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How stable are monetary policy rules: estimating the time-varying coefficients in monetary policy reaction function for the US☆

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Abstract

The relation among the federal funds rate and the Federal Reserve's expectations about future values of certain policy relevant variables is considered. The coefficients of this relation are biased (i) when relevant explanatory variables are omitted, (ii) when the included explanatory variables are measured with error, (iii) when the functional form of the relation is misspecified. These biases present obstacles to verifying the conditions for monetary policies to be effective. It is explained how auxiliary variables, called concomitants, can be used to remove some of these biases without assuming that the "true" functional form of the relation is known. An analysis of the US quarterly data on the variables in a reaction function for 1960Q1–2000Q4 is given using our methods with a description of a numerical algorithm for enacting our methods.

Keywords: Monetary policy reaction function; Bias-free coefficients; Necessary and sufficient conditions for macroeconomic stability

1. Introduction

Considerable recent research on monetary policy has focused attention on examining the extent to which the conduct of monetary policy can be characterized by a simple relationship

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between a policy instrument and a small set of variables. This work was largely inspired by Taylor (1993), who suggested a rule whereby the Federal Reserve (Fed) sets its target for the federal funds rate in response to deviations of actual inflation from target inflation and the gap between actual and potential output.

Such a rule is usually represented by an equation of the form:

$$r_t = \overline{r} + \alpha_1(\pi_t - \pi^*) + \alpha_2(y_t - y_t^*) + \varepsilon_t, \tag{1}$$

where r_t is the policy-determined interest rate, $\overline{r}$ the long-term nominal interest rate, π the inflation rate, π^* the target inflation rate, y the real output, y^* the potential output, and ε the disturbance term. This approach assumes that the relationship between the interest rate and its determinants is linear. There have been attempts to estimate changes in the coefficients of (1) in the periods before and after Paul Volcker was Chairman of the Fed (see, Clarida et al., 1998; Taylor, 1999), but this work has remained in the context of fixed-coefficient linear model.

Let us assume that the “true” version of Eq. (1) exists. The difficulty is that we do not know the functional form of this version and do not have data on some of its explanatory variables. Also, the data that are available on some of its variables contain errors. Consequently, the problems of omitted variables, measurement errors, and unknown functional form are associated with (1). The linearity assumption about (1) is incorrect because the magnitude, direction, and timing of change the Fed wants to make in the interest rate it controls in response to a given gap between actual and expected inflation, and to the gap between actual and potential output, depend on which one of the five broad (and illustrative) categories of policies: “strongly expansionary,” “mildly expansionary,” “neutral,” “mildly contractionary,” and “strongly contractionary,” it wants to follow in light of its expectations about future economic conditions. There can be a host of factors other than the explanatory variables in (1) that affect the Fed’s decision to raise or lower the interest rate and that are unlikely to be fully incorporated in the variables in (1). Thus, the estimation of (1) is subject to biases arising from omitted variables. Finally, accurate data on inflation and output may not be available and errors are inevitably present in the measures used for expected inflation and potential output. Therefore, there are ample reasons to believe that serious errors-in-variables problems are present with (1). The biasing effects of omitting relevant explanatory variables, mismeasuring some or all of the included explanatory variables and of misspecifying the “true” functional forms are a pervasive problem in econometrics. The purpose of this paper is to correct the estimates of the coefficients of (1) for such biases without making strong functional-form assumptions.

Section 2 modifies Eq. (1) in such a way that the modified equation corresponds to the “true” equation. The latter equation is used to state both a necessary and sufficient and a sufficient condition for a monetary policy to be a good policy (defined below). The section also provides the real-world interpretations of the coefficients of the modified equation. Section 3 calculates bias-corrected estimates of the coefficients of the modified equation. Section 4 concludes. Computational details are given in the appendix to the paper.