Output gap uncertainty: Does it matter for the Taylor rule?*

Frank Smets
ECB, D-60311 Frankfurt am Main, Germany, (e-mail: frank.smets@ecb.int)

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Abstract. This paper analyses the effect of measurement error in the output gap on efficient monetary policy rules in a simple estimated model of the US economy. While it is a well-known result that such additive uncertainty does not affect the optimal feedback rule in a linear-quadratic framework, it is shown that output gap uncertainty can have a significant effect on the efficient response coefficients in restricted instrument rules such as the popular Taylor rule. Output gap uncertainty reduces the response to the current estimated output gap relative to current inflation and may partly explain why the parameters in estimated Taylor rules are often much less than what optimal control exercises which assume the state of the economy is known suggest.

Key words: monetary policy, output gap, uncertainty

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1. Introduction

This paper analyses the effect of uncertainty in the measurement of the output gap on monetary policy rules in a simple estimated linear model of the US economy. There are at least two reasons why this is an interesting question. First, following the work by Kuttner (1994) and Staiger, Stock and Watson (1996) there is increasing evidence that indicators of aggregate capacity utilisation such as the NAIRU or the output gap are measured with a considerable margin of uncertainty. However, there is little formal analysis of the effects of

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1 Cross-country evidence can be found in Gerlach and Smets (1997) and Laubach (1997).
this uncertainty on monetary policy behaviour. Staiger et al. (1996) conjecture that “monetary policy in the presence of measurement error . . . is consistent with placing less weight on poorly measured targets”. More recently, however, Estrella and Mishkin (1998) conclude: “Uncertainty about the level of the NAIRU has no influence on the setting of policy instruments, although it does affect the value of the objective function. This type of uncertainty makes the policymaker worse off, but does not alter the policymakers’ behaviour.” (See also Wieland (1997))

The results in this paper are consistent with both of the statements above. Because output gap uncertainty enters additively in the linear-quadratic framework of this paper, it does not affect the optimal linear instrument rule. Estrella and Mishkin (1998) base their conclusions on this well-known certainty equivalence result. However, this result does not apply to restricted instrument rules such as the popular Taylor rule which links the central bank’s policy rate to only two variables, the current inflation rate and output gap (Taylor, 1993). Below I show that measurement error in the US output gap considerably reduces the optimal weight on the output gap in such restricted instrument rules. This provides evidence in favour of the intuition of Staiger et al. (1996) mentioned above.

Second, while restricted instrument rules such as the Taylor rule have become increasingly popular both as a positive and a normative tool to analyse central bank behaviour, there has been less consensus on how large the feedback parameters should be on output and inflation. In his original contribution John Taylor proposed a parameter of 1.5 on inflation and 0.5 on the output gap to explain recent Fed behaviour. Similarly, parameters in estimated Taylor-type reaction functions for a number of other countries are often close to these values. In contrast, many papers that calculate efficient Taylor rule parameters using model economies often come to the conclusion that the optimal feedback parameters should be much higher. For example, using a simple estimated model of the US economy Rudebusch and Svensson (1998) find that while the Taylor rule does almost as well as the optimal feedback rule in minimising a loss function over output, inflation and interest rate variations, the optimal parameters are larger than two in most cases. Similarly, Levin (1996) compares the performance of the original Taylor rule with the Henderson-McKibbin rule which has the same arguments as the Taylor rule but feedback parameters of two on both output and inflation. He finds that the latter rule performs better in stabilising output and inflation in the Fed’s macro model. Finally, on the basis of a simple calibrated model, Ball (1997) argues that for a central bank that cares about variations in output and inflation an efficient feedback parameter on the output gap should be much larger than the one suggested by Taylor (1993).

There are various potential explanations for this discrepancy between actual central bank behaviour and the feedback these optimal control exercises suggest. One explanation may be that central banks have an interest rate smoothing objective which would tend to reduce the central bank’s immediate response

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2 One exception which came to my attention after finishing the first draft of this paper is Rudebusch (1998), who addresses the same question using a somewhat different methodology and comes to very similar conclusions.

3 See, for example, Clarida, Gali and Gertler (1998).