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Inflation targeting, credibility, and non-linear Taylor rules[☆]



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In this paper we systematically evaluate how central banks respond to deviations from the inflation target. We present a stylized New Keynesian model in which agents' inflation expectations are sensitive to deviations from the inflation target. To (re-) establish credibility, monetary policy under discretion sets higher interest rates today if average inflation exceeded the target in the past. Moreover, the central bank responds non-linearly to past inflation gaps. This is reflected in an additional term in the central bank's instrument rule, which we refer to as the "credibility loss." Augmenting a standard Taylor (1993) rule with the latter term, we provide empirical evidence for the interest rate response for a sample of five inflation targeting (IT) economies. We find, first, that past deviations from IT feed back into the reaction function and that this influence is economically meaningful. Deterioration in credibility (*ceteris paribus*) forces central bankers to undertake larger interest rate steps. Second, we detect an asymmetric reaction to positive and negative credibility losses, with the latter dominating the former.

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1. Introduction

Over the past two decades, many central banks have adopted an inflation targeting (IT) framework. Although generally considered successful in stabilizing inflation, many IT economies have experienced periods, some of them prolonged, during which inflation deviated from the inflation target. In this paper we systematically evaluate how central banks responded to these deviations from the inflation target. Our analysis focuses on the following question: Do past deviations from target prompt central banks to set contemporaneous interest rates more aggressively?

In a first step, we present a stylized model in which agents' inflation expectations are sensitive to deviations from the inflation target. Credibility deteriorates if the central bank misses the announced target rate. To reestablish credibility, monetary policy is shown to respond to average past inflation being, say, above target by setting higher interest rates today. This is reflected in an additional term in the central bank's instrument rule, which we refer to as the "credibility loss." Hence, the central bank responds non-linearly to past inflation deviations, with the strength of the interest rate adjustment increasing in with extent of credibility loss. In a second step, we provide empirical evidence for the interest rate response to credibility loss for a sample of five IT economies.

This analysis contributes to two strands of the literature, the first of these being that addressing the nature of inflation deviations from target. In light of the recent inflation liftoff in the United Kingdom, [Corder and Eckloff \(2011\)](#) identify "sustained off-target inflation (SOTI) episodes" for a large set of IT countries. These authors are particularly interested in how SOTI episodes feed into inflation expectations. They show that short- and medium-term inflation expectations drift in the direction of inflation deviations. [Svensson \(2012\)](#) evaluates the costs of inflation deviations in terms of additional unemployment. If inflation expectations remain anchored and inflation exceeds the target, unemployment increases. He finds that average unemployment has been 0.8 percentage points higher due to positive inflation deviations. The persistence of inflation and long-term inflation expectations is addressed by [Davis \(2012\)](#). He modifies a standard New Keynesian model by introducing agents whose beliefs about the central bank's target rate lie between two extremes. Past inflation observations are used to update private beliefs about the target, which are interpreted as a measure of central bank credibility.

The second branch of the literature to which we contribute involves important non-linearities in interest rate setting that are neglected in the standard specification of estimated [Taylor \(1993\)](#) rules. The evidence provided by [Dolado et al. \(2004, 2005\)](#), [Kim et al. \(2005\)](#), [Chevapatrakul et al. \(2009\)](#), and [Wolters \(2012\)](#), among others, suggests that policy rates are adjusted in a non-linear way to inflation and output movements. The precise nature of non-linearity differs across studies and depends on the theoretical motivation. Furthermore, central banks often announce a target range around their inflation target, i.e., small deviations from the inflation target are tolerated, whereas large deviations are fought vigorously. Inflation deviations judged to be within a "comfort zone" require no action.¹ As a result, the interest rate response to inflation is non-linear.

The literature suggests three different motivations for non-linear interest rate setting. First, the Phillips curve tradeoff could be non-linear. [Nobay and Peel \(2000\)](#) and [Dolado et al. \(2005\)](#), among others, introduce convexity or concavity in a short-run Phillips curve that nests the linear tradeoff as a special case. This non-linearity is eventually reflected in non-linear policy steps. Second, asymmetric central bank preferences, i.e., deviations from the standard linear-quadratic framework, could be why the central bank adjusts interest rates non-linearly in response to inflation and output figures. [Surico \(2007a,b\)](#), [Ruge-Murcia \(2003\)](#), [Nobay and Peel \(2003\)](#), and [Cukierman and Muscatelli \(2008\)](#) introduce different preference asymmetries in models of optimal monetary policy. Third, non-linearity could arise from policymaker uncertainty about key economic data, the true model describing the economy, or over important parameters governing the monetary transmission mechanism (see [Meyer et al., 2001](#); [Swanson, 2006](#); [Tillmann, 2011](#)).

This paper offers an additional rationale for non-linear interest rate adjustment. If past deviations from the inflation target feed into current inflation expectations and if the absolute size of the

¹ See [Mishkin \(2008\)](#) for a discussion.

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