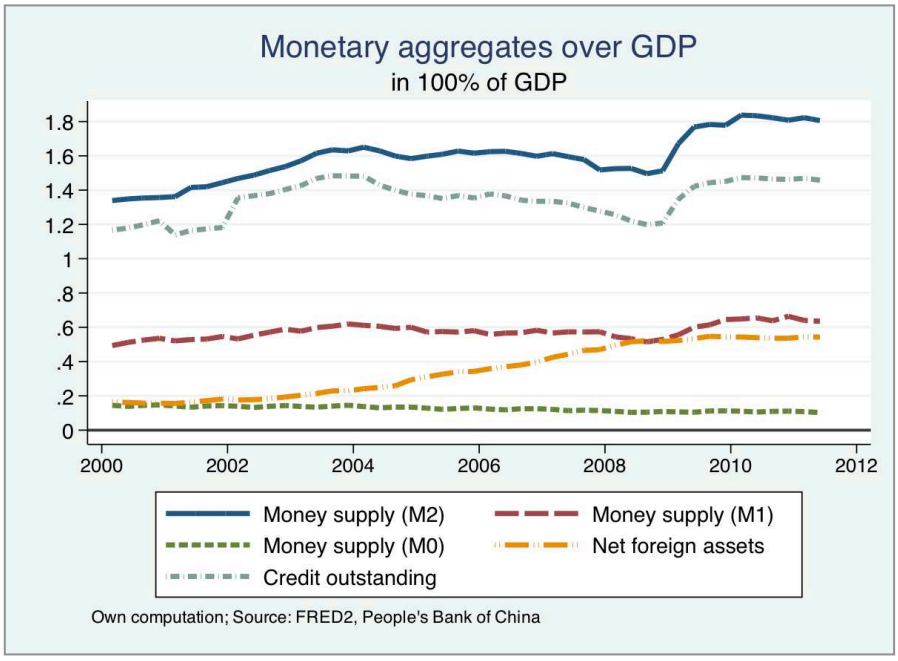
China is the world's largest exporter of manufactured goods measured in US dollars, having overtaken Germany as recently as 2009. Chinese exports are not matched by imports of equal magnitude so that China has been running an average trade balance surplus of 3.6% of GDP since 2000. Additionally, being subject to considerable capital inflows from foreign direct investment (FDI), China's current account surplus during the first decade of the millennium stood at an annual average of 5.1% of GDP.

3.1 A collision of theory and practice

This is the background against which the People's Bank of China is conducting its monetary policy. One of the drivers of its export performance has been the stability of its exchange rate vis-à-vis the US dollar, which has been kept at 8.28 yuan to the dollar between 1995 and mid-2005. Between 2005 and 2008 and in 2010 and 2011, the People's Bank of China let the yuan-dollar rate appreciate by 5% a year amounting to a cumulative 24% nominal appreciation to 6.30 yuan since June 2005. This appreciation partly remedied or even overcompensated the overvaluation of the yuan a as result of the deflationary period before 2003 (Korhonen and Ritola 2009).

Figure 1 visualizes the development of monetary aggregates and net foreign assets. In the presence of surplus demand for Chinese currency from a positive net trade balance, we would expect both to move in lockstep if new money was created to buy dollars. Yet, for the three monetary aggregates published by the PBoC[1], we see a different behaviour. While currency in circulation (M0) stays almost constant at just below 15% of GDP, we see a moderate increase for money (M1) by 20 percentage points and a stronger increase for "Money & Quasi-Money" (M2) by 55 percentage points since 1998 (see Table 4 for exact figures).

Figure 1 Chineses net foreign assets, domestic credit and money supply (2000–12)



The most striking development is the one of net foreign assets (NFA). While standing just above 15% of GDP in 2000, NFA grew fast throughout the 2000s reaching almost 54% by the end of 2010. This development represents the well-known rise of China to become the largest foreign holder of US Treasury securities officially worth over US$1,149 bn in July 2012.[2] The build-up of US bond holdings of US$1,090 bn

[1] The PBoC publishes the "Balance sheet of the monetary authority" and "Money Supply" statistics on its website, available as annual overviews at http://www.pbc.gov.cn/publish/english/984/index.html.

[2] US Treasury, Major Foreign Holders of Treasury Securities, available at: http://www.treasury.gov/resource-center/data-chart-center/tic/Documents/mfhhis01.txt

— the equivalent of 55% of all current account surpluses during this time — is the 'buy-side' of the theoretical exposition laid out in the theory part. In order to stabilize the yuan exchange rate to the US dollar, the PBoC bought US assets of which US government securities constitute the majority. The 'sell-side' of monetary policy, required to offset the monetary expansion when exchanging yuan for dollars, is more contentious. In Figure 1 we simply do not see any of the three monetary aggregates move in line with net foreign assets. While M0 and M1 do not show sufficient variation to account for monetary expansion, M2 has a different time pattern altogether, especially in the second half of the 2000s. The divergence becomes more obvious when looking at rates of growth as presented in Figure 2.

Figure 2 The (non-)relation between net foreign asset and money supply growth

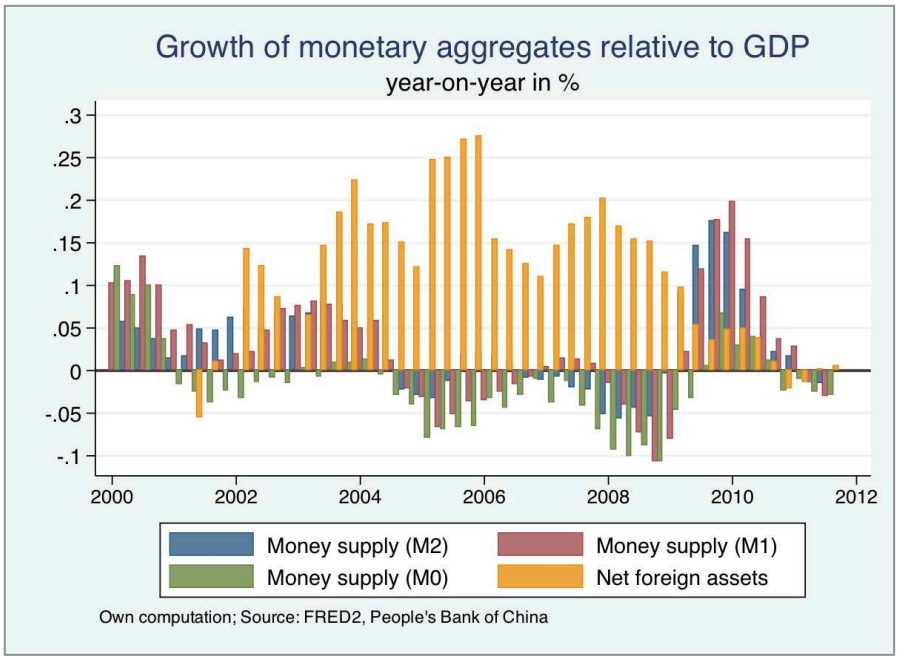


Figure 2 displays year-on-year changes of the three money supply aggregates and net foreign assets as a share of GDP. The latter share grows at two-digit rates between 2002 and 2009 while money supply grows between 2000 and 2004 and after 2009 but is nil or negative in between. If the Mundell–Fleming model were the appropriate tool for interpreting Chinese monetary policy, we should see changes in net foreign assets and money supply behave in a similar manner both in terms of quantity and timing.

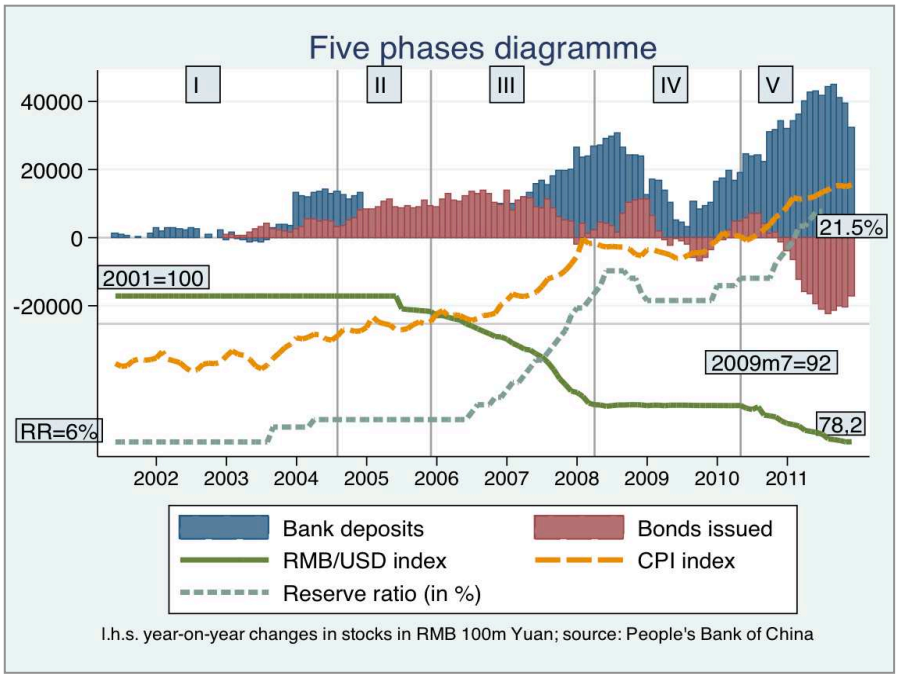
The correlation of the growth rates of the monetary aggregates shows no such relation. Between 2000 and 2011 all rates of change of the monetary aggregates have a small, but stable negative correlation with the growth in net foreign assets with –42%, –41% and –32% for M0 to M2 respectively. Since the PBoC achieves stabilization of the exchange rate the way it does and thereby accumulates international reserves from offsetting foreign capital inflows, there need to be other channels at work through which compensation takes place. The compensation thesis view offers three competing explanations.

3.2 Five phases of pragmatic central banking

It may be conceivable, and there is considerable indication in the literature (Geiger 2006, He and Pauwels 2008, Reade and Volz 2011), that the People's Bank of China has in the past had a rather flexible policy stance adjusting to circumstances at need. We have therefore come up with an interpretation of the uses of monetary policy instruments and the targets of these changes which can be divided into the five phases shown in Figure 3 and summarised in Table 3.

The first phase is characterised by a stable exchange rate and a mixture of low inflation and mild deflation until mid-2004 with growing net foreign assets largely absorbed by increases in the money supply (phase I) and (repo) open market operations. As Green (2005, 6) reports, this was put to an end when the central bank ran out of bonds. Therefore, in 2003 the use of government bonds was substituted by the emission of sterilization bonds, which effectively compensate for the monetary expansion by withdrawing money from the public (phase II). Selling sterilization bonds was continued on a large scale starting from scratch in 2003 and reaching 17% of GDP in 2007 when bond emissions seized. In the meantime, the PBoC let the exchange rate appreciate at a rate of 5% per year after June 2005. From 2006 onwards, inflation took off despite decreases in the money supply (phase III).

Figure 3 Five phases of the monetary policy stance of the PBoC (2001–2011)



As a new policy response, reserve requirements were increased from 7.5% of bank deposits in 2006 by successively lifting the ratio to 17.5% at the time of the Lehman crash in September 2008. During this time, the equivalent of 6.5% of GDP or US$220 bn have been absorbed by the PBoC from the banking system by sharply raising the ratio of required reserves deposited with the central bank (see Table 4 and Table 5).

Table 3 Summary of policy instruments use and targets of the PBoC (2000–2011)

	Targets & priority		**Instruments**				
	Inflation	Exchange rate appr.	Money supply	Foreign assets	Reserve requirements	Bond issuance	
2000–2004	**+**	**o**	**++**	**+**	**+**	**+**	**I**
2004–2006	**o**	**+**	**-**	**++**	**o**	**++**	**II**
2006–2008	**+**	**++**	**o**	**++**	**++**	**++**	**III**
2008–2010	**--**	**o**	**-**	**+**	**-**	**o**	**IV**
2010–	**+**	**+**	**+**	**o**	**+**	**--**	**V**

++/+ representing a (strong) increase, **o** stability and -/**--** a (strong) decrease

In the Great Financial Crisis, the PBoC accompanied its fiscal stimulus measures of countering export and growth slowdowns by re-pegging the exchange rate. Monetary policy was reverted to the pre-2004 stance of accumulating net foreign assets without offsetting them by sterilization (phase IV). Once the domestic and global economies started to normalize, the PBoC restarted its small-scale appreciation (suspended in 2012). A reduction of outstanding sterilization bonds freed previously locked liquidity and a mixture of money supply and reserve deposits growth characterized phase V. The policy stance of the PBoC — if it is at all characterizable by outsiders without inside knowledge of the policy targets of the highly secretive Chinese central bank — seems mainly oriented towards curbing inflation and allowing modest exchange rate appreciation while keeping a lid on money supply growth. This permits the current Chinese business model of promoting growth and employment through exports accompanied by large-scale domestic infrastructure investment to continue. The asymmetry in the PBoC's balance sheet, which is heavily skewed to net foreign assets, may nonetheless cause problems in the future. Valuation effects from exchange rate changes or lower US bond prices, if interest rates pick up again, may cause considerable disruption to the asset side of the PBoC's balance sheet.

The People's Bank of China maintained a pragmatic approach to its monetary policy over the past 12 years. With periods of a fixed exchange rate and a managed peg alternating and inflationary pressure varying, the Chinese central bank has used all policy instruments at its hands. The pure money supply perspective of central banking from Mundell–Fleming can be refuted in the case of China. Instead, the multitude of policy instruments put forward by the compensation thesis view seems warranted, allowing China to circumvent Mundell's impossible trinity by keeping control over domestic money supply. The cost of this practice, however, is considerable financial repression of domestic markets.

3.3 Practical problems of inflation control: loans vs. deposits

The Mundell-Fleming model is a not a good gauge of Chinese reality in the past decade nor is the money supply driven by inflows and outflows of foreign capital. The central bank rather insulates capital flows from the money supply by absorbing them on its balance sheet, to which end there are several monetary policy instruments

available to policy makers. In the case of China, the standard tool of monetary policy is not the interest rate, as in most developed economies, but the ratio of required reserves (RRR). The use of this policy instrument is the subject of much academic debate. Fullwiler (2008, 2) declares that "reserve balances do not 'fund' loans or otherwise aid the creation of outside money". Outside money creation, used here somewhat irregularly for money created outside the central bank – which is normally called inside money by convention –, means that the money multiplier is not a causal determinant but may rather constitute an ex-post property of credit creation within the banking system. We agree with Fullwiler's statement up to a point. As we understand it, the RRR does play a substantial role in money creation in China.

Banks in China are bound by two institutional barriers from increasing their lending. The first barrier is a legal ceiling of a 75% loans-to-deposit ratio (LDR). Article 39 of the Law of the People's Republic of China on Commerical Banks (PBC 1995) states:

> *"When granting a loan, commercial banks shall abide by the following provisions on the control of assets-liabilities ratios: (1) the capital adequacy ratio may not be lower than 8 percent; (2) the ratio of the outstanding of loans to the outstanding of deposits may not exceed 75 percent; (3) the ratio of the balance of floating assets to the balance of floating liabilities may not be lower than 25 percent; (4) the ratio of the outstanding of loans granted to the same borrower to the balance of the capital of the commercial bank may not exceed 10 percent; and (5) other provisions of the People's Bank of China concerning the control of assest-liabilities ratios. If, after the implementation of this Law, the assets-liabilities ratios of a commercial bank established prior to the implementation of this Law are found not in conformity with the provisions of the preceding paragraph, the bank shall make it conform to the provisions of the preceding paragraph within a certain time limit. The specific measures therefor shall be formulated by the State Council."*

The 75% loans-to-deposit ratio was scrapped as a legal barrier in July 2012 but continues to be monitored closely by the China Banking Regulatory Commission

(CBRC). The second is the reserve requirement ratio. We believe that the two are connected and that this connection is crucial in understanding how the PBoC can influence the amount of credit created within the banking system. An assumption required for this construct to work is sufficient demand for loans. Given a sufficiently high demand for loans in normal times, a rise in the RRR diminishes the share of deposits that banks can translate into loans. Since a constant amount of loans outstanding is now funded by a smaller share of free liquidity on the asset side of a banks' balance sheets, these would need to reduce their loan portfolio to meet the reserve and LDR requirements.

Now, as everywhere, rules are there to warrant exceptions. The rules in China are as follows according to a Japanese Ministry of Finance analysis (IIMA 2004, 26):

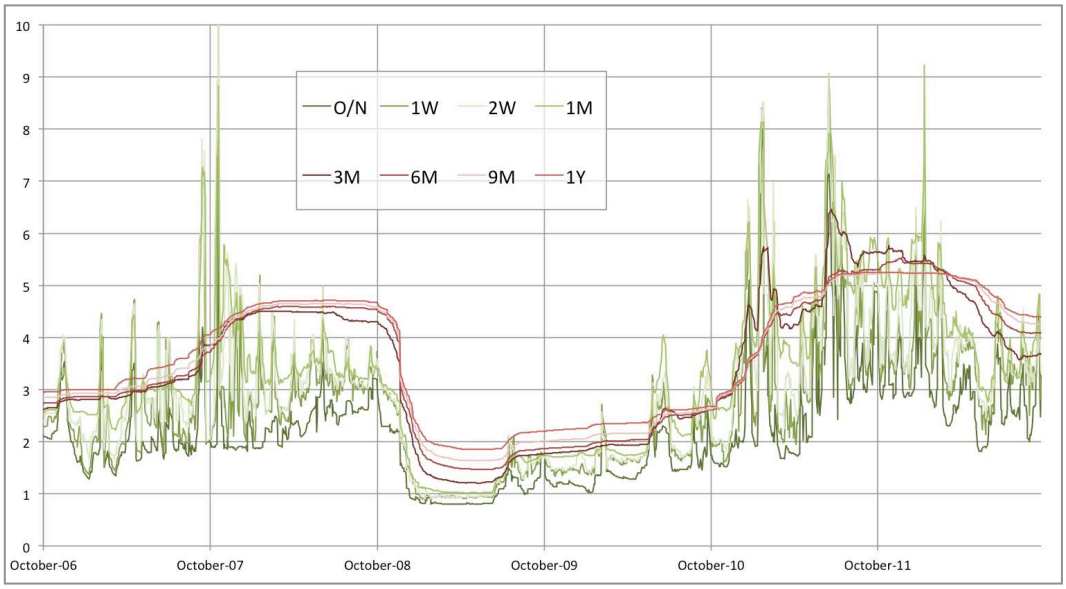
> *"In HVPS [High-Value Payment System], financial institutions must cancel payment instructions in the queue by 6:00 p.m., or credit them via HVPS after raising funds from other branches. When an overdraft is not compensated by 6:00 p.m., the unpaid payment instruction in HVPS will be compulsorily returned to the sending bank. If payment is not completed in BEPS [Bulk-Entry Payment System] or LCHS [regional payment systems], PBC will apply a penalty interest rate to financial institutions with overdrafts, and extend an overnight credit."*

A bank in overdraft will lose money from lending activities if its marginal credit margin is below the penalty rate. It would then be in the interest of the bank to reduce its loan portfolio in order not to end up short on reserves for the central bank. As the end-of-quarter deadline to deliver the reserves to the PBoC approaches, the interbank market interest rate can be expected to spike upwards if the total amount of reserves in the system is too low. More precisely, the interest rate will approach the penalty rate on overdrafts. This is just the mechanism Fullwiler (2010, 4) described: reserves do not create loans, they are rather the required ex-post financing condition validating all granted loans.

Figure 4 shows the Shanghai Inter-Bank Offered Rate (SHIBOR). Interest rates are relatively volatile compared to interbank markets in OECD countries because the PBoC is not using open market operations to affect the interest rate. Instead it

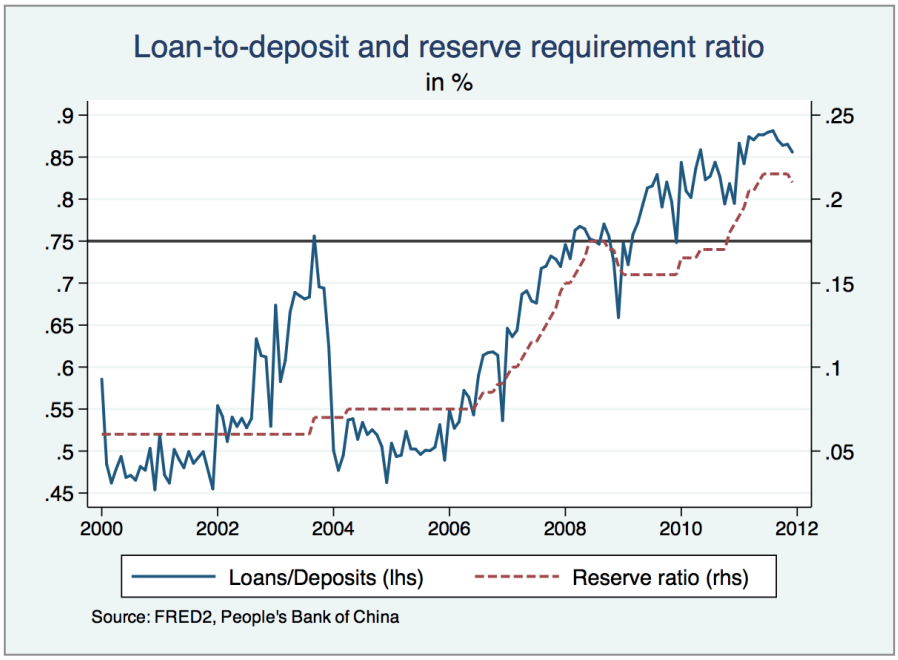
employs purely quantitative measures like reserve requirements and the loan-to-deposit ratio. When a bank has difficulty in providing sufficient reserves to meet reserve requirements in the time window set by the PBoC, the bank borrows the remainder on the interbank market forcing interest rates up. After the reserve window is closed at the end of a quarter, rates fall back and only rise again towards the end of the next reserve settlement period. The effect is only noticeable at short maturities which is exactly what Figure 4 is showing in high fluctuations for maturities below one month while longer maturities are more stable.

Figure 4 SHIBOR, maturities from overnight to one year (2006–2012)



When the world economy experienced a slowdown in economic growth after the bankruptcy of Lehman Brothers in September 2008, the spikes in interest rates ceased. Banks shrank their loan portfolio and subsequently needed less reserves, which effectively ended the struggle for scarce reserves. This meant no more bidding-up of the inter-bank interest rate. Additionally, the PBoC may have provided help by offering cheaper overdrafts, which is unknown. In this period, however, the RRR was lowered and the actual loan-to-deposit ratio fell from its legal ceiling of 75% to 65% within two months in 2009 (see Figure 5). In addition, Figure 2 showed monetary aggregates to have fallen during that time.

Figure 5 Domestic credit over reserve deposits ratio and reserve requirements



Note: Ratio calculated as domestic credit times reserve requirement ratio over PBoC deposits of financial institutions

The loan-to-deposit ratio of 75% has been a cornerstone to China's banking system for 17 years. Figure 5 shows that it was not surpassed until 2009. Despite a record-high reserve ratio of 21.5% (lowered to 20% in mid-2012), the actual loan-to-deposit level has been on the rise reaching almost 90% in late 2011. Shang Fulin, chairman of the China Banking Regulatory Commission (CBRC) noted that a stunning 64 commercial banks where surpassing their average daily loan-to-deposit ratio of 75% at the end of September 2011. An interesting phenomenon is that the interest rates for short-term inter-banking lending in Figure 4 feature drastic increases in the last days of a quarter. When the quarterly check is over, the interest rate decreases again.

From September 2008 onwards the two monetary policy instruments RRR and loan-to-deposit ratio seem to have been ineffective, at least in the expansionary direction. If loan demand from firms is insufficient, the ability to create more loans alone does not make banks lend out more. Despite a lowering of the reserve ratio in Q3 2008, growth of the monetary aggregates turned around only in mid-2009 when economic conditions normalized and loan demand picked up as interest rate rise in Figure 4

shows. Instead of lowering the RRR further, on November 15th 2008 the Chinese government revealed a 1.2 trn yuan stimulus package creating the lacking loan demand itself.

If monetary policy had control over the economy, why would the Chinese government turn to a fiscal stimulus? It seems certain that the PBoC understood that loan demand was fallling, thus the required assumption for effective monetary policy was not fulfilled anymore. Just as the US and the euro zone entered a liquidity trap, the previously so successfully conducted Chinese monetary policy of absorbing capital inflows and insulating net foreign asset growth from spilling over into domestic money supply by using quantiative policy instruments stopped working in an environment of negative growth rates and a lack of loan demand.

4. Policy implications

We have put two theories – the Mundell–Fleming model and the compensation thesis – to a test by examining assumptions and predictions of both regarding foreign reserves and money supply. We have found evidence pointing towards the validity of the compensation thesis while the mechanism suggested by the Mundell–Fleming model is rejected. Money supply and foreign reserves do not correlate, and monetary policy can indeed be conducted by the central bank using required reserve ratios.

While rejecting an automatism from foreign exchange accumulation to money supply growth we want to stress that the compensation on the central banks balance sheet is not without effect. Building up huge reserves of foreign reserves and neutralizing them by emitting central bank bills creates a currency and also a maturity mismatch. A realignment of the fixed exchange rate, for whatever reason, would incur large losses on the PBoC balance sheet which is composed mainly of assets denominated in US dollars and yuan denominated liabilities. The abundant supply of US dollars might also lead to changes in the behaviour of the private or public sectors when their risk perception of the vulnerability from currency appreciation rises.

Another related consequence of the fixed exchange rate regime is the central bank's risk of incurring valuation losses on its portfolio. Foreign reserves in the form of US government securities pay only little interest given the Fed's protracted expansionary monetary policy. When compensating US dollar inflows by selling central bank bills, the overall net present value of the operation may be negative. Whether these losses hurt the PBoC depends on their size and the willingness of the Chinese public to incur them, as did Germany and Japan in the 1970s. One way to avoid losses would be to shift them on less visible balance sheets, which is exactly what the PBoC has been doing. Forcing central bank bills with low interest rates onto banks' balance sheets led to what Shaw (1973) and McKinnon (1973) call 'financial repression'.

The increase in total assets and liabilities in the financial system increases the fragility in the financial structure and distorts incentives. Low real returns to capital favours credit-driven investment over consumption and, perhaps somewhat later, speculation over real investment. Whatever the channels will be, it seems that capital inflows to China do not automatically lead to a change in the money supply. The compensation thesis is correct in assuming that the central bank has some instruments at its disposal to shift the burden of adjustment into different directions. This leaves quite a large role for monetary policy which Mundell's impossible trinity denies.

Chinese monetary policy as conducted by the PBoC can be understood from a compensation thesis point of view. The PBoC insulated inflows of foreign capital from the monetary base and focused on the loan aggregate by using the RRR in conjunction with a 75% loan-to-deposit ratio. We find no evidence that the latter is in fact a policy instrument and the legal ceiling was consequently converted into a monitoring variable in July 2012 by the Chinese banking regulator. In the aftermath of the Lehman bankruptcy the use of the RRRs turned out to be ineffective and was replaced by fiscal policy while the world economy was grinding to a halt. By now, monetary policy is back as the preferred instrument for economic policy control in China but an historically high loan-to-deposit ratio despite a record-high reserve ratio of over 20% leaves little room for non-loan bank activities casting clouds of doubt over the sustainability of the quantity-driven approach to Chinese monetary policy.

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Statistical appendix

Table 4 Overview of financial statistics of the PBoC

	Gross domestic product	Current account	Net foreign assets	Bank reserve deposits	Base money M0	Money M1	(Quasi-) Money M2	Domestic credit
1998	84402.28	3.09			13.27	46.15	123.81	
1999	89677.05	1.95			15.00	51.11	133.70	
2000	99214.55	1.71	15.71	16.15	14.77	53.57	135.68	122.16
2001	109655.17	1.31	18.11	15.58	14.31	54.60	144.36	118.18
2002	120332.69	2.44	19.32	15.90	14.36	58.91	153.75	140.36
2003	135822.8	2.80	22.93	16.61	14.54	61.93	162.88	148.19
2004	159878.3	3.55	29.37	22.31	13.43	60.03	158.38	137.62
2005	184937.4	5.94	34.25	20.76	12.99	58.01	161.54	135.41
2006	216314.4	8.58	39.65	22.40	12.52	58.26	159.76	133.48
2007	265810.3	10.13	46.96	25.74	11.41	57.38	151.76	127.78
2008	314045.4	9.12	51.76	29.33	10.90	52.93	151.31	120.80
2009	340902.82	5.23	54.37	30.05	11.22	64.53	177.83	145.08
2010	401512.8	5.15	53.65	34.04	11.12	66.40	180.78	146.28

Source: National Bureau of Statistics of China, PboC; end of year values as percentages of Chinese GDP (in 100m yuan), missing values not reported before 2000.

Table 5 Overview of real and monetary growth rates of the PBoC

	Real GDP	CPI inflation	Bond issues	Reserves deposits	Base money M0	Money M1	(Quasi-) Money M2	Domestic credit	Yuan appreciation rate	Reserve requirements ratio
1999	7.3	-1.01			12.25	10.21	7.68			6.00
2000	6.8	1.49			-1.58	4.69	1.47		-0.01	6.00
2001	8.2	-0.30		6.47	-3.17	1.91	6.21	6.69	0.00	6.00
2002	7.0	-0.43		11.33	0.36	7.59	6.30	26.50	0.00	6.00
2003	8.35	3.16	71.19	16.44	1.24	5.01	5.77	17.53	0.00	7.00
2004	9.0	2.28	129.6	45.83	-7.94	-3.12	-2.80	8.90	-0.01	7.50
2005	9.7	1.57	60.54	7.34	-3.28	-3.42	1.98	12.95	-2.45	7.50
2006	10.0	2.77	38.21	23.29	-3.76	0.44	-1.11	14.24	-4.26	9.00
2007	11.4	6.37	14.76	34.49	-9.23	-1.53	-5.13	16.24	-8.97	14.50
2008	14.6	1.25	28.38	29.73	-4.63	-8.08	-0.30	11.06	-3.47	16.00
2009	8.2	1.69	-8.46	10.62	2.92	19.83	16.15	26.52	-0.09	15.50
2010	9.2	4.47	-3.80	28.84	-0.93	2.86	1.65	17.19	-2.62	18.50
2011	9.8	6.37	-54.40	32.57	-2.86	-2.99	-1.52	15.37	-5.10	21.50

Source: National Bureau of Statistics of China, PboC; year-on-year growth rates of end of year values, missing values not reported before 2000, 2011 values are end of Q2, reserve requirements ratio in percent of deposits of deposit holding institutions (banks).