



# Disinflations in a model of imperfectly anchored expectations<sup>☆</sup>



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## ABSTRACT

We study disinflations under imperfect credibility of the central bank. We propose a framework to model imperfectly credible announcements and use it to study the distribution of the output cost for a given disinflation. Imperfect credibility is modeled as the extent to which agents rely on adaptive learning to form expectations. Lower credibility increases the mean, variance, and skewness of the distribution of the sacrifice ratio. When credibility is low, disinflations become very costly for adverse realizations of the shocks. But, an opportunistic disinflation, a disinflation implemented after a period of below trend inflation, can significantly lower the sacrifice ratio. With simulated data, we reinterpret the reduced form evidence in sacrifice ratio regressions. Coefficient estimates from these regressions can be misleading for policymakers considering the cost of disinflation.

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## 1. Introduction

Advanced economies have succeeded in keeping inflation low after the high inflation rates of the 1970s. Other economies have not. For example, in Argentina, inflation has once again become the main macroeconomic concern. The case for price stability is by now well-established and theoretical studies of disinflations, like [Ascari and Ropele \(2013\)](#) and [Ireland \(1995\)](#), make clear that the long-term welfare gains from low inflation tend to exceed the short-term cost of reducing it. But empirical studies on the cost of disinflation, such as [Cecchetti and Rich \(2001\)](#), [Brito \(2010\)](#), [Brito and Bystedt \(2010\)](#), [Mazumder \(2014\)](#), and [Katayama et al. \(2015\)](#), suggest that considerable uncertainty remains over what determines the short-term cost of disinflation.

In this paper, we extend the study of disinflation in two ways. First, following [Ball \(1994\)](#), we significantly extend the sample, relative to previous studies, on the cost of disinflation.<sup>1</sup> We use this sample to show that the variance of the distribution of the sacrifice ratio is large and that key determinants of the sacrifice ratio, like the size of the disinflation or its

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<sup>1</sup> The cost of disinflation is measured by the sacrifice ratio which is defined as the cumulative percentage of output growth lost for decreasing the annual inflation rate by one percent.

duration, explain little of its variation. Second, we propose a method to model imperfectly credible announcements. We use this method to study how the distribution of the sacrifice ratio changes as the degree of credibility changes in the context of an estimated sticky-price structural model. What the distribution makes clear is that the cost of any realized disinflation may be more affected by shocks (luck) than by the design of the disinflation policy.

By expanding the analysis to the determinants of the distribution, we are able to bridge the theoretical literature on the cost of disinflations with the econometric evidence from regression results. Theoretical studies of the cost of disinflation such as [Ascari and Ropele \(2012a,b,2013\)](#) show that medium-scale monetary models of the kind proposed by [Christiano et al. \(2005\)](#) can yield perfect foresight paths that are consistent with the mean sacrifice ratio in the data, a number which ranges somewhere between one and four.<sup>2</sup> But, perfect foresight simulations do not account for the uncertainty surrounding estimates of the mean sacrifice ratio, nor the significant variation of the sacrifice ratio observed in the data, which we find can range from  $-50$  to  $37$ . Using an estimated structural model, we generate artificial disinflations to show that the empirical regressions of the sacrifice ratio may be misleading.

We propose a novel way to model imperfectly credible announcements in a standard sticky-price model. We extend the approach of [Evans and Honkapohja \(2001\)](#) by replacing the expectations operator with expectations that combine forecasts based on the solution for anticipated structural changes of [Kulish and Pagan \(2017\)](#) with forecasts based on standard adaptive learning. The former forecast captures the forward-looking component of the representative agent's beliefs, while adaptive learning captures the backward-looking component. In our model, the weight that agents place on adaptive learning to form expectations represents the extent to which expectations are anchored. This weight can also be thought to govern the degree of credibility because it determines the impact of a policy announcement.

Our notion of credibility, however, is not the rational expectations notion which arises with time-inconsistency and commitment policy.<sup>3</sup> A property of rational expectations equilibrium modeling is that beliefs are always consistent with the policy strategy. In our case, data influences the evolution of beliefs, which allows them to be inconsistent with the policy strategy for some time. This notion of credibility speaks to the view of policymakers exemplified by [Kohn \(2009\)](#) on inflation stabilization. He emphasizes that outcomes over the medium term are an important determinant of the extent to which long-run expectations are anchored to policy objectives.<sup>4</sup>

Using this model of imperfect credibility, we find that a lower degree of credibility not only increases the mean cost of disinflation but also significantly increases the variance and skewness of the distribution of the sacrifice ratio for all disinflation policies. The design of a disinflation policy such as whether it is anticipated or unanticipated, gradual or cold turkey, shapes the distribution. For example, pre-announcing a disinflation shifts the distribution to the left and reduces right skewness even at low levels of credibility.

Our modeling framework also allows us to quantify the gains from an opportunistic approach to disinflation, when a policymaker takes advantage of shocks that lower inflation and inflation expectations to announce and implement a lower inflation target.<sup>5</sup> There is evidence that many central banks used this type of strategy in the early 1990s when inflation targeting regimes were first established.<sup>6</sup> An opportunistic approach to disinflations reduces the sacrifice ratio. The gains are large enough that opportunism can trump credibility. For any disinflation policy, a policymaker with low credibility can often achieve a sacrifice ratio behaving opportunistically that is lower than what a policymaker with high credibility can expect on average.

Finally, we use the distribution of the sacrifice ratio implied by the structural model to re-examine the evidence that comes from regressions results. We find that the coefficient estimates are misleading for policymakers contemplating a disinflation policy for two reasons. First, empirical measures of the sacrifice ratio rely on statistical filters to compute trend inflation and the output gap, which biases the estimates. Second, regressions on observable characteristics of disinflations pool episodes from different conditional distributions, which give rise to an omitted variable bias if non-observable determinants like the degree of credibility are not taken into account. What matters for a policymaker wishing to disinflate is the conditional distribution of the sacrifice ratio that is associated with her degree of credibility and with the characteristics of the disinflation policy under consideration. The rest is noise.

The rest of the paper is structured as follows. [Section 2](#) extends the sample of disinflation episodes and reproduces standard regressions to establish reduced-form evidence on the determinants of the sacrifice ratio. [Section 3](#) introduces the framework for imperfectly credible announcements. [Section 4](#) applies this framework to illustrate, analytically, the relation between the sacrifice ratio and credibility in a simple model. [Section 5](#) uses an estimated structural model to study the conditional distribution of the sacrifice ratio and to interpret the reduced-form evidence of [Section 2](#). [Section 6](#) concludes and offer a suggestion for future research.

<sup>2</sup> The range of the mean sacrifice ratio comes from [Ball \(1994\)](#), [Cecchetti and Rich \(2001\)](#), and [Gonçalves and Carvalho \(2009\)](#).

<sup>3</sup> It is also distinct from the framework of [Cogley et al. \(2015\)](#), where agents' uncertainty and learning refer only to the central bank's policy rule.

<sup>4</sup> See the 2009 speech by Donald Kohn, former Vice Chairman of the Federal Reserve, cited previously. [Eusepi et al. \(2015\)](#) present evidence from survey data which is consistent with the view of Kohn showing that long-horizon forecasts of inflation are, in fact, correlated with short-term forecast errors.

<sup>5</sup> [Bomfim and Rudebusch \(2000\)](#), [Orphanides and Wilcox \(2002\)](#), and [Aksoy et al. \(2006\)](#) study different aspect of opportunistic disinflations.

<sup>6</sup> For example, the Reserve Bank of Australia formalized its inflation targeting framework after a significant fall in inflation in the early 1990s. [Bomfim and Rudebusch \(2000\)](#) note that opportunistic policies were discussed in Federal Reserve FOMC meetings in the late 1980s.

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