

“(Dis)Inflation Targeting”

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Introduction

- ▶ Brazil, Chile and Colombia were countries that experienced high inflation (triple digits) in the late 80s and early 90s.
 1. Political cycle generated an inflation bias

A constitutional amendment led to the creation of a new institution, to reduce the cost of inflation.

- ▶ An “independent” Central Bank
- ▶ The objective of “Price Stability”

Introduction

The “independent” central bank was created with the following characteristics:

1. A board of governors, which includes only 2 or 3 members appointed by the incumbent government and not nominated by the new government.
2. Created to de-link the political cycle from monetary policy
3. A panel to announce **one year ahead inflation targets**
 - ▶ Intermediate inflation targets prior to the adoption of inflation targeting
 - ▶ Started around 1991-1992 in all 3 countries.
 - ▶ For the first 2 years, the targets were not announced.

Monetary Policy and the Cost of Disinflation

Given that there was now an independent central bank there were two possibilities for monetary policy.

1. The central bank followed the same set of policies as the government and the targets were cheap talk *or*
2. Set a new policy by announcing the intermediate inflation targets aided the disinflation process.

Our hypothesis: Announcing intermediate targets reduced the cost of disinflation by allowing central banks to build credibility.

Mechanism: Announcing inflation targets allows for faster learning with smaller inflation surprises. It also allows the central bank to build credibility, ex-post.

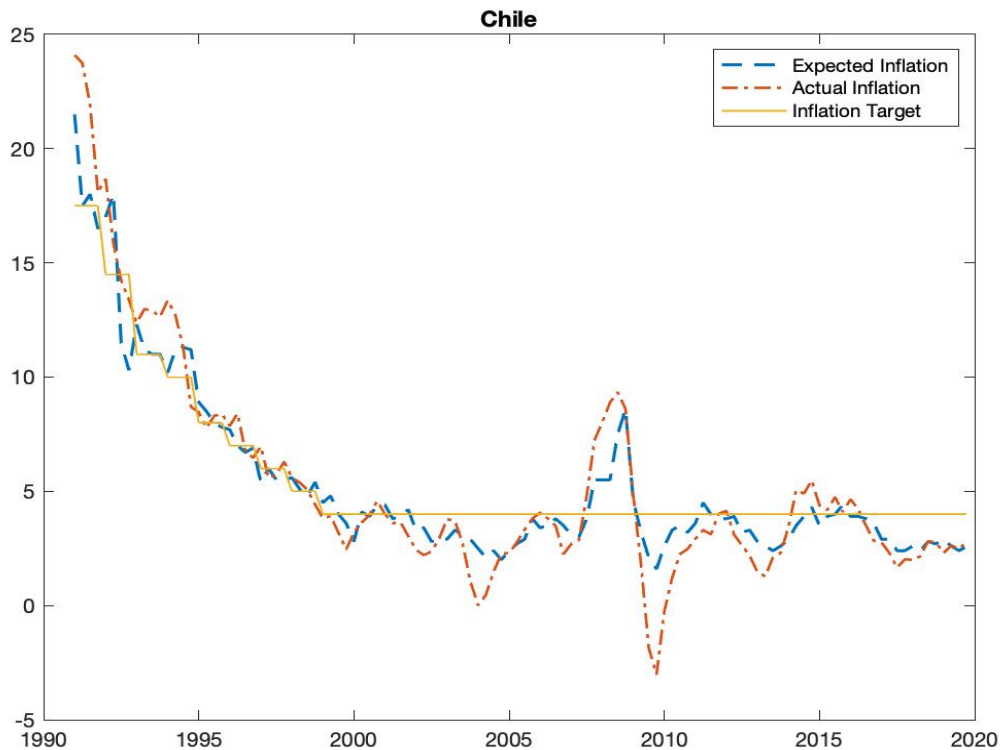
What we do

We extend the [Barro Gordon \(1983a, 1983b\)](#) set up by introducing,

1. A government that delegates Monetary Policy to the Central Bank with a different loss function.
2. Allow for the central bank to introduce intermediate targets.
3. Agents learn about the objectives of the new institution based on observed inflation.

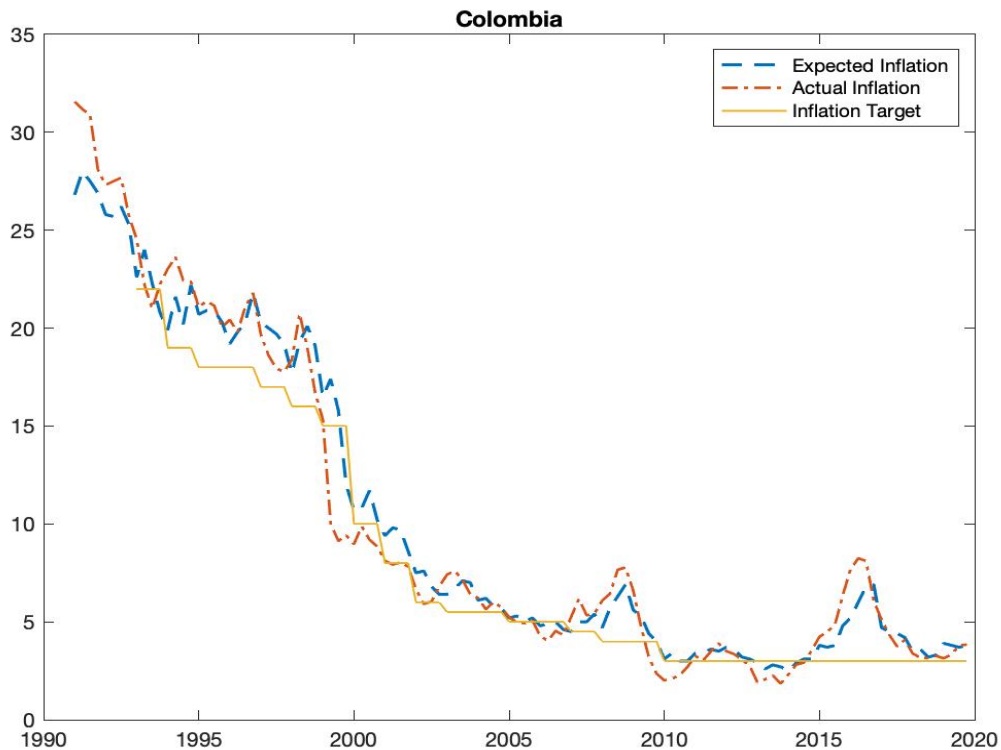
Motivation

Figure 1: Chile Inflation Dynamics 1991M1-2019M12



Motivation

Figure 2: Colombia Inflation Dynamics 1990M1-2019M12



Literature

Central Bank Policy and Forward Guidance: Kydland and Prescott (1977), Barro and Gordon (1983a , 1983b), Barro (1986), Basetto (2019).

Disinflation: Ascari and Ropele (2013), Lamla et al. (2018), Kostadinov and Roldán (2020).

Learning: Marcet and Nicolini (2003), Sargent et al. (2009).

Model Economy

1. Government's Loss Function

$$L^G = \pi_t^2 - a\tilde{y}_t$$

2. Central Bank's Loss Function

$$L^{CB} = (\pi_t - \pi_t^o)^2$$

3. Perceived Loss Function by the agents

$$L^A = \gamma_t L^{CB} + (1 - \gamma_t) L^G$$

γ_t measures the credibility of the central bank and is a Gaussian process given by $\gamma \sim N(\gamma_0, \sigma_0^2)$.

Model Economy

5 Inflation

$$\pi_t = \bar{\pi}_t + \varepsilon_t$$

Where, $\bar{\pi}_t$ is desired inflation by the Central Bank. ε_t exogenous inflation that can't be controlled by the central bank.

6 IS Curve

$$\tilde{y}_t = c(\pi_t - \pi_{t|t-1}^e)$$

<https://www.overleaf.com/project/61cc420db27cb08177f62e4f>

Where $\pi_{t|t-1}^e$, give the inflation expectations for period t based on the information set in $t - 1$. c is commonly referred to as the sacrifice ratio.

Beliefs

Given that agents now must infer the policies set by the central bank and that we have linear and Gaussian system, the beliefs are given by the following,

$$\pi_t = \gamma_t \left(\pi_t^o + \frac{ac}{2} \right) - \frac{ac}{2} + \epsilon_t \quad (1)$$

$$\gamma_t = \gamma_{t-1} + \eta_t \quad (2)$$

Depending on the target and the policy, the above model nests different cases.

Beliefs

Beliefs are updated according to the following,

$$\gamma_t = \gamma_{t-1} + K_t \left(\left(\pi_t^o + \frac{ac}{2} - \gamma_{t-1} \left(\pi_t^o + \frac{ac}{2} \right) + \epsilon_t \right) \right) \quad (3)$$

$$K_t = \frac{\sigma_{t-1}^2 + \sigma_\eta^2 \left(\pi_t^o + \frac{ac}{2} \right)}{(\sigma_{t-1}^2 + \sigma_\eta^2) \left(\pi_t^o + \frac{ac}{2} \right)^2 + \sigma_\epsilon^2} \quad (4)$$

$$\sigma_t^2 = (\sigma_{t-1}^2 + \sigma_\eta^2) + K_t \left(\pi_t^o + \frac{ac}{2} \right) (\sigma_{t-1}^2 + \sigma_\eta^2) \quad (5)$$

Four Stages of the Model

Our paper now splits the general model in to 4 different cases.

1. Inflation Bias: Standard Barro and Gordon (1983) model, no central bank.
2. Independent Central bank with the objective of zero inflation in every period.
3. Central bank with intermediate targets that are not announced. The targets can be zero.
4. Central bank with announced intermediate targets.

Inflation Bias

Using the loss function of the government, the present value of the expected welfare loss is given by,

$$E_0 \mathcal{L}^G = \left(\frac{ac}{2}\right)^2 \left(\frac{1}{1-\beta}\right) + \frac{\sigma_\epsilon^2}{1-\beta} \quad (6)$$

With optimal inflation given by,

$$\bar{\pi} = \frac{ac}{2} \quad (7)$$

Independent Central Bank

Using the loss function of the central bank, the present value of the expected welfare loss is given by,

$$E\{L_0^{G,CB}\} = \frac{ac^2}{2} \sum_{t=0}^{\infty} \beta^t \tilde{a}_0 \left(\prod_{j=1}^t \kappa_{t-j} \right) + \frac{\sigma_{\epsilon}^2}{1-\beta} \quad (8)$$

With optimal inflation given by,

$$\bar{\pi} = 0 \quad (9)$$

Inflation expectations are given by,

$$\pi_{t+1|t}^e = \pi_{t|t-1}^e + \left(\frac{(\sigma_{t-1}^2 + \sigma_{\eta}^2) (c/2)^2}{((c/2)^2 (\sigma_{t-1}^2 + \sigma_{\eta}^2) + \sigma_{\epsilon}^2)} \right) (\bar{\pi}_t - \pi_{t|t-1}^e + \epsilon_t) \quad (10)$$

No Announcements

Using the loss function of the central bank, the present value of the expected welfare loss is given by,

$$E\{\mathcal{L}_0\} = \frac{(ac)^2}{2(1-\beta\rho)} + \frac{(ac)^2}{2}(1+\alpha_0) \sum_{t=0}^{\infty} \beta^t \prod_{s=1}^{t-1} \kappa_{t+s} + \frac{\left(\frac{ac}{2}\right)^2}{1-\beta\rho^2} + \frac{\sigma_\epsilon^2}{1-\beta} \quad (11)$$

With optimal inflation given by,

$$\bar{\pi} = \gamma_t \left(\frac{ac}{2}\right) - \frac{ac}{2} \quad (12)$$

Inflation expectations are given by,

$$\pi_{t+1|t}^e = \pi_{t|t-1}^e + \left(\frac{(\sigma_{t-1}^2 + \sigma_\eta^2) (ac/2)^2}{\left((ac/2)^2 (\sigma_{t-1}^2 + \sigma_\eta^2) + \sigma_\epsilon^2\right)} \right) \left(\pi_t^o - \pi_{t|t-1}^e + \epsilon_t \right) \quad (13)$$

Intermediate Targets

We now introduce intermediate targets to the economy.

The sequence of the targets is predetermined and is given by,

$$\pi_t^o = \rho \pi_{t-1}^o \quad (14)$$

Where, $\pi_0^o = \frac{ac}{2}$, therefore,

$$\pi_t^o = \rho^t \frac{ac}{2} \quad (15)$$

Announcements

Using the loss function of the central bank, the present value of the expected welfare loss is given by,

$$E_0\{\mathcal{L}_0^{G,CB,O}\} = \frac{(ac)^2}{2} \tilde{\alpha}_0 \sum_{t=1}^{\infty} \beta^t \left(\prod_{s=1}^{t-1} \kappa_{t-s} \right) (1 - \rho^t) + \frac{\left(\frac{ac}{2}\right)^2}{1 - \rho^2 \beta} + \frac{\sigma_\epsilon^2}{1 - \beta} \quad (16)$$

With optimal inflation given by,

$$\bar{\pi} = \gamma_t \left(\pi_t^o + \frac{ac}{2} \right) - \frac{ac}{2} \quad (17)$$

Inflation expectations are given by,

$$\pi_{t+1|t}^e = \pi_{t|t-1}^e + \gamma_{t-1} (\pi_{t+1}^o - \pi_t^o) + \left(\left(\frac{(\sigma_{t-1}^2 + \sigma_\eta^2) \left(\frac{ac}{2} + \pi_t^o\right) \left(\frac{ac}{2} + \pi_{t+1}^o\right)}{\left(\frac{ac}{2} + \pi_t^o\right)^2 (\sigma_{t-1}^2 + \sigma_\eta^2) + \sigma_\epsilon^2} \right) \left(\pi_t - \pi_{t|t-1}^e \right) \right)$$

Announcements v/s No Announcements

The difference between announcing and not announcing the targets comes down to the following (Assume: $\sigma_\eta^2 = 0$),

Not Announced targets:

$$\tilde{\gamma}_t = (1 - \hat{\kappa}_t)\tilde{\gamma}_{t-1} + \hat{\kappa}_t \left(1 - \frac{(\pi_t^o + \epsilon_t)}{\frac{-ac}{2}} \right), \hat{\kappa}_t = \left(\frac{1}{1 + \frac{\sigma_\epsilon^2}{\tilde{\sigma}_{t-1}^2 \left(\frac{ac}{2} \right)^2}} \right)$$

Announced targets:

$$\tilde{\gamma}_t = (1 - \kappa_t)\tilde{\gamma}_{t-1} + \kappa_t \left(1 - \frac{\epsilon_t}{\left(\frac{ac}{2} - \pi_t^o \right)} \right), \kappa_t = \left(\frac{1}{1 + \frac{\sigma_\epsilon^2}{\tilde{\sigma}_{t-1}^2 \left(\frac{ac}{2} + \pi_t^o \right)^2}} \right)$$

Announcements v/s No Announcements

1. The speed of adjustment (K_t) is higher for the case with announced inflation targets. That is,

$$\hat{\kappa}_t < \kappa_t$$

2. Inflation surprise is smaller in the case with announcements,

$$\left(1 - \frac{(\pi_t^o + \epsilon_t)}{\frac{(ac)}{2}} \right) < \left(1 - \frac{\epsilon_t}{\left(\frac{(ac)}{2} - \pi_t^o \right)} \right) \quad (18)$$

Why does a small inflation surprise matter?

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- ▶ Suppose the economy begins with high inflation of 20%.
- ▶ Let the central bank announce a target of 18 %.
- ▶ Let realised inflation be close to 18%.

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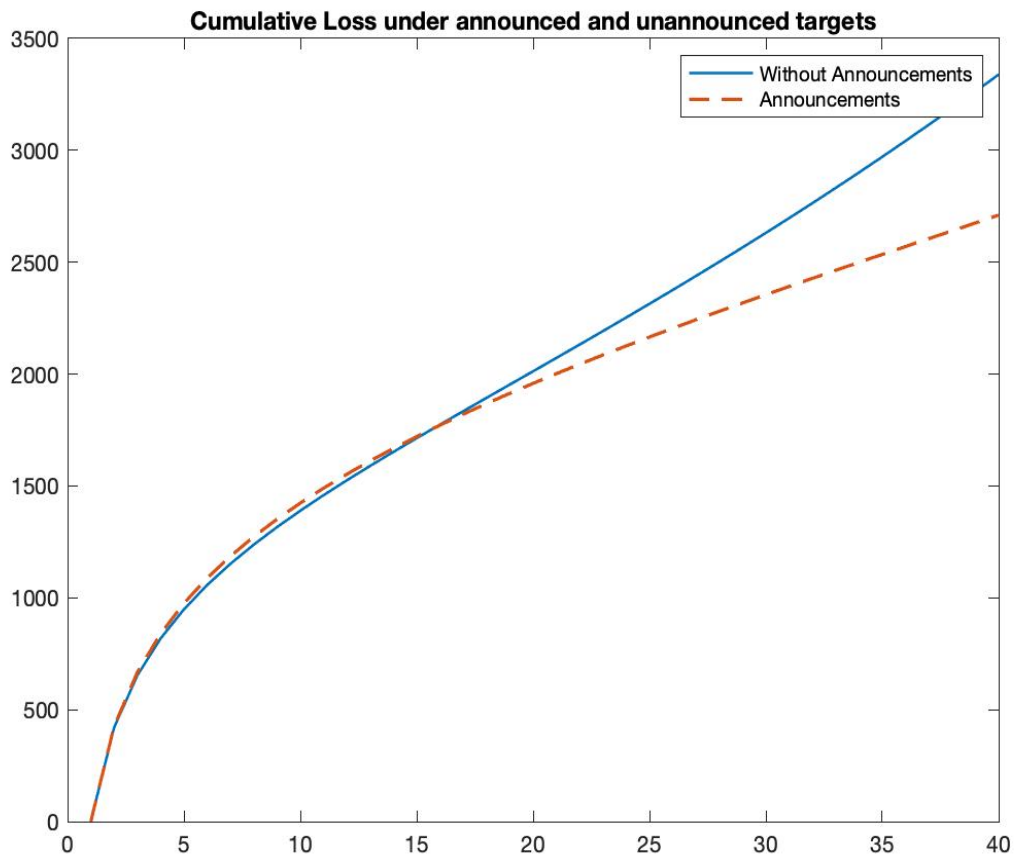
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- ▶ Then agents must update their view on how much the central bank cares about inflation.
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- ▶ Of course, this could be luck. But if the next target is 16% and the central bank achieves it, then agents must revise their expectations again.
- ▶ Subsequently, the central bank slowly builds credibility.
- ▶ However, when there is no announced target, changes in inflation could be attributed to ε_t . Thus, taking longer for agents to learn.

Cumulative Loss with and without announcements



Cumulative Loss with and without announcements

- ▶ Loss for the first 15-20 quarters is similar in the announcement and no announcement case.
- ▶ However, over time the central bank is able to build credibility
- ▶ Agents learn that the central bank is committed to the announced targets.
- ▶ Subsequently, the welfare loss starts declining.

Conclusion

- ▶ Having intermediate targets alone does not help with building credibility.
- ▶ Announced inflation targets reduce the surprise for agents.
- ▶ The reduced surprise helps with short and long term credibility.

Next Steps

- ▶ Compute optimal disinflation sequence
- ▶ Compute optimal inflation target
- ▶ Embed the model of intermediate targets into a larger DSGE model to be able to compute the welfare gains from the targets and the credibility of the central bank.

Thank You!