

Estimating Central Banks' preferences from a time-varying empirical reaction function

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Abstract

We estimate monetary policy reaction functions for the United States, the United Kingdom, and Germany, using a Markov-switching model that allows for shifts in the coefficients of the central bank's reaction function as well as for independent shifts in the residual variance. The results indicate that central bank policy can be characterized as falling into a low- and a high-inflation regime. Over time all central banks have assigned changing weights to inflation and the output gap. Switching in the residual variance turns out to be important for the fit of the model. As a reaction function is a reduced form, coefficients embody preference parameters as well as parameters characterizing the structure of the economy. To recover the central banks' preferences, we estimate the preference parameters jointly with a small model of the economy. The results show that the Bundesbank has placed a relatively higher weight on inflation than the Fed. Moreover, for the Bundesbank and the Fed the differences between both regimes seem to originate mainly from a changing preference for interest rate smoothing.

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0. Introduction

Since Taylor (1993) showed that interest rate policy in the United States can be described by a simple mathematical function comprising an interest rate, inflation, and the

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output gap, it has become common practice to use estimated central bank (CB) reaction functions for summarizing monetary policy behavior. Empirical studies of reaction functions, however, are typically confronted with the problem that CB policy changes over time, making parameter estimates unstable, especially when considering a longer sample period.¹ Moreover, estimation of a CB reaction function does not allow us to draw conclusions on the preferences of the CB, as the reaction function is only a reduced form. Coefficients in the reaction function depend on the CB's preference parameters as well as parameters characterizing the structure of the economy. In this paper we try to separate both to investigate shifts in the CB's preferences under the assumption that the economic structure has remained constant.

According to [Orphanides \(2004\)](#), CBs in the 1970s put a high weight on output while inflation was allowed to rise, whereas in the more recent past most CBs concentrated on achieving low inflation, and output goals received less attention. Such changes in CB policy may either take the form of a gradual shift or a sudden switch to another regime. While one could alternatively analyze a gradual policy shift in the framework of a smooth transition model, this paper is concerned with more abrupt changes of regime that are suitable for investigation with a Markov switching model. Experience shows that such shifts in CB policy have occurred, see [Romer and Romer \(1989\)](#). The CB's preference towards inflation could also shift with increasing CB independence. [Fischer \(1994, p. 293\)](#) presumes that dependent central bankers suffer from an inflationary bias, while independent central bankers develop a deflationary bias. Developments like, e.g. in the United Kingdom, where the introduction of the Monetary Policy Committee in 1997 marked a major change in monetary policy making, are also likely to have influenced the preferences of the CB.

The Markov-switching model used in this paper characterizes CB policy as falling into two different regimes.² One regime is expected to correspond to a high-inflation regime with a high weight on output stabilization and a low weight on inflation. In the second, low-inflation regime the CB should take a more aggressive position towards inflation with a high weight on inflation and a lower weight on output stabilization. Switching models are also able to deal with the changing variability of economic time series. The oil-price shocks in the 1970s increased the volatility of interest rates, inflation, and output. Other turbulent episodes in the stock or foreign exchange markets or the terrorist attacks on September 11, 2001 could induce volatility in interest rates. As these episodes are not necessarily related to the monetary policy regime in place, they are assumed to switch independently of the switching process driving the coefficients in the reaction function.

The paper is structured as follows. Section 1 reviews the existing literature on time-varying CB reaction functions. Though empirical research on this topic is still tentative, evidence that CB reaction functions are non-linear is increasing rapidly. Since we are concerned with shifts in the CB's preferences here, we concentrate on studies investigating

¹See, e.g., [Judd and Rudebusch \(1998\)](#), [Clarida et al. \(2000\)](#) or [Muscatelli et al. \(2002\)](#).

²Modelling the relation between inflation and unemployment ([Ruge-Murcia, 2001](#)) or the coefficients in a Taylor rule ([Cukierman and Gerlach, 2003](#)) with a non-linear function is an alternative to the approach pursued in this paper. In contrast to a sudden switch in regime, a non-linear function implies a gradual change in CB behavior as the respective variable deviates from target. Besides the different nature of regime shifts modeled by a non-linear function and the assumption of Markov switching, in switching models no a-priori assumptions on the causes of the regime shifts or the functional form for the changes in regime have to be made.

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