China Economic Review 23 (2012) 47–59

Contents lists available at SciVerse ScienceDirect

China Economic Review

Review

Estimating forward-looking rules for China's Monetary Policy: A regime-switching perspective

Tingguo ZHENG *, Xia WANG, Huiming GUO

Wang Yanan Institute for Studies in Economics, Xiamen University, Xiamen, Fujian, 361005, China

ARTICLE INFO

Article history:
Received 19 August 2010
Received in revised form 17 January 2011
Accepted 19 July 2011
Available online 10 August 2011

JEL classification:
E4
E5

Keywords:
Taylor rule
Regime switching
Forward-looking
Monetary policy

ABSTRACT

This paper introduces a regime-switching forward-looking Taylor rule to describe the monetary policy behavior and considers its estimation using a two-step MLE procedure due to Kim and Nelson (2006), Kim (2009) and Zheng and Wang (2010). By doing an empirical analysis on quarterly data for China over the period 1992–2010, our results show that the actual reactions of China's monetary policy can be well characterized by a two-regime forward-looking Taylor rule. Furthermore, it is also suggested that the interest rate policy in response to inflation and output gap is asymmetric, behaving a significant characteristic of regime-switching nonlinearity. Specifically, in the first regime the People's Bank of China targets inflation, but not focuses on the output gap; while in the second regime the central bank targets the output gap and the policy rule is not a stable framework.

1. Introduction

Since 1990s, interest rate, by replacing the money supply, has gradually become the intermediate target of monetary policy in the western countries, and it has played a more and more important role in the conduct of monetary policy. Taylor rule, firstly proposed by Taylor (1993), characterizes central banks' behavior through a linear function of interest rate to inflation gap (the deviation of inflation rate from its target) and output gap (the deviation of real output from its potential value). Now it is an important reference for central banks when implementing monetary policy to stabilize price level and smooth output fluctuations. In fact, Taylor rule not only performs well in empirical study, but also has fundamental economic theory. Given a quadratic central bank loss function and linear aggregate demand and supply curves in the dynamic structure of economy, we can obtain Taylor rule by minimizing the loss function.

After Taylor (1993), a stream of empirical literature studied and tested Taylor rule and its extensions. Clarida, Galí, and Gertler (1998) used the forward-looking reaction function to test Taylor rule. They reported estimates of monetary policy functions for two sets of countries: the G3 (Germany, Japan, and U.S.) and the E3 (UK, France, and Italy), and the results lend support to the view that some form of inflation targeting may be superior to fixing exchange rates, and then took it as a mean to gain a nominal anchor for monetary policy. McCallum (2000) adopted historical analysis to test Taylor rule using the economic data of U.S. and U.K. during the period from 1962 to 1999, and Japan from 1972 to 1998. He suggested that rules' messages are more dependent upon which instrument rather than which target variable is used. Clarida, Galí, and Gertler (2000) estimated a forward-looking U.S. monetary policy reaction function. They found that there are substantial differences in the estimated rule across periods before

* Corresponding author at: A202, Economics Building, Xiamen University, Xiamen, 361005, Fujian, China. Tel.: +86 592 2180695; fax: +86 592 2187708.
E-mail addresses: zhengtg@gmail.com (T. ZHENG), wxia820@163.com (X. WANG), guohuiming1203@163.com (H. GUO).

1043-951X/$ – see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.chieco.2011.07.012

and after 1979, and used these differences to show the price stability since 1980s. Judd and Rudebusch (1998) and Nelson (2000) combined the historical analysis with the reaction function method. Based on the analysis of monetary historical data, they successfully estimated the central bank's reaction function of U.S. during the period from 1970 to 1997 and U.K. during the period from 1992 to 1997, respectively. Ball (1999) established the policy rule under the open economy, and added the exchange rate in Taylor rule to decide the interest rate. In his paper, interest rate or monetary condition index are chosen by central bank as policy tool. Giannoni and Woodford (2002) introduced sticky price and/or wages into optimal monetary policy rules, and studied the robustness of these new rules. Semmler and Zhang (2007) and Taylor (2007) further applied Taylor rules into the analysis of asset price and estate price.

However, some recent research argued that the reaction of the interest rate to inflation and output gap could be nonlinear rather than linear. These studies can be classified into two categories. The first is about econometric modeling and testing for nonlinearity. For example, Kim and Nelson (2006) and Boivin (2006) adopted time-varying parameter models to examine the U.S. data during the latest 50 years, and found that the reaction of federal fund rate to inflation is obviously unstable, and what's more, the U.S. monetary policy began to step into a more active state since 1980s. Rabanal (2004) estimated a two-state Taylor rule to explain the behavior of the Federal Reserve over business cycle phases, and found that during expansions the Fed follows a rule that can be characterized as inflation targeting, whereas the Fed targets output growth during recessions. Bruggemann and Riedel (2008) used logistic smooth transition regression (LSTR) models with time varying parameters to estimate the U.K. monetary policy reaction function, and found that in times of recessions the Bank of England put more weight on the output gap and less on inflation, and a reverse pattern is observed in non-recession periods. The second is about theoretical analysis and explanation in terms of three different ways, e.g. the aggregate supply curve being nonlinear, the central bank's preferences being asymmetric around the targeted rate, and the central banker facing uncertainty about the model describing the economy. For example, Dolado, Maria-Dolores, and Naveria (2005) relaxed the linear assumption of Phillips curve, and assumed that inflation is a concave function of output gap, which means a nonlinear Phillips curve. Nobay and Peel (2003), Ruge-Murcia (2003), Surico (2007a, b)[1] set nonlinear welfare loss functions of central bank, which can represent central bank's asymmetric preference to positive or negative deviations of inflation and output gap from its target. Tillmann (2010) discussed the optimal monetary policy under parameter uncertainty, and showed that if the central bank is uncertain about the slope of Phillips curve and applied monetary policy according to a min–max strategy, then the response of interest rate to inflation becomes stronger when inflation is away from its target. In addition, Davig and Leeper (2007) generalized the Taylor principle to an environment in which reaction coefficients in the monetary policy rule evolve according to a Markov process.

From the practical situation of China's economic development, there are still a lot of controversies about whether the interest rate or the money supply is more appropriate as an intermediate goal for monetary policy. If Taylor rule may track China's monetary policy well, then taking the interest rate as an intermediate target will offer the central bank a wider selection of policy targets. So far, the Chinese scholars have done a lot of explorations and discussions. Xia and Liao (2001), after having examined the conduct of China's monetary policy in the past, have concluded that the quantity control of money supply is not suited any more for the Chinese economy. Xie and Luo (2002) firstly employed the historical analysis and reaction function method to conduct an empirical analysis of China's monetary policy in the framework of Taylor rule and draw the conclusion that this rule can accurately measure the operation level of China's monetary policy. Zhao and Gao (2004) constructed a more suitable interest rate rule in China by allowing the exchange rate to influence the long-run inflation target. Bian (2006) used both general method of moments (GMM) and cointegration test method to examine the applicability of Taylor rule in China. Considering standard Taylor rule and the optimal monetary policy raised by Clarida, Gali, and Gertler (2002) in a comprehensive way, Wang and Zou (2006) proposed an extensive Taylor rule in the opening-up economic condition and made empirical test on China's monetary policy. In short, these studies have largely promoted and enriched the understanding of monetary policy rules for China. However, the estimated results of policy reaction functions showed unstable behavior of China's monetary policy, which is not consistent with the traditional Taylor rule. A more likely explanation is that these studies specified the policy reaction functions improperly.

Recently, a few studies attempt to employ nonlinear methods to investigate China's monetary policy reaction function. Zhang and Zhang (2008) applied a threshold regression model and found that all reaction coefficients in the regime of high money growth are larger than those in the regime of low money growth. Ouyang and Wang (2009), based on the situation of asymmetric reaction of monetary policy to inflation and real GDP, constructed a nonlinear monetary policy reaction function using economic growth rate and inflation rate as threshold variables. The results showed that the reaction of monetary policy to inflation and GDP gap is nonlinear and asymmetric. Zheng and Liu (2010) developed a regime switching Taylor rule with time-varying inflation target and showed that China's monetary policy has significant regime switching feature, that is, different regimes reflect different monetary policy reactions. However, possible two drawbacks of their study are worthy of consideration: the first is that the estimated model is not based on the forward-looking Taylor rule, so it might be inconsistent with the People's Bank of China (PBC)'s actions; the second is that they do not deal with the endogeneity problem in the regime switching model which may lead to inconsistent parameter estimates for Taylor rule.

In this study, we consider a regime-switching forward-looking Taylor rule that nests the simple rule with regime switching in Zheng and Liu (2010) as a special case. For this regime switching model, the traditional generalized method of moments (GMM) is

[1] Surico (2007b) showed that the first six years of ECB monetary policy can be characterized by a nonlinear, state-dependent policy rule. The empirical analysis on synthetic euro-area data suggests that the objective of price stability is symmetric, whereas the objectives of real activity and interest-rate stabilizations are not. Output contractions imply larger policy responses than output expansions of the same size, while no asymmetric reaction for inflation.