The estimation of monetary policy reaction function in a data-rich environment: The case of Japan

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Abstract

This paper reports the estimates of a monetary policy reaction function for the Bank of Japan in a data-rich environment. There are two main findings. First, a weak identification problem arises in the estimates under the specifications that some previous works employ, though in a data-rich environment it may be possible to avoid this problem. Second, the evidence from the estimates in a data-rich environment suggests that the Bank of Japan only controlled the inflation forecast, and placed no weight on output stabilization directly over the period from November 1988 through February 2001.
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1. Introduction

To discuss the issue of how to conduct monetary policy, many empirical studies have estimated the Taylor-type monetary policy reaction function. In the original Taylor (1993) formulation, the policy instrument responds only to current inflation and output gaps. In turn, Clarida et al. (1998, 1999, 2000) specify that the behavior of an interest rate as a monetary policy instrument depends on the expected output gap and expected future inflation. They estimate this simple rule by the Generalized Method of Moments (GMM), and examine to what extent the simple rule provides good empirical descriptions of central bank behavior. In

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addition, Clarida et al. (1998), Jinushi et al. (2000), Bernanke and Gertler (1999) and Tachibana (2006) describe the Bank of Japan (BOJ)'s behavior by estimating the reaction function.

However, the results from these previous studies of the BOJ's behavior seem to have been inconsistent. Clarida et al. (1998), using a monthly dataset from April 1979 to December 1994, argued that the BOJ has placed somewhat more weight on controlling inflation relative to output stabilization. Jinushi et al. (2000), using the quarterly data from the first quarter of 1975 to the fourth quarter of 1985, argued that the BOJ has placed weight on output stabilization (they remark that the estimated policy rule in this period is the 'good' policy rule); although, by using a cointegration analysis, the BOJ has placed more weight on inflation than output stabilization since 1987. On the other hand, Bernanke and Gertler (1999) estimated a forward-looking reaction function for the period before and after June 1989 by using the Clarida et al. (1998) approach, and argued that after 1989 the BOJ greatly weakened its commitment to inflation stabilization and attempted to stabilize the stock market. In addition, Tachibana (2006), using a monthly dataset from January 1975 to September 1995, estimated a piecewise linear reaction function in terms of inflation as the nonlinear inflation-zone targeting specification, and argued that the BOJ did not respond to inflation within the target zone, nor even very strongly to inflation outside this zone.

These previous studies used lagged values of a few variables from the central bank information set as instrumental variables. This means that the expectations of future variables are replaced by the forecasts estimated using lagged values of a few variables. However, in reality, the central bank typically monitors not only a few variables but also a very large number of time series, including asset prices, exchange rates, employment and so on, to predict the future path of relevant macroeconomic variables. To describe actual central bank behavior as above, it is necessary to estimate the reaction function with some crucial aspects of monetary policy decisions, such as the collection, processing, and analysis of large amounts of data and projections of the target variables. Failure to take this point into account may lead to an econometric problem. Recently, it has been found that 'weak identification' is a problem for the GMM estimation of forward-looking models with rational expectations. This problem arises when an equation is identified but the instruments may be weakly correlated with the endogenous variables; see in particular Mavroeidis (2004) for application to the case of the reaction function specified by Clarida et al. (1998, 2000) and the New Keynesian Phillips Curve specified by Gali and Gertler (1999). When the instruments are not particularly useful for forecasting the expected variables, the resulting GMM estimators suffer from weak identification, which leads to nonstandard distributions for estimators that can yield misleading inferences; see, for example, Stock et al. (2002) for a general overview of weak instruments and weak identification.

To consider the large amount of information from the monetary policy authority, large amounts of instrumental variables may be needed. In this regard, however, the greater the number of instrumental variables, the greater the number of moment conditions. It is well known that the GMM estimators are biased if the number of moment conditions is so large that the ratio between the total number of instrumental variables and the number of observations is significantly large.[1] Therefore, an econometric method to extract a small number of factors

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[1] Altonji and Segal (1996) examine the small sample properties of the GMM estimator, and argue that the finite sample bias of the GMM estimators can arise due to a large number of moment conditions.