



## Bank loans and the effects of monetary policy in China: VAR/VECM approach

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### ABSTRACT

In this paper, we test the differential effects of monetary policy shock on aspects of banks' balance sheets (deposits, loans, and securities) across bank categories (aggregate banks, state banks, and non-state banks) as well as on macroeconomic variables (output, consumer price index, exports, imports, and foreign exchange reserves). We do so by estimating VAR/VEC Models to uncover the transmission mechanisms of China's monetary policy. Also we identify the cointegrating vectors to establish the long-run relationship between these variables. By using monthly aggregate bank data and disaggregated data on bank and loan types from 1996 to 2006, our study suggests the existence of a *bank lending channel*, an *interest rate channel* and an *asset price channel*. Furthermore, we discuss and explore the distribution and growth effects of China's monetary policy on China's real economy. In addition, we investigate the effects of China's monetary policy on China's international trade. Finally, we identify the cointegrating vectors among these variables and set up VEC Models to uncover the long-run relationships that connect the indicators of monetary policy, bank balance sheet variables and the macroeconomic variables in China.

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## 1. Introduction

Since 1978, China has undergone an economic transformation. Many successes resulting from this change came to fruition around the turn of the 21st century (specially from 1996 to 2006). As this marks China's integration with the world, this transformation profoundly impacts both Chinese and global history. Within the process of China's economic development, monetary policy has played important roles to stabilize the economy, which has spurred various academic debates on effects of the monetary policy regime in China. In this paper, we use monthly data of China's economy during this period to identify the transmission mechanisms of monetary policy and to test the effects of monetary policy on the real economy. According to [Christiano, Eichenbaum, and Evans \(1998a,b\)](#), monetary policy decisions and the economic events after them are the effects of all the shocks to the economy. Thus, to explore the effects of monetary policy on the economy is to test the effects of monetary policy shocks from diverse transmission channels.

The monetary transmission mechanism (MTM) is a process through which monetary policy triggers the changes in macroeconomic variables by certain transmission channels.<sup>1</sup> There is disagreement on the monetary transmission channels. As such, a variety of transmission channels of monetary policy are identified and employed by different schools of thought to measure the effects of monetary policy on economic activities. The 'money view' works through the interest rate channel and exchange rate channel. The 'credit view' works through the bank lending channel and the balance sheet channel. The asset price channel works through wealth effects due to the monetary policy, and the expectation channel is determined by the rational expectations by the public. Due to China's fixed exchange rate regime prior to 2005, we ignore the exchange rate channel here, although we still

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<sup>1</sup> See [Taylor \(1995\)](#).

discuss the effects of monetary policy on the exports, imports, total foreign exchanges and aggregate outputs. The interest rate channel reflects that, when the central bank increases (decreases) the money supply or reduces (raises) the nominal interest rate, if the prices are sticky, the real interest rate will decline (rise), commercial banks will create more (less) money by issuing deposits, and the demand for consumption and investment in diverse sectors will increase (decrease) the aggregate output (GDP). The bank lending channel dominates the credit channels, which assumes that the banking system plays a significant role in the transmission of monetary policy and the business cycle. It focuses on the asset side of banks' balance sheets, assuming that contractionary monetary policy not only reduces the deposits and the liabilities of the banks, but also causes a decline of the supply of bank loans. It also focuses on the extent of reduction in loans diverse across banks of varying size. This implies that the type of borrower matters given asymmetric information and friction in the loan market. The balance sheet channel is similar to the bank lending channel; in a monetary contraction, the decline of net worth of firms (borrowers) will raise the cost of external finance and thereby reduce the demand for loans and investments.

Following Ford et al. (2003) and Bernanke and Blinder (1992), we have identified and tested the existence of the transmission channels of monetary policies, giving particular attention to *the money channels* and *the credit channels* in China and to the long-run relationships between macroeconomic variables and monetary policy parameters by employing VAR/VEC Models with cointegration. First, we use aggregate time series monthly data, namely total loans and total deposits, from 1996 to 2006 to examine the relationships between bank loans and macroeconomic variables to identify the existence of the *interest rate channel* and *bank lending channel*. Second, we test the differential effects of China's monetary policy across the size of banks by two categories, state-owned banks (big banks), which dominate the capital structure of banking system lend to state-owned enterprises (large and medium firms), and non-state banks (small banks), which lend to private and small firms. By doing this, we can further test the evidence of credit channels because recent studies (e.g., Kashyap & Stein, 1995; Ford et al., 2003) indicate that results from disaggregated bank data can reflect a theoretical base on which the bank lending channel was developed: asymmetric information and the possibility of financial friction in loan markets. Third, we explore the distributional effects of monetary policy across sectors by disaggregating the loans to different economic sectors (industry, commercial, and construction), which is also an important aspect caused by the *bank lending channel*. Fourth, we determine the effects of monetary policies on the international trade (exports and imports) in China under the fixed exchange rate regime in China that existed before May 2005. Finally, we identify the cointegrating vectors among these variables and set up VEC Models to uncover the long-run relationships that connect monetary policy, bank balance sheet variables and macroeconomic variables in China.

The monthly data from January 1996 to December 2006 are collected from China's central bank, PBC, IFS, China's National Statistics, National Planning and Development Committee and Data companies. Considering the data period (1996–2006), by seasonally adjusting all variables and inspecting the graphs of all variables in Fig. 1, we ignore the possible structure break of data. The data sample and notations are detailed and explained in Appendix A.

It is difficult to choose the indicators of China's monetary policy in a VAR approach because the accuracy of the estimates of the effects of monetary policy depends crucially on the validity of the measure of monetary policy that is used. Use of an inappropriate measure may obscure a relationship between monetary policy and other economic variables that actually exists, or it may create the appearance of a relationship where there is no true causal link.<sup>2</sup> Here we use the inter-bank weighted average rate, *cibr*, as the indicator of China's monetary policy. Also, we try to provide another aspect to test the transmission channels of China's monetary policy by employing the growth rate of M2 as the indicator of China's monetary policy because, according to some Chinese economists, the PBC targets the growth rate of broad money.

All variables are taken log excluding the indicators of monetary policy and CPI inflation. We conduct a seasonal analysis on all variables by X12 approach and find that the industrial production, exports, and imports have distinguished seasonal characters; therefore in our system, the above three variables are seasonally adjusted, and other variables are kept unchanged.

There are both advantages and drawbacks to using VAR. The fact that the VAR/VECM technique has produced many fruitful and consistent results motivates our study. On the other hand, critics, especially Rudebusch (1998), are concerned by the difficulty of identifying policy innovations and accounting for exogenous structural innovations to monetary policy. Also, according to Romer and Romer (2004), *endogenous and anticipatory movements* caused by some indicators of monetary policy, which are generally employed in the VAR/VECM technique, may lead to underestimates of the effects of monetary policy. An example of this can be seen in the federal funds rate, which is used as indicator of American monetary policy: the federal funds rate in non-Greenspan periods often moved endogenously with changes in economic conditions. In Section 3.2 and Appendix D, we will discuss this issue and offer evidence to connect structural innovations to *cibr* and growth rate of M2, the indicators of China's monetary policy, with the exogenous monetary policy actions by monetary authority.

The remainder of this chapter is organized as follows. Section 2 describes the methodology. Section 3 specifies the VAR/VEC Models for China's monetary policy transmission. The empirical results of MTMs by VARs are presented in Section 4. Section 5 discusses the cointegrating vectors and VEC Models. Section 6 summarizes and concludes.

## 2. Vector Autoregression (VAR) approach and Vector Error Correction (VEC) Model

Sims (1980) developed the Vector Autoregression (VAR) in macroeconometrics. According to him, a VAR is an ad hoc dynamic multivariate model, treating simultaneous set of variables equally, in which each endogenous variable is regressed on its own lags

<sup>2</sup> See Romer and Romer (2004).

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