China Economic Review 23 (2012) 60–70

Contents lists available at SciVerse ScienceDirect

China Economic Review

Multivariate model-based gap measures and a new Phillips curve for China ☆

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ARTICLE INFO

Article history:
Received 22 July 2010
Received in revised form 27 July 2011
Accepted 28 July 2011
Available online 16 August 2011

JEL classification:
E31
E32
E58
C11
C22

Keywords:
Phillips curve
Bayesian estimator
Output gap
Structural change

ABSTRACT

This paper examines empirically the Phillips curve relationship for the Chinese economy. We use quarterly data that go back to 1978 and employ a multivariate rather than univariate method in the construction of gap measures for inflation, money and output jointly with reliable error bands. Our empirical results show that the inflation gap and the output gap fit a New Phillips curve very well. We also find some structural change in the inflation–output trade-off.

1. Introduction

The short-run tradeoff between inflation and unemployment, equivalent between inflation and output, has been widely studied in the Phillips curve framework.[1] This framework has been extended from the conventional Phillips curve with adaptive expectations as in Gordon (1990) and King and Watson (1994), to the recently developed New Keynesian Phillips curve (NKPC) with rational expectations as in Roberts (1995), Gali and Gertler (1999), Gali, Gertler, and David Lopez-Salido (2005), Sbordone (2005), Rudd and Whelan (2006), and Zhang et al. (2008). The continuously growing literature on the Phillips curve modeling reflects how the understanding of inflation dynamics has progressed over time. It also indicates that the baseline tradeoff depicted by the Phillips curve remains a useful component in monetary policy analysis after decades of investigation.

In practice, however, the examination of the Phillips curve relationship has been largely dominated by the experiences in the developed economy, presumably because this relationship originated from developed countries and standard macro models often work less well in developing countries. Nonetheless, most central banks (from both the developed and developing economies)

☆ The research is supported by the Fundamental Research Funds for the Central Universities and the Research Funds of Renmin University of China (No.10XNJ053), the National Natural Science Foundation of China (No. 71173224), and also supported by KAKENHI (23530255). The authors are grateful to anonymous referees and the editor (Professor Xiaodong Zhu) for their valuable comments.

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[1] See, for instance, Gordon (1990), King and Watson (1994), Roberts (1995), Gali and Gertler (1999), Stock and Watson (1999), Mankiw and Reis (2002), and Zhang, Denise, and Kim (2008), among many others.

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doi:10.1016/j.chieco.2011.07.014

assume, either explicitly or implicitly, the existence of the Phillips curve tradeoff in its policy decisions (Fischer, 1996). For instance, it is widely observed that high output (relative to the potential) and high capacity utilization lead to monetary authority tightening to prevent inflation, whereas monetary policy is eased during low output periods to spur economic development. This indicates that the Phillips curve relationship is not a unique toolkit exclusively applied to developed economies.

In this paper, we examine the Phillips curve relationship for the Chinese economy, which has experienced a number of episodes of pronounced ups and downs in its business cycle associated with marked movements in inflation since the late 1970s (Brandt & Zhu, 2000, 2001). This association is attracting a small but growing number of studies to investigate the stylized form of the Phillips curve that links inflation with the real output gap in China. The work to date has generated some useful findings, but these findings have also raised some troubling questions about Phillips curve modeling in China. As we will discuss, it seems to be difficult for existing studies to reconcile the standard Phillips curve model without appealing either to annual data or the strong (and inappropriate) assumption of the stationarity of inflation series.

For example, Coe and McDermott (1997) used a nonparametric estimation procedure for trend output in China (and other 13 countries/regions in Asia) and found that annual data in China fail to fit the conventional Phillips curve model, even though the model works very well in almost all of the other Asian economies. The authors attributed this failure to data limitations (annual data from 1978 to 1994). Oppers (1997) estimated a similar Phillips curve model with a similar sample period for China (annual data of 1980–1996) but found that the Phillips curve works well in China. These contrasting results are induced by different dynamic structures for the real output gap in their respective models. Recently, Gerlach and Peng (2006) estimated a conventional Phillips curve model for China using annual data from 1982 to 2003. They found that the conventional Phillips curve model fits the Chinese data well only if an unobserved variable is captured by an autoregressive process. This finding was challenged by Ha, Fan, and Shu (2003), Scheibe and Vines (2005), Kojima, Nakamura, and Ohyama (2005), Funke (2006), and Mehrotra, Peltonen, and Rivera (2010) who all claimed that the NKPC model, rather than the conventional Phillips curve, is consistent with the underlying data-generating process of inflation in China.

The aforementioned literature has certainly contributed to the understanding of inflation performance in China during its post-reform period. However, when it comes to inflation dynamics modeling in China with quarterly data, there is still room for improvement. First, the thorny data issue of studying inflation dynamics in China, as widely claimed in the literature, has improved considerably with increasing data availability over time. In particular, *China Monthly Economic Indicators* (CMEI) published monthly by China's National Bureau of Statistics (NBS) contains monthly data for consumer price index (CPI) inflation (and many other macro economic data series) in China for most of the 1980s and the period onwards. Furthermore, quarterly data of real GDP can be calculated by using the level of nominal GDP and the growth rate of real GDP published by NBS for the post-1992 period. The real GDP data before 1992 can be obtained by using Abeysinghe and Rajaguru (2004) forecasting method. In this paper, we utilize these data sources and model the Phillips curve relationship using quarterly data for China over the post-reform period (i.e. 1978–2008).

Second, in most of the existing literature, variant Phillips curve models are estimated under the assumption that the inflation series in China is stationary. The stationarity assumption seems to be fairly strong for China's inflation data series. The plot of the year-on-year CPI growth rate in China over the first quarter of 1978 to the last quarter of 2008 (Fig. 1 in Section 2) suggests that inflation in China over the past 30 years is highly persistent with strong patterns of long memory. Indeed, as the following section shows, various unit root tests confirm the nonstationary nature of inflation in China. This nonstationarity could invalidate the many estimation techniques often used in the literature to estimate the Phillips curve for China.

Third, the output gap measures employed in the literature are often based on univariate detrending methods. Although the univariate approach has the merit of simplicity, it can omit useful information embedded in variables which endogenously interact with each other. Therefore, gap measures based on a multivariate model, which provide more accurate information in the modeling process, are clearly warranted.

This paper aims to contribute to the literature in the above three aspects. First, quarterly data for inflation, the real output, and money aggregates in China in the period 1978–2008 are used in empirical estimations. Second, we construct a multivariate dynamic model for the Chinese economy and estimate gaps for the underlying variables jointly. Third, we estimate the Phillips curve model with the gaps of inflation and real output, which addresses the nonstationary problem for the Chinese inflation series.

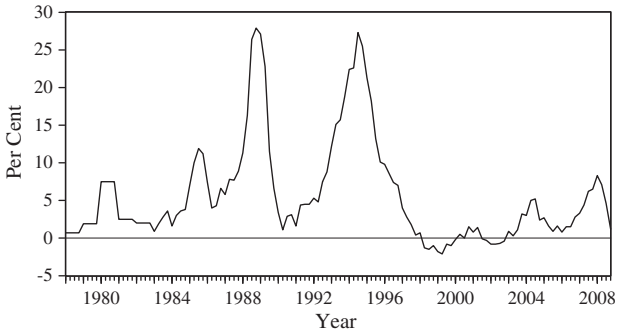

Fig. 1. CPI inflation in China: 1978Q1–2008Q4.