

How Effective is China's Monetary Policy?

An assessment of the link between the growth of monetary aggregates and inflation during the 2000s*

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Abstract

The effectiveness of China's monetary policy hinges on the existence of a robust link between the growth of monetary aggregates and inflation. This paper considers this link during the 2000s using Structural VAR models and simulated out-of-sample forecasting techniques. The results indicate that the link is far from robust. Such findings serve to underscore the importance of institutional reforms that will enable interest rates to play a more prominent role as an instrument of monetary policy.

Key words – China, monetary policy, monetary aggregates, inflation.

JEL codes – E31, E37

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1. Introduction

Central banks in most OECD countries operate monetary policy in a broadly similar fashion. Using tools such as open market operations to inject or withdraw funds from an aggregate stock of bank reserves, they manipulate an operational instrument, such as the overnight discount rate. The term structure of interest rates then ensures that these changes flow through to aggregate demand and impact on the central bank's final target of inflation.¹

Since the mid-1990s, China's central bank, the People's Bank of China (PBC), has *officially* adopted the same final target.² However, in the absence of complete, deep and unfettered financial markets, the PBC's use of interest rates as an instrument of monetary policy is limited. Instead, the PBC uses an eclectic mix of tools to influence the growth of monetary aggregates, which in turn are assumed to be related to inflation. Tools commonly used by the PBC include adjustments to bank reserve requirements and providing them with "window guidance" on the volume of credit they extend. The emphasis placed on such tools is most clearly seen during inflationary and deflationary episodes. For example, as can be seen in Figure 1, when inflation began rising in 2007 and 2008, and again in 2011, the increase in the PBC-administered bank lending rate was extremely small. In contrast, the bank reserve requirement was raised to 17.5 per cent in 2008 (from 11.5 per cent a year earlier) and 20.5 per cent in 2011 (up from 16.5 per cent a year earlier).³

Figure 1 here

¹ This can be an explicit commitment to a specific inflation target / band or a desired target range for inflation alongside other targets such as the stability of economic growth.

² See the PBC's website.

³ These increases reflect a tightening of monetary policy but also liquidity management via sterilization of the PBC's foreign exchange interventions.

The effectiveness of a monetary policy that emphasizes the growth of monetary aggregates hinges on two big "ifs" (Mishkin, 1997, p.25). The first is whether the central bank does in fact have the ability to control the growth of monetary aggregates. It is chiefly on this point that the existing critique of China's monetary policy effectiveness concentrates. In particular, several authors have questioned whether the PBC retains an ability to control the growth of monetary aggregates in view of an increasingly porous capital account and a nominal exchange rate that remains heavily tied to the \$US (Prasad, et al. 2005; Laurens and Maino, 2007; Glick and Hutchison, 2009). The second is whether there also exists a robust link between the growth of monetary aggregates and inflation. That is, even if the PBC retains sufficient control of monetary aggregates by virtue of partial capital controls (Laurenceson and Tang, 2007), sterilization activities (Wu, 2009) and the like, the effectiveness of monetary policy will still be heavily compromised if there does not exist a robust link with inflation. Given uncertainty regarding both of the above "ifs", in the late 1970s central banks in OECD countries began to abandon their monetary aggregate targets and focus exclusively on making interest rate adjustments (Estrella and Mishkin, 1997).

The purpose of this paper is to provide an empirical assessment of the link between the growth of monetary aggregates and inflation in China during the 2000s. An assessment of the effectiveness of China's monetary policy is of obvious importance to the country itself. Moreover, given China's growing importance in the global economy – it became the world's second largest economy in 2010 – the effectiveness of its monetary policy increasingly has international ramifications. While international

financial markets do not yet watch the monetary policy decisions of the PBC as closely as those of the US Federal Reserve, a cursory glance of the mainstream financial press in recent years shows that reporting of developments related to China's monetary policy have become commonplace, as are op-ed pieces related to the topic.

Section 2 of this paper provides a critical review of the existing literature as it pertains to the relationship between monetary aggregates and prices in China, or their first difference, the growth of monetary aggregates and inflation. The contributions of the present paper are also highlighted. Section 3 presents evidence concerning this link during the 2000s using Structural VAR (SVAR) models. Section 4 does likewise using out-of-sample forecasting techniques. Section 5 summarizes the findings and draws policy implications.

2. Literature Review

Earlier studies that considered the relationship between money and prices in China tended to revolve around the question of whether the quantity theory of money could provide a useful account of the Chinese data. To the best of our knowledge, Chow (1987) was the first to do so. Utilizing an error correction model and annual data over the period 1954-1983, Chow (1987) found that a long-run relationship appeared to exist between a narrow measure of money and the general retail price index. Indeed, after performing a similar exercise using earlier US data, Chow (1987) concluded that the long-run relationship between these variables appeared to be more stable in the case of China.

However, Peebles (1992) largely rejects Chow's (1987) findings, specifically that the quantity theory of money can meaningfully be applied in the Chinese context. Peebles (1992) points out that the quantity theory of money assumes market-determined prices, and yet for most of Chow's (1987) sample period China had a command economy where price controls were pervasive.

Mookerjee and Peebles (1998) also considered whether money and prices were cointegrated over the period 1952-1991. Another contribution of this paper was to examine the direction of causality between money and prices. One of the main findings was to show that while money and prices were typically cointegrated, the strength of the relationship depended to some extent on the particular measures of money (e.g., M0, M1, etc) and prices (e.g., government list price index, retail price index, etc) that were used. Their results pertaining to causality also pointed to considerable endogeneity. Such endogeneity creates challenges for policy-makers in that it complicates trying to control the growth of a given monetary aggregate.

Hasan (1999) revisited Chow's (1987) question of whether the quantity theory of money could provide a useful account of the relationship between money and prices in China. Hasan (1999) also made use of cointegration and error correction modelling techniques and considered the period 1952-1993. However, there were two points of departure. First, Hasan (1999) considered a broader monetary aggregate (M3). Second, rather than relying on an official price index, which Peebles (1992) argued would be plagued by rigidities as a result of price controls, Hasan (1999) constructed a "true price level" series. Using this unencumbered series, Hasan (1999, p.669) found that the quantity theory of money could account for Chinese data well and that there

existed "...[a] reliable long run relationship between the general price level and the money stock, as well as between monetary growth and inflation" (p.669) and that "Monetary forces exert a perceptible and predictable influence on the movement of prices in China" (p.682). Given these findings, Hasan (1999) endorsed the use of M3 as an appropriate intermediate target for monetary policy by the PBC. Like Mookerjee and Peebles (1998), Hasan (1999) also finds evidence of bi-directional causality between the growth of monetary aggregates and inflation.

Sun and Ma (2004) added to the literature in two ways. Firstly, they considered the relationship between money and prices exclusively after 1990. By this time, most prices in the Chinese economy had become market-determined. Secondly, they considered the relationship using an unrestricted VAR model. VAR models make a natural choice for studying the relationship between money and prices given the endogeneity reported in earlier studies. The specific VAR model used by Sun and Ma (2004) consisted of three variables (real output, money, prices) and was estimated with monthly data over the period 1990.01-2002.06. Like Mookerjee and Peebles (1998), they also found that the relationship between money (M0, M1, M2) and prices (CPI) depended to some extent on the measure of money that was used. Through the use of a rolling estimation window, another important finding was to show that the relationship was not stable over time: in general, the impact of money on prices appeared to weaken. Presumably, some of the monetary data in this study are constructed since to the best of our knowledge official monthly data on monetary aggregates are only available since the late 1990s. A more recent paper by Sun (2009) essentially extends the above conclusions through to 2005.

Xie (2004) also considered the relationship between money and prices using an unrestricted, three variable VAR model (real output, money, prices) estimated with quarterly data over the period 1992-2002. A contribution of this study was to include impulse response functions, which show the dynamic response of inflation over time given a monetary shock. Xie's (2004) results showed that a shock to M2 resulted in a sudden response in inflation (CPI) and that this response was long lived. Confidence intervals surrounding the response of inflation were not presented.

Laurens and Maino (2007) estimated a five variable unrestricted VAR model (real output, money, prices, exchange rate, short-term interest rate) using quarterly data over the period 1994-2005. They also presented the associated impulse response functions, which indicated that a shock to M2 caused a sudden reaction in the CPI. However, an examination with the associated confidence intervals shows it not to be a statistically significant one.

Zhang (2011) is the latest in the long line of studies to have studied the relationship between money and prices in China using an unrestricted VAR model. This paper estimated a three variable VAR model (real output, money, prices) and a four variable VAR model (real output, money, prices, exchange rate) using quarterly data over the period 1978-2010. In both models, the results indicated that the growth of M1 and M2 did "Granger cause" growth in the CPI. Impulse response functions were not presented. The possibility that the relationship between money and prices might have changed over the three decades of the sample period, as alluded to by Sun and Ma (2004), was also not considered.

A recent paper by Koivu (2010) also discusses the relationship between money and prices in China, although the primary focus is on asset prices rather than general goods and services prices. This paper advances the literature by analyzing the relationship between money and prices using a Structural VAR (SVAR) model. Unrestricted VAR models have been criticized on the basis that they are a-theoretical (Cooley and Leroy, 1985) and unsuited for policy analysis (Sargent, 1984; Sims, 1986). Pioneered by the likes of Bernanke (1986) and Blanchard and Watson (1986), SVAR models address many of the criticisms of unrestricted VAR models by recovering the structural form model through imposing restrictions on coefficient values based on economic theory and / or institutional knowledge. Koivu's (2010) five variable SVAR model (household income, household consumption, general prices, money, asset prices) is estimated using quarterly data over the period 1998-2008. The impulse response functions presented suggest that a shock to M2 caused a sudden and statistically significant response in the CPI.

Having reviewed the existing literature, the contributions of the present paper are now highlighted.

Like Koivu (2010), in the following section the relationship between money and prices is considered using SVAR models. We consider SVAR models to be the methodological benchmark, at least amongst in-sample techniques. However, rather than using quarterly data, we use monthly data covering the period 1999.06-2011.04. Using monthly data has several advantages. Most obviously, it expands the number of observations in the dataset – 142 in our study versus 44 in Koivu (2010) – and so improves the reliability of statistical inference. It also means that our modelling can

allow for the possibility that a shock to one variable in the model might have an impact on other variables at time graduations of less than a quarter. As we will later show, this indeed turns out to be the case. The use of monthly data also means that we are able to adopt less controversial identification restrictions (discussed below) related to contemporaneous relationships in our modelling.

Another departure from Koivu (2010) is that rather than representing monetary policy solely through the inclusion of M2 (currency in circulation and residents' deposits), we take a more agnostic approach. Our preferred measures are narrow measures of money, such as M0 (currency in circulation) and M1 (currency in circulation and demand deposits), since these are more intimately connected to the policy tools at the disposal of the PBC.⁴ Nonetheless, in light of the results of earlier studies which suggest that the relationship between money and prices could be sensitive to the particular measure of money used, we seek to model the impact of a monetary shock through the successive replacement of base money (M0) with M1, M2, domestic credit and the market-determined interest rate in the inter-bank market.

An exclusive focus is placed on the 2000s for several reasons. Firstly, our interest is not in providing an historical analysis covering the entire reform period. Rather, we seek to assess the robustness (or otherwise) of the link between money and prices as it currently stands. Secondly, we wish to avoid unnecessary technical complications such as possible structural breaks in the data generating process in earlier decades. Whether there are in fact structural breaks as some authors have argued (Sun and Ma, 2004) is of no consequence to our research question of interest. Note that

⁴ Growth in M2 is, however, the explicit intermediate target of the PBC, with targets announced annually.

investigating the effectiveness of monetary policy in the 1980s and 1990s is also complicated by other matters, such as nominating the final target of monetary policy. With the designation of inflation as the final target in China's 1995 central banking law such ambiguity is reduced.⁵ Thirdly, during the 2000s, high frequency official data are available for both monetary aggregates and prices, the advantages of which are noted above.

Another contribution of the paper is to supplement the analysis of the relationship between money and prices using SVAR models with out-of-sample forecasting techniques. To the best of our knowledge this is the first time that the relationship between money and prices in China has been studied using such an approach. The reliability of in-sample techniques for establishing causality have been questioned since Messe and Rogoff's (1983) seminal paper on the dismal out-of-sample forecasting performance of models of exchange rate determination. This lesson has since been incorporated into the inflation forecasting literature in the context of other countries (Stock and Watson, 1999), but not in the case of China. For example, when the PBC increases bank reserve requirements today, it does so in the belief that this will slow the growth rate of monetary aggregates, and in turn inflation, over some time horizon in the future. Note that the PBC does not possess a line of best fit that encompasses these future observations. Thus, what the PBC essentially needs is confidence in the out-of-sample inflation forecasting performance of the growth rate of monetary aggregates.

⁵ Article 3 of China's central banking law states, "The aim of monetary policy is to maintain stability of the value of currency and thereby promote economic growth (ACFB, 1997, p.175). As is the case for most central banks, in practice the PBC also pays heed to other variables, notably the exchange rate and employment growth.

3. Evidence from SVAR models

3.1 Methodology

The specific SVAR models we estimate are in keeping with the previous literature and kept as parsimonious as possible. They consist of three endogenous variables and one exogenous variable. The exogenous variable is world commodity prices. This is intended to capture any exogenous shocks emanating from the world economy.⁶ The three endogenous variables are real output, money and general goods and services prices.

Given that real GDP data are available only at a quarterly frequency, real output at a monthly frequency is proxied by real industrial output. In the case of China, real industrial output offers a good proxy for real GDP: when taken at a quarterly frequency, the correlation coefficient between the two series is upwards of 0.85. Real industrial output data are seasonally adjusted before being included in the model. General goods and services prices are proxied by the consumer price index (CPI).⁷ Note that by the time of our sample period nearly all prices in China had become market-determined.

The main modelling challenge is to represent monetary policy via the PBC's intermediate target: the quantity of money. The PBC strives to hit its intermediate monetary target by manipulating its operational target (reserves balances held at the

⁶ While the world price of some commodities, such as iron ore, might be endogenous with respect to economic activity in China, this is unlikely to be the case for commodities as a whole.

⁷ Constructing a CPI for China at a monthly frequency is not entirely straightforward. Historically, official data have only shown inflation in terms of year-on-year changes. Fortunately, in the most recent years, China's National Bureau of Statistics has also begun reporting inflation in terms of month-on-month changes. Using this month-on-month data, a 12-month base period can be constructed and this can then be extended back using year-on-year data. The constructed CPI index is available from the authors upon request.

PBC) using policy instruments. Monetary policy is effective if the intermediate target is related to the PBC's final inflation target. As noted in Section 1, unlike the US Federal Reserve, short-term interest rates play a relatively minor role as an instrument of the PBC. As such, monetary policy cannot be represented by an interest rate. Another complication associated with representing monetary policy relates to China's exchange rate policy. While the State Council has permitted greater flexibility in the nominal RMB/\$US exchange rate since 2005 – between 1994 and 2004 it was a fixed peg – it remains far from free floating. What this means is that faced with large scale capital inflows and trade surpluses, as has typically been the case during the 2000s, an increase in money supply is at least to some extent automatic. That is, it does not necessarily signify a deliberate change in monetary policy settings by the PBC. Having said that, capital controls do provide the PBC with some autonomy and it is also able to sterilize the impact of capital inflows on the domestic money supply should it elect to. Recent research shows that the PBC has in fact been quite effective in using central bank bond issuance and adjusting bank reserve requirements to sterilize the impact of capital inflows on the domestic money supply (Ouyang, et al. 2010). Wang (2010) reports that the PBC's sterilization activities have been particularly effective with respect to managing the impact on base money, but less so with respect to broader monetary aggregates.

As noted earlier, narrower measures of money are our preferred monetary policy indicators given that these are most directly under the PBC's control. Nonetheless, in addition to M0 to M1, we successively represent monetary policy in our SVAR

models with M2, domestic credit and the market-determined interest rate in the inter-bank market. The specific interest rate we use is the 7-day rate.⁸

Real output, money and prices data are available from the International Monetary Fund's database, *International Financial Statistics*. Interest rate data from the inter-bank market are obtained from the Chinese version of the PBC website.

To identify the structural form of the above model we place restrictions on some of contemporaneous relationships between variables. Another approach might be to place restrictions on the long-run relationships between variables, such as in Blanchard and Quah (1989). However, given that our sample period is only 11 years in length, identifying the structural form through short-run restrictions is more appropriate. Recall that we are using data at a monthly frequency. Thus, what we are referring to is restrictions being placed on relationships between variables *within* a one month period. The following restrictions are sufficient for the model to be just identified.

Firstly, real output is assumed not to respond contemporaneously to a monetary shock. This restriction stems from the lags inherent in the monetary transmission channel. Secondly, prices are assumed not to respond contemporaneously to a shock to real output or money. This restriction reflects the sticky price assumption embedded in standard macroeconomic models, such as the AD-AS and IS-LM models, as well as more modern new-Keynesian derivatives.

⁸ The overnight rate was not used because several observations were missing in the dataset on the website of the PBC.

Unit root tests reveal that all variables in the model, with the exception of interest rates, are integrated of order 1. Therefore, we take the log value of all variables, with the exception of interest rates, and enter them into the model in the form of first differences.⁹ Thus, in our main equation of interest, we consider the impact of a shock to the *growth* of money on *inflation*. Lag length selection tests reveal 12 lags to be appropriate.¹⁰

3.2 Results

Figure 2 presents the impulse response functions that show the dynamic response of inflation out to 24 months following a positive, one standard deviation structural shock. The initial response of inflation is in the theoretically expected direction (positive) following a shock to all monetary aggregates, but not interest rates. We interpret the latter as reflecting the fact that interest rates have yet to become a variable of consequence in China's monetary transmission channel. However, as can be seen from the associated confidence intervals, the responses following shocks to monetary aggregates are rarely statistically significant. Only in the cases of M0 and M1 are the responses significant in the month immediately following the shock. But even in these cases, the responses are no longer significant in the following month.

4. Evidence from out-of-sample forecasting models

4.1 Methodology

⁹ Enders (2010) notes that this is the conventional approach, although some authors prefer to estimate the model in levels. As a robustness test we also estimated the model in levels and the qualitative results were unchanged. These results are available from the authors upon request.

¹⁰ Detailed results for unit root and lag selection tests are available from the authors upon request.

The out-of-sample forecasting methodology used in this paper draws most directly on Stock and Watson (1999). The basic idea is a simple one. A univariate model of inflation is first estimated that takes the following form:

$$\pi_{t+h}^h = \alpha_1 + \beta(L)\pi_t + e_{t+h} \quad (1)$$

where $\pi_t^h = (1200/h)\ln(P_t/P_{t-h})$ is the h -period change in the price level P_t (i.e., inflation) reported at an annual rate; $\pi_t \equiv \pi_t^1 = 1200 \times \ln(P_t/P_{t-1})$ is monthly inflation reported at an annual rate; and $\beta(L)$ is a polynomial in the lag operator, L .¹¹ The formulation of equation (1) is convenient because it facilitates the forecasting of inflation over different time horizons. For example, if one is working with monthly data and sets $h=6$, equation (1) contends that inflation over the next 6 months is a function of the current month rate of inflation, the previous month rate of inflation, and further lags. As in the previous section, inflation is proxied by changes in the CPI.

Equation (1) is estimated using data over the period 1999.6-2008.12. Given the use of monthly data, the current month rate of inflation and 11 lags are included on the right-hand side. On the basis of the estimated coefficients, forecasts of inflation are then generated over the period 2009.01-2011.04, providing a total of 28 out-of-sample observations. On the left-hand side, inflation over three time horizons is considered, $h = 6, 12, 24$.

¹¹ There are two essential differences between equation (1) and that used by Stock and Watson (1999). The first is that Stock and Watson (1999) used differenced inflation variables on the right hand side of the equation reflecting the fact that inflation is an I(1) process in the US. However, unit root tests of our data showed inflation to be stationary. These results are available from the authors upon request. The second is that Stock and Watson (1999) also included the deviation of the unemployment rate away from the natural rate on the right-hand side of equation (1), reflecting the prominence and stability of the Phillips curve relationship in the US. In the case of China, reliable unemployment data are not available.

As is common in forecasting studies, the forecasting performance of the model is then assessed using the root mean squared error (RMSE) –

$$RMSE = \sqrt{\frac{1}{N} \sum_{t=1}^N (e_{it})^2} \quad (2)$$

where N is the number of time periods over which out-of-sample forecasts are generated (i.e., 28) and e_{it} is the difference between the actual and forecast value of inflation in time period t according to model i . What the RMSE essentially shows is the average of the forecasting errors generated by a given model.

The purpose of equation (1) is to serve as a benchmark model against which the strength of the link between the current growth of monetary aggregates and future inflation can be assessed. If there is a robust link between these variables, then it ought to be the case that the *addition* of the current growth of monetary aggregates and its lags on the right-hand side of (1) will improve forecasts of inflation. As in the previous section, a variety of monetary aggregate growth rates are considered – M0, M1, M2 and domestic credit. As with π_t , the growth rate of these monetary aggregates enter the right-hand side of equation (1) in the form of monthly changes reported at an annual rate, and the current month growth rate and 11 lags are allowed for.

If a model that includes the growth of monetary aggregates generates better forecasts of future inflation than the univariate model, it will have a lower RMSE. To determine

whether model $i=1$ generates a forecast that is better than model $i=2$ in a statistically significant sense, we use the procedure recommended by West (2006). The null hypothesis is that $Ee_{1t}^2 - Ee_{2t}^2 = 0$. That is, the expected value of the difference between the squared forecasting errors of model $i=1$ are equal to those of model $i=2$. West (2006) demonstrates that the most straightforward way to operationalize a test of this null hypothesis is to regress the series of forecasting error differentials, $\{\hat{e}_{1t+1}^2 - \hat{e}_{2t+1}^2\}$ on a constant and then examine the calculated t-statistic using heteroskedasticity and autocorrelation consistent (HAC) standard errors.

4.2 Results

Table 1 shows the RMSEs of the various models. The RMSEs for all models are quite high. To put these figures in some context, over the sample period the actual, annualized 6, 12 and 24 month inflation rate averaged 2.25 percent, 2.12 percent and 2.08 percent, respectively. All the models missed these targets by over 3 percentage points in the case of $h = 6$ and 12. Forecasting errors are lower in the case of $h = 24$, but this mainly reflects the fact that actual inflation over longer time horizons tends to be less volatile, rather than the models improving their forecasting performance *per se*.

In the case of the univariate model, a high RMSE is in a sense unsurprising since all this model does is generates forecasts of inflation based on the current month rate of inflation, and its lags. More striking is just how little the addition of the growth of monetary aggregates improves forecasts. Models including the growth of monetary aggregates that generate statistically better forecasts at the 5 percent level are indicated by *. The results indicate that including the growth of M0 improves

forecasts for $h = 6$ and 12, not $h = 24$. Apart from M0, there is little else to suggest a robust link between the growth of monetary aggregates and future inflation. Models that include the growth of M1 and M2 fail to generate forecasts that are statistically better than the univariate model over any time horizon. The model including the growth of domestic credit improves forecasts for $h = 6$, but not 12 and 24.

Table 1 here

5. Conclusion

The effectiveness of monetary policy in China has attracted increased critical attention in recent years reflecting the country's rapidly rising status in the global economy. To date the critique has centered on whether the PBC retains an ability to control the growth of monetary aggregates. However, of equal consequence is whether there exists a robust link between the growth of monetary aggregates and inflation.

This paper made use of SVAR models and out-of-sample forecasting techniques to assess the robustness of this link during the 2000s. Taken as a whole, the results suggest that the link is far from robust. The main implication of this finding is to underscore the importance of further reforms in China's financial sector, notably the development of more complete, deep and unfettered financial markets. This will help to facilitate a shift away from the current reliance on monetary aggregates, which appear increasingly unreliable. However, institutional realities in China make a comprehensive shift along these lines improbable for the foreseeable future. For example, liberalizing retail interest rates in the banking system may make sense from the perspective of better positioning interest rates to play a more significant role as an

instrument of monetary policy. However, to do so would also put pressure on the profitability of state-owned enterprises and their chief creditors, the state-owned banks. What this means is that China's economy is vulnerable to macroeconomic shocks because its monetary policy occupies a halfway house of sorts, somewhere in between the administrative approach it has traditionally relied upon and the indirect, interest rate-based systems seen in OECD countries. The traditional approach appears to be losing effectiveness and yet the institutional transformation needed for the alternative to function continues to be some years away.

References

- Almanac of China's Finance and Banking 1996* (ACFB). (1997). Beijing: China Financial Publishing House.
- Bernanke, B. (1986) Alternative explanations of the money-income correlation. *Carnegie-Rochester Conference Series on Public Policy* 25: 253-257.
- Blanchard, O., Watson, M. (1986) Are business cycles all alike? In *The American Business Cycle: continuity and chance* (R.Gordon, Ed.) Chicago: University of Chicago Press, 123-180.
- Chow, G. (1987) Money and price level determination in China, *Journal of Comparative Economics* 11, 319-333.
- Enders, W. (2010) *Applied econometric time series*. Hoboken: John Wiley and Sons.
- Estrella, A., Mishkin, F. (1997) Is there a role for monetary aggregates in the conduct of monetary policy? *Journal of Monetary Economics* 40, 279-304.
- Glick, R., Hutchison, M. (2009) Navigating the trilemma: capital flows and monetary policy in China. *Journal of Asian Economics* 20, 205-224.
- Hasan, M. (1999) Monetary growth and inflation in China: a re-examination. *Journal of Comparative Economics* 27, 669-685.
- Koivu, T. (2010) *Monetary policy, asset prices and consumption in China*. European Central Bank Working Paper No.1240.
<http://www.ecb.int/pub/pdf/scpwps/ecbwp1240.pdf>
- Laurens, B., Maino, R. (2007) *China: strengthening monetary policy implementation*. International Monetary Fund Working Paper 07/14. Available at -
<http://www.imf.org/external/pubs/ft/wp/2007/wp0714.pdf>
- Laurenceson, J., Tang, K.K. (2007) Opening China's capital account: modelling the capital flow response. *Journal of Chinese Economics and Business Studies* 5, 1-18.
- Messe, R., Rogoff, K. (1983) Empirical exchange rate models of the Seventies: do they fit out of sample? *Journal of International Economics* 14, 3-24.
- Mishkin, F. (1997) *Strategies for controlling inflation*. Reserve Bank of Australia Conference on Monetary Policy and Inflation Targeting, July 21-22nd, Sydney. Available at - <http://www.rba.gov.au/publications/confs/1997/index.html>
- Mookerjee, R., Peebles, G. (1998) Endogenous money in China: evidence and insights on recent policies. *Journal of Asian Economics* 9, 139-158.
- Ouyang, A., Rajan, R., Willett, T. (2010) China as a reserve sink: the evidence from offset and sterilization coefficients. *Journal of International Money and Finance* 29, 951-72.

Peebles, G. (1992). Why the quantity theory of money is not applicable to China, together with a tested theory that is. *Cambridge Journal of Economics* 16, 23-42.

Prasad, E., Rumbaugh, T. and Wang, Q. (2005). *Putting the cart before the horse? Capital account liberalization and exchange rate flexibility in China*. International Monetary Fund Discussion Paper PDP05/1. Available at – <http://www.imf.org/external/pubs/ft/pdp/2005/pdp01.pdf>

Sargent, T. (1984) Autoregressions, Expectations, and Advice. *American Economic Review* 74, 279-290.

Sims, C. (1986). Are Forecasting Models Usable for Policy Analysis? *Federal Reserve Bank of Minneapolis Quarterly Review* 1011, 2-16.

Stock, J., Watson, M. (1999) Forecasting inflation. *Journal of Monetary Economics*, 44, 293-335.

Sun, H., Ma, Y. (2004) Money and price relationship in China. *Journal of Chinese Economic and Business Studies* 2, 225-247.

Sun, H. (2009) Autonomy and effectiveness of Chinese monetary policy under the defacto fixed exchange rate system. *China and World Economy*, 17, 23-38.

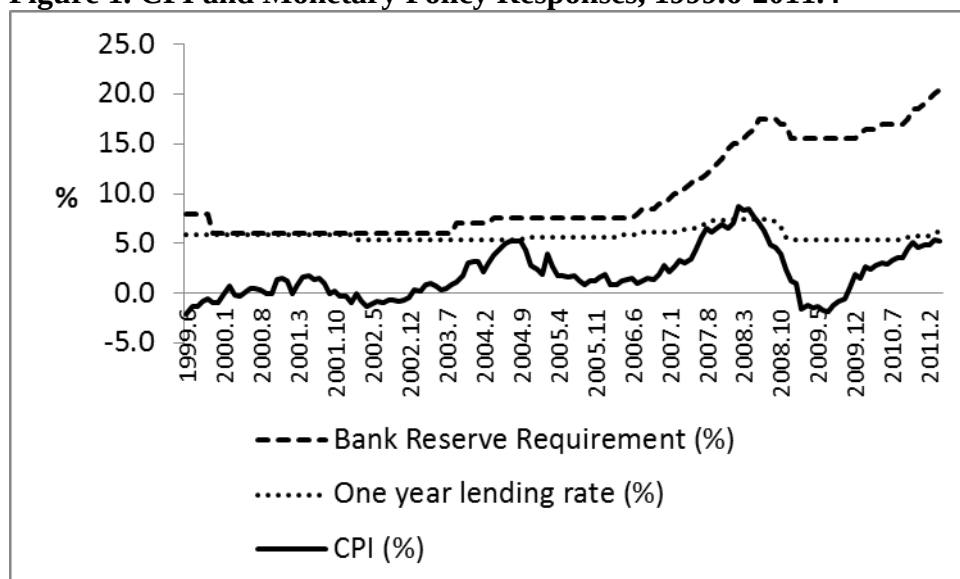
West, K. (2006). Forecast Evaluation. In *Handbook of Economics Forecasting Volume 1* (Elliot, G., Granger, C., Timmermann, A., Eds), Amsterdam: North-Holland, 99-134.

Wu, Y. (2009) Measuring China's sterilization and autonomy in the era of globalization: 1995-2005. *Journal of Asian Economics* 20, 336-347.

Xie, P. (2004) *China's monetary policy: 1998-2002*. Stanford Center for International Development Working Paper No.217. Available at - <http://www.stanford.edu/group/siepr/cgi-bin/siepr/?q=system/files/shared/pubs/papers/pdf/SCID217.pdf>

Zhang, C.(2011). Why is inflation in China a monetary phenomenon? *China and World Economy* 19, 1-17.

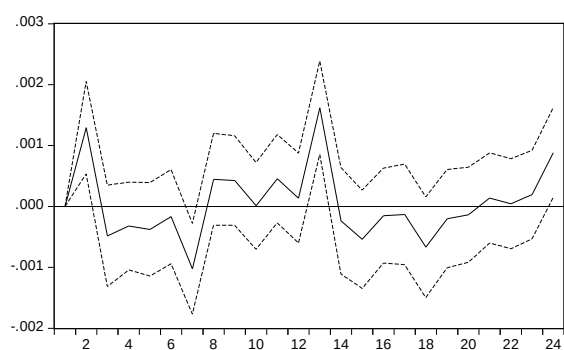
Figure 1. CPI and Monetary Policy Responses, 1999.6-2011.4



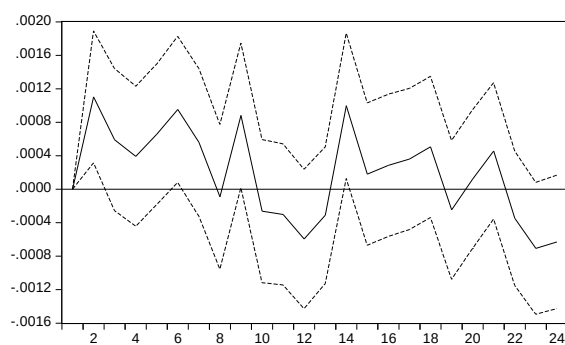
Source – CPI and lending rate data are from *International Financial Statistics*. Bank reserve requirement data are from news sources.

Figure 2. SVAR Model Impulse Response Functions

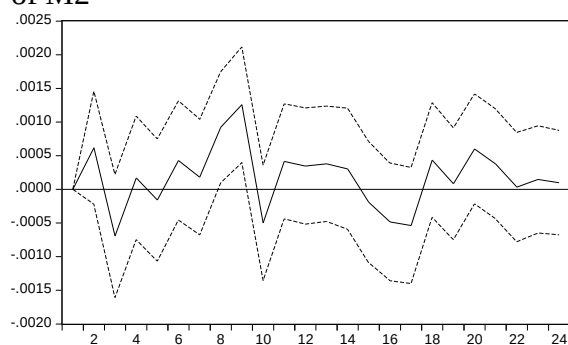
(a) Response of Inflation to a Structural One Standard Deviation Shock to the Growth of M0



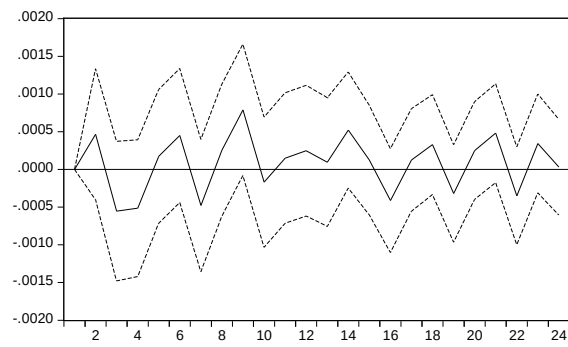
(b) Response of Inflation to a Structural One Standard Deviation Shock to the Growth of M1



(c) Response of Inflation to a Structural One Standard Deviation Shock to the Growth of M2



(d) Response of Inflation to a Structural One Standard Deviation Shock to the Growth of Domestic Credit



(e) Response of Inflation to a Structural One Standard Deviation Shock to the Interest Rate

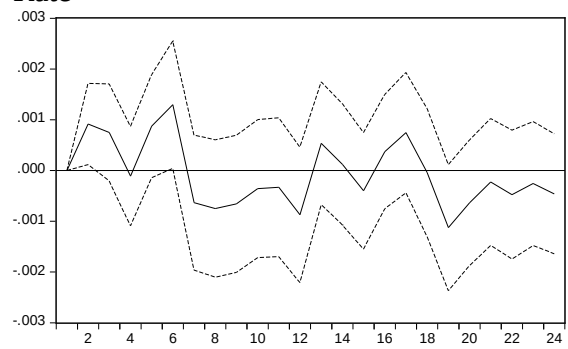


Table 1 – RMSEs of Out-of-Sample Forecasting Models

h	Univariate	M0	M1	M2	DC
6	4.36	3.14*	4.58	4.69	3.82*
12	3.35	3.07*	3.55	3.64	3.47
24	0.99	1.40	1.55	1.20	1.36