Measuring Disinflation Credibility in Emerging Markets: A Bayesian Approach with an Application to Turkey's IMF-Supported Program

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Abstract

This paper proposes a new empirical measure of disinflation credibility and applies it to the IMF-supported disinflation program in Turkey since the 2001 crisis. This measure relies only on the consumer price index and can thus be easily applied in countries in which asset prices and survey inflation expectations are not available or reliable. The application to Turkey's shows that it is less volatile and hence more reliable than a survey-expectation based measure.

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I. INTRODUCTION

Credibility is easy to define, but it is difficult to measure. Credibility can be thought of as the public's degree of uncertainty regarding the government's true policy objectives. Policy credibility can thus be measured as the probability, as assessed by agents, that policy outturns coincide with publicly announced policy targets. While there are several approaches in the literature (see Agenor and Taylor, 1993, for short surveys), in practice, central banks and market analysts often use asset prices and inflation expectation surveys to assess monetary policy credibility.

Inflation expectation surveys and asset price measures of inflation expectations are often not available in emerging economies, and even if available, they have severe limitations in such countries. There, domestic bond markets are not deep and liquid enough, and financial market participants don't have sufficient incentives to reveal their expectations. Credibility measures so constructed also do not represent expectations of actual price setters (e. g., workers and firms).

This paper proposes a measure of disinflation credibility that can be used whenever there is a publicly announced inflation target and a public inflation forecast (e.g., in the budget), and applies it to the disinflation program in Turkey since the 2001 crisis. Following Baxter (1985), this measure is the probability that the estimated parameters of an econometric model of the disinflation process are consistent with those implicit in the government's announced objectives. This measure uses only the consumer price index, which is available and relatively reliable in most developing economies and hence embeds also information on price and wage setting behavior of workers and firms.

In the application, we find that it yields the same qualitative results as a survey-based measure, but is much less volatile and hence a more reliable credibility indicator for policy makers and analysts.

The next section describes the methodology and illustrates the steps we follow in the application. Section III reports the results of the application. Section IV concludes.

II. METHODOLOGY

Like Baxter (1985), we assume that the representative agent "learns" in a Bayesian manner. Unlike Baxter (1985), we focus on the final objective, inflation, rather than the intermediate target of monetary policy. We assume agents know the econometric model of the inflation process, but have only beliefs (i.e., prior probability distributions) on its parameters. They update these beliefs on the basis of realizations of the inflation process, through the Bayes' rule, to form posterior distributions on the model parameters. By integrating these posterior densities, we can calculate the probability that the *true* parameters of the inflation process are consistent with those *implicit* in the publicly announced policy target, after each realization of the inflation process.

To implement this methodology, we need (i) an econometric model of the disinflation process, (ii) a mapping from the government's policy objectives to the parameter values of this model, and (iii) an estimation procedure to implement econometrically Bayesian learning about these parameters and compute their posterior distributions.

For simplicity, the *econometric model* of the disinflation process that we posit is a first order autoregression:

$$(1) \qquad \Delta\pi_t = \alpha + \beta\,\Delta\pi_{t-1} + e_t, \qquad e_t \sim N(0, \sigma^2)$$

This model characterizes the average speed of inflation or disinflation (α), the conditional persistence of temporary deviations from this average (β), and the conditional volatility of the shocks producing these deviations (σ^2).[2]

The *mapping* from the authorities' policy objectives to the parameter values of the disinflation process relies on the publicly announced inflation targets and publicly made inflation forecasts under a formal or informal inflation targeting framework (in the application to Turkey, targets and forecasts are those agreed under the stabilization program supported by the IMF).[3] From these targets and forecasts, it is possible to construct a projected monthly inflation path. Equation (1) can then be estimated on monthly series of actual data, up to the announcement of a new target (till the month before the announcement of the IMF program in our application to Turkey), and the projected monthly path, from the month of the announcement (the month of the program approval in our application) to the end of the projection period (24 months in most inflation targeting frameworks). This regression provides a set of coefficients for equation (1), consistent with the announced disinflation objectives in the absence of shocks, which we call "Program" coefficients.

These "Program" coefficients, denoted $\alpha(P)$, $\beta(P)$, and $\sigma(P)$, are the subject of our credibility analysis. Different programs may result in different parameter values, but the sign of $\alpha(P)$ should always be negative while moving from a situation of high and persistent inflation to one of low and stable inflation. In other words, a genuine commitment to taming inflation must imply a shift in this coefficient—from $\alpha \geq 0$ to $\alpha(P) < 0$—during the stabilization process. In practice, shocks will cause the actual inflation path after the announcement of a new inflation target to deviate from the projected path. But actual inflation should decline at the projected average rate, $\alpha(P)$, if the government sticks to its declared inflation objectives firmly.

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[2] Many rational expectation models of the monetary transmission mechanism imply such a univariate, reduced form representation for the inflation process (e.g., Kapetanios, Pagan, and Scott, (2005).

[3] Inflation targets may be revised over time, and these changes are taken into account accordingly (in the application to Turkey, by considering two successive IMF programs).

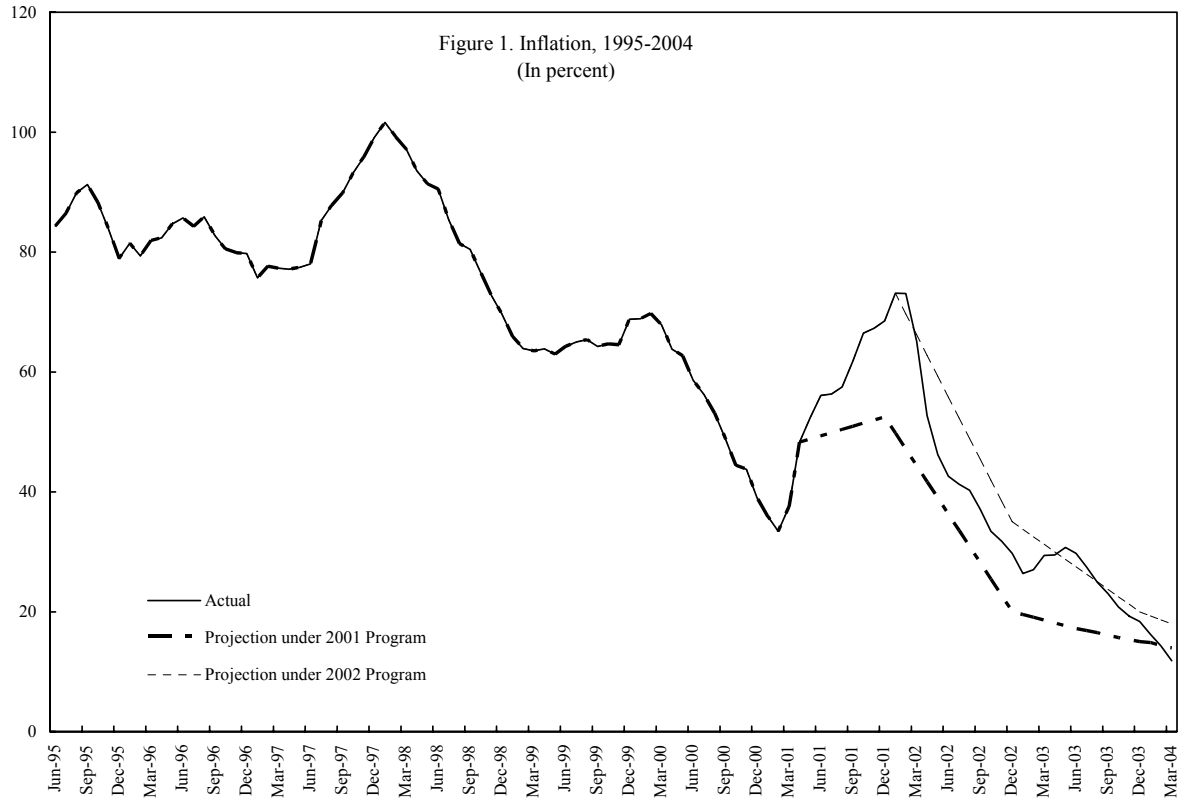
The recursive application of Bayes' rule implements Bayesian learning econometrically. Theil's (1971) mixed estimator permits computing the Bayes' rule after each realization of the inflation process, thus providing for a very simple *estimation procedure*. Given agents' initial beliefs—proxied by a prior distribution on the coefficients of (1)—and the true model of the disinflation process—the likelihood function of (1)—mixed estimation of equation (1) updates agent's beliefs, and provides posterior distributions of $\alpha(t)$, for each t = T,..., T+K, where T is the month of the inflation target announcement and T+K is the last month of the projection period over which credibility is assessed.

By iterating this procedure, we obtain a series of probabilities that $\alpha(t) \leq \alpha(P)$, for t =T, ..., T+K, which is our credibility measure. For instance, given agents' prior on the model parameters at time T-1, say $\alpha(T-1)$, where T-1 is the month before the inflation target announcement, mixed estimation of equation (1) over the sample period from T-S to T, where S is the fixed-length of the estimation window, provides a posterior distribution of $\alpha(T)$. The posterior distribution of $\alpha(T)$ can then be used as prior for $\alpha(T+1)$, and the posterior at time T+1 as prior at T+2, and so and so on. Given the sequence of posterior distributions, which are approximately normal if computed based on mixed estimation of (1), we can easily compute the posterior probability that, at each period t, $\alpha(t) \leq \alpha(P)$ for t =T, ..., T+K.

III. AN APPLICATION: MEASURING DISINFLATION CREDIBILITY IN TURKEY

In this section we apply the methodology above to Turkey's IMF-supported disinflation program after the 2001 crisis.[4] Following the financial crisis of February 2001, the launch of a new program in May 2001 provides our starting point of the empirical analysis. The credibility analysis extends through March 2004, and encompasses a second IMF program approved in February 2002, as well as both domestic (mainly political) and external shocks (such as September 11, 2001 and the Iraq war).

[4] Celasun, Gelos, and Prati (2005) analyze the determinants of monetary credibility in Turkey and other emerging market economies.



We use two sets of program coefficients—since we consider two IMF-supported programs—and one set of prior coefficients (Table 1). The first set of program coefficients (2001 Program) is obtained on historical data from June 1995 to April 2001—the month before the new IMF program was approved in May 2001—and projections from May 2001 to December 2002, which was the end of 2001 Program's projection period. The second set of program coefficients (2002 Program) is obtained based on historical data from June 1995 to January 2002—the month before the second IMF program we consider was approved—and projections from February 2002 to December 2004—the end of the 2002 Program's projection period. For both programs, the annual inflation targets are those published in the respective letter of intent with the IMF (available at www.imf.org).

We derive monthly inflation projections by assuming a constantly decreasing monthly inflation rate (Figure 1, dashed and dotted lines)—that is, by assuming a gradual disinflation path in the absence of shocks. We then check the sensitivity of the results to using actual monthly inflation projections under these two IMF-supported programs, which are not reported because they are confidential.

Prior coefficients are estimated by fitting equation (1) over the period preceding the 2001 IMF program—June 1995–April 2001. Consistent with a standard two-year forecasting horizon under most inflation targeting regimes, we set S, the constant width of the data window rolled over time, equal to 24 months and then check the sensitivity of the results to alternative values.

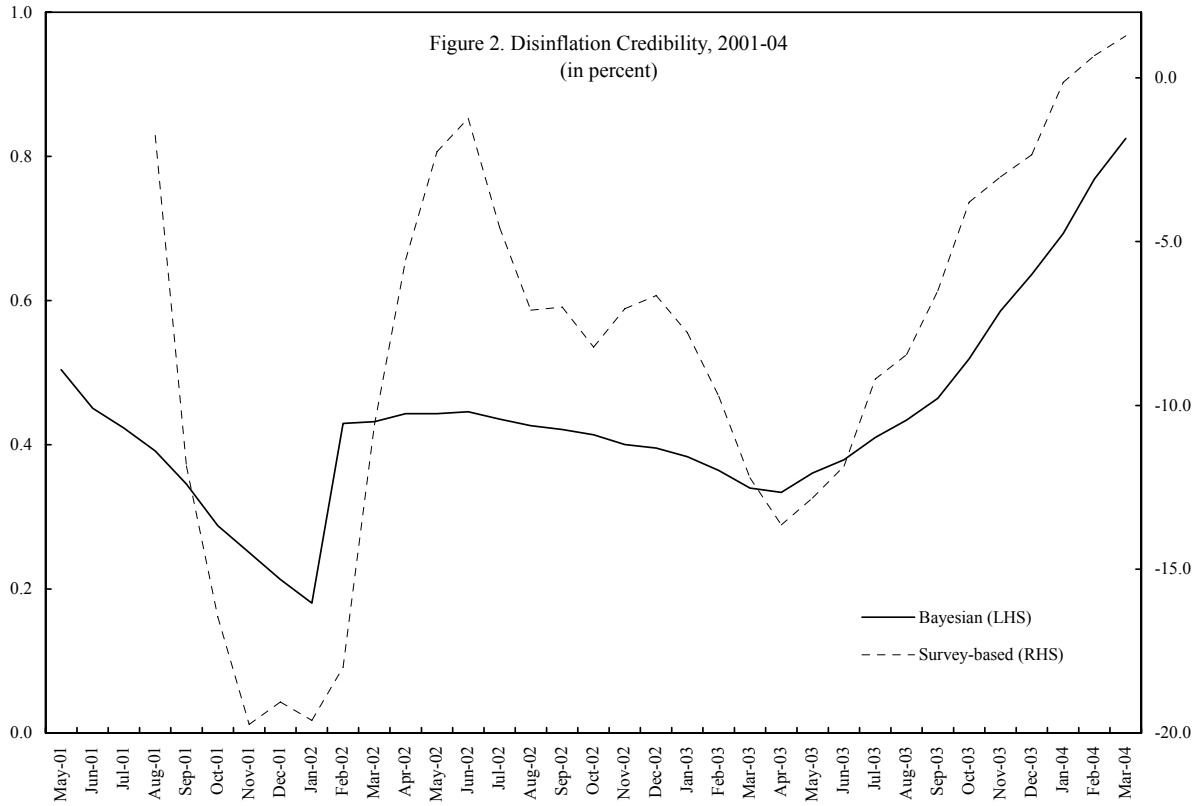
Table 1. Priors and Program Coefficients

	2001 Program coefficients		2002 Program coefficients		Prior coefficients	
	Value	t-statistic	Value	t-statistic	Value	t-statistic
α	-0.38	-1.40	-0.28	-1.24	-0.16	-0.48
β	0.39	4.31	0.46	6.03	0.39	3.56
No. of observations	91		115		71	
R-square	0.17		0.24		0.15	
Sample	June 1995-December 2002		June 1995-December 2004		June 1995-April 2001	

Estimated 2001 program coefficients imply an acceleration of the disinflation process and a reduction of the uncertainty surrounding the central projection path compared to the disinflation history. The projected average decline in inflation under the 2001 program is twice as large as that implied by the prior and is much less uncertain. The estimated 2002 program coefficients imply a slight deceleration in the disinflation process, without altering the degree of uncertainty around the central projection path.

Figure 1 shows that our Bayesian credibility measure (solid line) is much less responsive to shocks than a measure based on survey inflation expectations (dashed line).[5] So our measure is much less volatile and hence a more reliable credibility indicator for policy makers and market analysts than the survey-based one. There is no commonly used asset price-based measure of inflation credibility in Turkey to compare with our Bayesian credibility measure, highlighting the importance to have alternative, simple, readily available credibility measures in emerging market countries.

[5] The survey-based credibility measure is computed as the difference between monthly inflation projections and expected inflation in the survey conducted by the central bank of Turkey available at www.tcmb.gov.tr.



Sources: Central Bank of Turkey inflation survey; and authors' calculations.

This result is robust to the use of alternative priors (computed by including observations starting in June 1991) and different estimation windows (i.e., S equal 18, 36 or 48 moths). The results are robust also to the use of actual inflation projections under the two IMF-supported programs considered.

IV. CONCLUSIONS

This paper presented a measure of disinflation credibility that does not rely on asset prices or survey inflation expectations, which have limited applicability in emerging markets. Our measure only relies on the aggregate CPI index, which is available and reliable even in most low-income countries. It also embeds information on actual price and wage setting behavior more fully than estimates of this behavior by financial markets participants. Our measure is easily applied in the context of IMF-supported programs, which provide for both an inflation objective and inflation projections, but can be applied to any inflation-targeting framework in which the inflation forecasts are published. The application to Turkey's IMF-supported disinflation program clearly indicates that our measure is less volatile and hence more reliable than a survey-based measure.

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