

## We're Gonna Need A Bigger Boat

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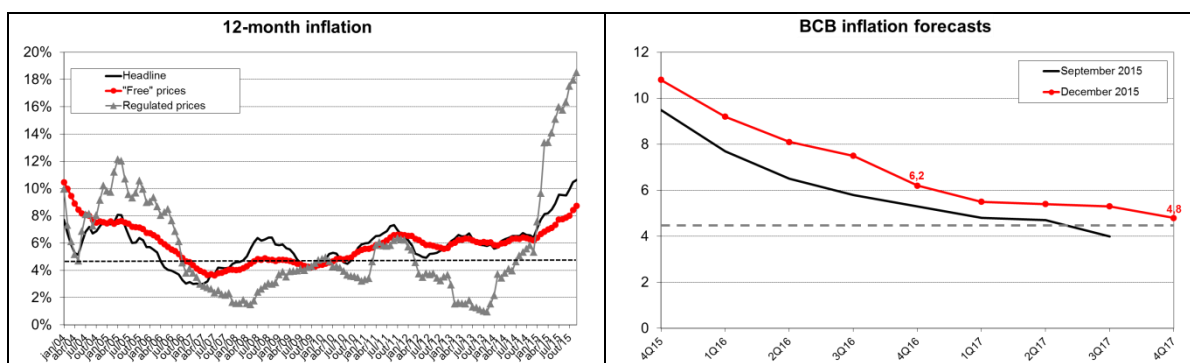
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- *As inflation stands at double digit levels, BCB has pledged in its formal communication to “adopt the necessary measures in order to (...) keep inflation within the limits set by the National Monetary Council in 2016, and make inflation converge to the 4.5% target in 2017”;*
- *Tough talk notwithstanding, there are doubts regarding BCB’s resolve, made worse by its governor recent statement on IMF’s revisions about Brazilian growth, which signaled a far softer approach to the inflation problem, even though the risks of inflation remaining above the 6.5% threshold are increasing by the day;*
- *We note that disinflation is likely to have become more costly. Price and wage setting behavior seems more backward looking in recent times than it was some years ago. In consequence, a higher effort in terms of monetary policy (hence in terms of a more negative output gap);*
- *We assign most of the blame for higher inflation persistency to the Central Bank monetary policy stance of these past 5-6 years. Having extended inflation’s convergence period, BCB created incentives for a higher weight to past inflation in forming inflation expectations;*
- *These developments put the Central Bank in an awkward position. As it faces difficulties in committing itself to a fast convergence path, it might get stuck in a bad equilibrium, in which the public believes that the Central Bank would always opt for a slow convergence, and, for this reason, it has no alternative but sanction this belief, locking the economy in a persistent inflation equilibrium;*
- *Thus, pushing inflation down requires deeper recessions. Even an output gap commensurate to the one that materialized in early 2009 would not suffice to promote the same fast disinflation. In contrast to what was observed at that time, inflation expectations are nowhere close to the target. Therefore the output gap would have to become even more negative than in was in early 2009 to do the job*
- *This is not a reason to avoid fighting inflation. Since there is no stable trade-off between inflation and economic activity, choosing not to fight inflation is unlikely to help output permanently. Besides, the problem would get worse down the road. The failure to confront inflation increases the odds that it becomes a non-stationary process, requiring even harsher measures to push it down some years into the future.*

Having allowed inflation not only to pierce through the upper threshold of the inflation target, but to reach double digit levels, BCB has pledged in its formal communication (*Minutes*, *Quarterly Inflation Report*, and, more recently, the *Open Letter to the Finance Minister*) that it will do the utmost to reverse this trend. More to the point, it wrote (in all the documents above):

*Independently from the definition of other policies, the Committee will adopt the necessary measures in order to assure the fulfilment of the inflation target regime objectives, that is, keep inflation **within the limits set by the National Monetary Council in 2016**, and make inflation converge to the 4.5% target in 2017". [Our emphasis]*

This pledge notwithstanding, there are substantial doubts about BCB's resolve, made worse in the past few days since its governor decided to publish in the institution website his comments on the recent downgrade of Brazilian growth forecasts prepared by the IMF, prompting interpretations that, despite the tough talk above, when it comes to the real business of monetary policy, BCB would talk the talk, but never walk the walk.



Sources: IBGE and BCB

As its (usually optimistic) inflation forecasts suggest, there is a substantial risk of missing the inflation target range once more in 2016, in a direct violation of the pledge.

Yet, there are reasons to believe that bringing inflation back in track (in 2017, mind you, certainly not 2016) is a costly proposition. As we intend to show in this report, as price (and wage) setting behavior becomes more backward looking, inflation persistency (or *inertia*) increases, with important implications for monetary policy.

Indeed, under higher persistency, the same initial deviation of inflation from the target requires an additional effort in terms of monetary policy to promote the same amount of disinflation, which implies a more negative output gap (or higher unemployment) for a longer period.

We assign most of the blame for higher inflation persistency to the Central Bank monetary policy stance of these past 5-6 years. Having extended inflation's convergence period, BCB created incentives for a higher weight to past inflation in forming inflation expectations, which makes inflation more persistent, and – as argued – requires more in terms of the output gap to push inflation down towards the target.

These developments put the Central Bank in an awkward position. As we show, it faces difficulties in committing itself to a fast convergence path, although this could be more desirable in terms of both inflation and economic activity. As a result, it might get stuck (which seems increasingly to be the case) in a bad equilibrium, in which the public believes that the Central Bank would always opt for a slow

convergence, and, for this reason, it has no alternative but sanction this belief, locking the economy in a persistent inflation equilibrium.

In consequence, pushing inflation down requires deeper recessions. We argue that an output gap commensurate to the one that materialized in early 2009, on the back of the financial crisis, would not – unlike then – suffice to promote the same fast disinflation. In contrast to what was observed at that time, inflation expectations are nowhere close to the target, partially due to the loss of credibility, partially due to higher inflation persistency. These developments suggest that the output gap would have to become even more negative than in was in early 2009 to do the job.

Under these circumstances, the natural question is whether lowering inflation is worth all this trouble. As we see it, it is, essentially because there is no stable trade-off between inflation and economic activity, which implies that choosing not to fight inflation is unlikely to help output permanently.

Worse, there are reasons to believe that the problem should get worse down the road. The failure to confront the inflation problems increases the odds that inflation becomes a non-stationary process, requiring even harsher measures to push it down some years into the future.

Sure, this would probably be someone else's problem, but an institutionally minded board ought to prevent this from happening. Unfortunately, this does not seem to be the current case.

### Monetary policy under inflationary inertia

There are at least two ways of introducing inflationary inertia into a simple macro model.

We shall begin by the most straightforward (and least interesting) one, assuming that, when setting their prices, companies and workers alike do not take in consideration only the current state of the economy (captured by the output gap,  $y$ ), but also inflation expectations ( $E_t\pi_{t+1}$ ) and past inflation,  $\pi_{t-1}$ , in addition to a random supply shock,  $e_t$ , as described by the Phillips Curve below.

$$\pi_t = \rho\pi_{t-1} + (1 - \rho)E_t\pi_{t+1} + \alpha y_t + e_t; \alpha > 0; 0 \leq \rho < 1 \quad (1)$$

The output gap in the present context depends only on the distance between the actual real interest rate (defined as the difference between the nominal interest rate,  $i_t$ , and expected inflation,  $E_t\pi_t$ ) and the neutral rate, plus a demand shock,  $u_t$ .

$$y_t = -\beta(i_t - E_t\pi_t - \bar{r}) + u_t \quad (2)$$

Closing the model we specify a simple rule for monetary policy: the Central Bank sets the nominal interest rate in response to the difference between expected inflation and the target. Whenever expected inflation rises above the target, the Central Bank raises the real interest rate, and, conversely, it pushes down real rates when expected inflation reaches below the target.

$$i_t = \bar{r} + E_t\pi_t + a(E_t\pi_t - \bar{\pi}); a > 0 \quad (3)$$

Combining (1) to (3) we arrive at the following second degree difference equation:

$$E_t\pi_t = \omega(1 - \rho)E_t\pi_{t+1} + \omega\rho\pi_{t-1} + (1 - \omega)\bar{\pi} \quad (4)$$

where  $\omega = 1/(1 + \beta\alpha)$ .

In this case, the solution to (4) is given by the following equation:

$$E_t \pi_t = \varphi \pi_{t-1} + (1 - \varphi) \bar{\pi} \quad (5)$$

where  $\varphi$  is the stationary (i.e., lower than 1<sup>1</sup>) root of the second degree equation:

$$\varphi^2 - \frac{1}{\omega(1 - \rho)} \varphi + \frac{\rho}{1 - \rho} = 0$$

In this case, expected inflation will be the weighted average of past inflation and the target, that is, inflation will display persistency or *inertia*, but, recall, this stems from our initial assumption that current price setting depends on past inflation. In a way we already assumed inertia, hence it is not surprising to observe it popping up.

Notice, however, that, as long as “ $a$ ” is positive, that is, as long as the Central Bank reacts to higher inflation expectations, inflation persistency,  $\varphi$ , is lower than the parameter associated to past inflation in the Phillips curve,  $\rho$ . In other words, active monetary policy reduces the influence of past inflation on current inflation.

Leaving this issue aside for the moment (we will return to it in the next section), if, under monetary policy rule (3), the behavior of expected inflation is given by (5), interest rates would be given by:

$$i_t = \bar{r} + \bar{\pi} + \varphi(1 + a)(\pi_{t-1} - \bar{\pi}) \quad (6)$$

That is, the Central Bank would have to hike interest rates above the neutral level ( $\bar{r} + \bar{\pi}$ ), whenever past inflation reaches above the target. For a given deviation of past inflation from the target, the difference between the policy rate and its neutral level depends on the parameter  $a$ , which captures how much the Central Bank dislikes deviations of inflation from the target, and from the “persistency parameter”,  $\varphi$ <sup>2</sup>.

It should be clear that, whenever  $\rho$  approaches zero,  $\varphi$  also converges to that value, that is, as the weight of past inflation in the Phillips vanishes, inflationary inertia also disappears. In this case, the policy rate approaches the neutral rate and we can say that lower inertia implies lower interest rates (assuming, of course, that past inflation was above the target).

In case  $\rho = 1$ , equation (4) becomes

$$E_t \pi_t = \omega \pi_{t-1} + (1 - \omega) \bar{\pi} \quad (4a)$$

That is, even under a completely backward looking Phillips curve, inflation is not random walk, but rather a weighted average of past inflation and the target (as long as  $a$  is not zero, more on this at the end of this section). In this case,  $\varphi = \omega = 1/(1 + \beta \alpha a)$ . Hence (6) can be re-written as:

$$i_t = \bar{r} + \bar{\pi} + \omega(1 + a)(\pi_{t-1} - \bar{\pi}) \quad (6a)$$

That is, in the other polar case ( $\rho=1$ ), if past inflation reached higher than the target in a given year, then the interest rate must be set higher than its neutral level. In case the output gap is not very sensitive to real interest rates ( $\beta$  is small), or inflation is not sensitive to the output gap ( $\alpha$  is small), then  $\omega$  is large, and the difference between the policy and the neutral rate is high. Conversely, if the output gap is sensitive to interest

<sup>1</sup> Technically speaking these models display saddle-path properties, that is, one stationary root and a non-stationary root. This allows a sole equilibrium path, rather than multiple paths converging to the steady-state.

<sup>2</sup>  $\varphi$  is not actually a parameter, but rather a combination of parameters, which, in other settings, should reflect the model’s primitives, that is, preferences and technology. Yet, for explanatory purposes, we might think of it as a “persistency parameter”.

rates and/or inflation reacts strongly to the output gap, the difference between the policy and neutral rates would be small.

The limiting cases for the “persistency parameter”  $\phi$  are, therefore,  $\phi=0$  for  $\rho=0$  and  $\phi=\omega$  for  $\rho=1$ . Hence, the more backward looking are economic agents (the closer is  $\rho$  to 1), the higher is  $\phi$ , which means that, for any given past deviation of inflation from the target, the stronger must be the Central Bank’s response in terms of interest rates.

Looking now at the expected output gap, it can be written as:

$$E_t y_t = -\beta a \phi (\pi_{t-1} - \bar{\pi}) \quad (7)$$

That is, whenever inflation deviates above the target in a given period, the output gap must become negative in the following period (in response to interest rates above neutral), gradually converging to zero. The speed of convergence, as with inflation, depends on the “persistence parameter”  $\phi$ . Thus, for  $\rho = 1$  (hence  $\phi = \omega$ ), the speed of convergence would be the lowest, whereas as  $\rho$  approaches zero, the speed of convergence reaches close to infinity (convergence would be immediate). Hence, the more backward looking are economic agents, the longer it would take for the output gap to return to zero.

Although the model is a simple one, it allows us to arrive at a few general conclusions.

First, even assuming that agents are fully backward looking, inflation does not become entirely inertial in the sense of replicating past inflation plus a random shock under the form:

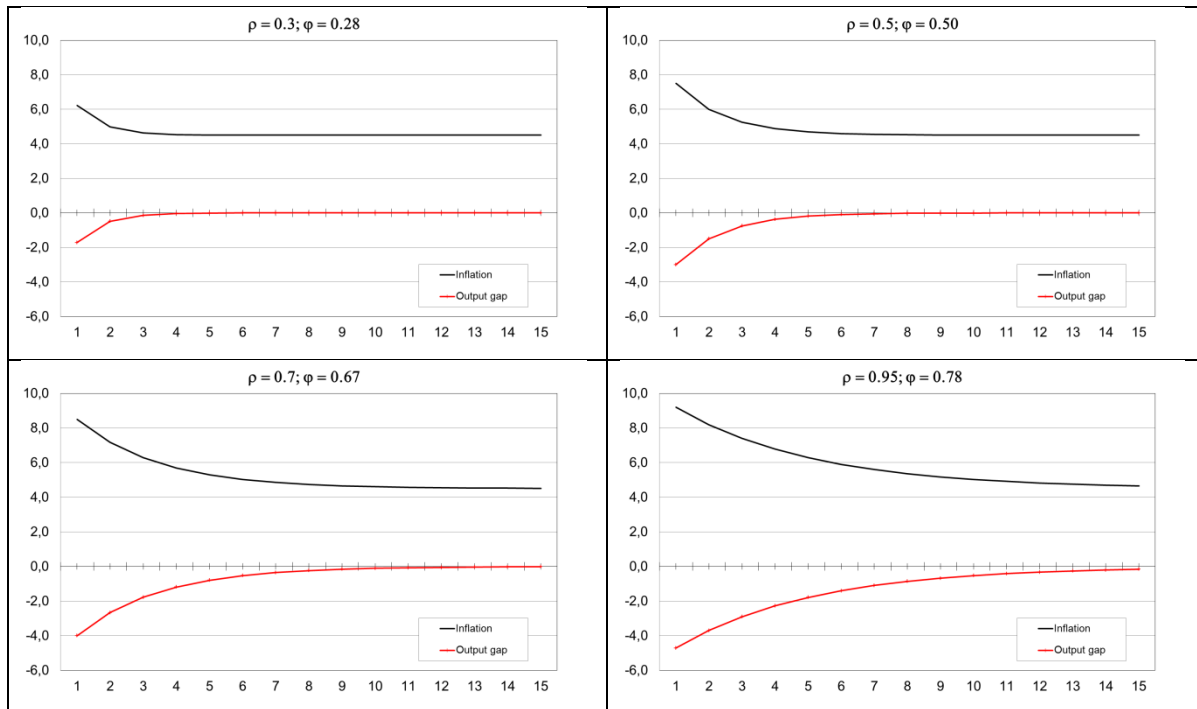
$$\pi_t = \pi_{t-1} + \epsilon_t \quad (8)$$

which would characterize inflation as a random walk, that is, a non-stationary process. Inflation would remain a stationary process, even under  $\rho=1$ , as long as the parameter  $a$ , which captures the intensity of the reaction of the Central Bank to deviations of inflation from the target, is positive<sup>3</sup>.

In so many words, as long as the Central Bank remains mindful about inflation ( $a>0$ ), reacting to its deviations from the target, inflation would return to the target, although the speed of convergence would depend crucially on parameters such as “ $a$ ” and “ $\rho$ ”. In particular, convergence can take a longer time even if  $\rho$  remains constant, but  $a$ , for whatever reason, decreases.

Second, monetary policy loses efficiency as  $\rho$  increases, that is, as agents become more backward looking. For any given deviation of inflation from the target, a higher deviation of the policy rate from its neutral level would be necessary. Yet, as we noted above, there is a limit to efficiency losses: monetary policy does not become completely inefficient even for fully backward looking agents, remaining able to push inflation back to the target, at a higher output cost, of course.

<sup>3</sup> For the sake of completeness,  $\omega$  would be lower than 1 as long as both  $\beta$  (the sensitivity of the output gap to interest rates) and  $\alpha$  (the sensitivity of inflation to the output gap) are positive, in addition to  $a$ . Having said that, these are not parameters that the Central Bank would set, contrary to the case of parameter  $a$ , hence our attention to it in particular.



Source: S&A

The charts above illustrate the phenomenon. Just to add a touch of realism (just a smidge!), we assumed a 4.5% target and initial (at period  $t=0$ , not shown in the charts) inflation at 10.5%. We assumed different values for  $\rho$ , the backward looking parameter in the Phillips curve and calculated the implied value of the inflation persistency parameter,  $\phi$ . Unsurprisingly, the more backward looking are agents, the longer it takes for inflation to converge to the target.

More importantly, under high persistency convergence requires the initial output gap to become more negative: for  $\rho=0.3$ , which implies  $\phi=0.285$ , the initial output gap would be around -2%, whereas for  $\rho=0.95$  ( $\phi=0.78$ ) it would reach between -4.5% and -5.0%. In addition to that, it would remain in negative territory for longer. For instance, under  $\rho=0.3$ , the output gap would be indistinguishable from zero as early as  $t=4$ ; under  $\rho=0.7$  it would take some 12 periods to get sufficiently close to zero, and more than 15 periods for  $\rho=0.95$ .

### Inflationary inertia and monetary policy

A more interesting way of addressing the issue doesn't assume any kind of backward looking behavior in the Phillips curve, which would be written as:

$$\pi_t = E_t \pi_{t+1} + \alpha y_t + e_t ; \alpha > 0 \quad (1a)$$

Prices are set today based on the state of the economy (the output gap) and inflation expectations.

The demand side remains the same, as described by (2), but now we allow the Central Bank to choose the speed at which inflation would converge to the target. Indeed, rather than sticking to rule (3), we assume that the Central Bank sets interest rates as a weighted average of the past interest rate,  $i_{t-1}$ , and the one that would be given by equation (3), that is:

$$i_t = \mu i_{t-1} + (1 - \mu)[\bar{r} + E_t \pi_t + \alpha(E_t \pi_t - \bar{\pi})]; 0 \leq \mu \leq 1 \quad (3a)$$

One can easily see that, for  $\mu=0$ , we would be back to the original version of (3), whereas for  $\mu = 1$  the interest rate would be constant, i.e., the Central Bank would never react to deviations of expected inflation from the target. In between, the closer  $\mu$  is to zero, the faster would be the convergence of inflation towards the target, and, conversely, the closer it is to one, the slower would be convergence.

Combining (1a) to (2) and (3a) we arrive at the following second-order difference equation:

$$E_t \pi_t = \omega_1 E_t \pi_{t+1} + \omega_2 \pi_{t-1} + (1 - \omega_1 - \omega_2) \bar{\pi} \quad (9)$$

$$\text{where: } \omega_1 = \frac{1}{1 + \alpha \beta [a(1-\mu) - \mu]} \text{ and } \omega_2 = \frac{-\alpha \beta \mu}{1 + \alpha \beta [a(1-\mu) - \mu]}$$

Again, the solution to (4a) would take the form of expected current inflation being the weighted average of past inflation and the target, formally identical to (5):

$$E_t \pi_t = \theta \pi_{t-1} + (1 - \theta) \bar{\pi} \quad (10)$$

$$\text{where } \theta = \frac{(\omega_2 - \gamma_1)}{1 - \omega_1(1 - \gamma_1)} \quad \text{and } \gamma_1 \text{ is the stationary root of:}$$

$$\gamma^2 - (1/\omega_1)\gamma + (\omega_2/\omega_1) = 0$$

Nice technicalities apart, now inflation persistency arises from the Central Bank behavior in terms of its monetary policy. It can be shown that in the case of  $\mu = 0$ ,  $\theta = 0$  as well, and **expected** inflation is always at target (although inflation itself might deviate temporarily due to supply and demand shocks). By the same token, for  $\mu = 1$ ,  $\theta=1$  and expected inflation would always be equal to past inflation (hence actual inflation would follow a random walk, as in (7)).

That is, the longer the Central Bank sets the convergence period, the higher persistency would be. The intuition, amazing as it might sound, is straightforward.

Consider initially the case of a Central Bank that faces no inertia from the behavior of price setters and sets  $\rho = 0$ , that is, convergence is immediate. Expected inflation is, thus, always at the target, although, once again, actual inflation might deviate thanks to the aforementioned demand and supply shocks. On average, however, actual inflation is equal to the target.

Knowing that, the best guess for inflation in any given period, considering that demand and supply shocks are not known in advance, is always the inflation target.

Suppose, instead, that, faced with a large shock, that pushed inflation way out of the target, the Central Bank, for some reason, decides for slower convergence, setting  $\mu > 0$ . To simplify things, assume that the Central Bank decides to reach the target only 3 years from now, uniformly distributing convergence towards the target.

It should be clear that, under these circumstances, it is no longer optimal to believe that inflation in the current period will be at the target (plus unforeseen shocks). It will be, if everything plays out right and no shocks interfere, one third of the way between past inflation and the target at the end of the first year, two thirds of the way in the second year and at the target in the third.

The best bet for inflation in the current year would be, therefore, a weighted average of past inflation (with weight 2/3) and the target (with weight 1/3). That is, slower convergence introduces optimal inertia in inflation expectations.

We do not have, therefore, to assume backward looking agents to conclude that inflation would have an inertial component as well, that is, the “persistence parameter” (in the current case,  $\theta$ ) would result from BCB’s decisions about the speed of convergence.

Sure, it might even be the case that we have **both** forces at work, backward looking agents and a Central Bank that favors slow convergence, contributing for persistent inflation<sup>4</sup>.

That said, if we have to come up with a reason for the **recent** increase in inflation persistence, it seems far more likely that the change comes from the Central Bank’s different stance regarding the speed of convergence than some unexplained modification in individuals behavior. For this reason we tend to assign higher persistence precisely to the extension of the convergence period after 2011<sup>5</sup>.

### Reputational implications and the output gap

If our reasoning is true, there are good reasons to believe that higher inflation persistence stems from a more relaxed stance in terms of monetary policy. Having said that, the natural question is whether a change in the Central Bank’s stance, now favoring faster convergence, would necessarily reduce persistence.

We would expect the answer to be a positive one, yet, there are complications related to the perception about the Central Bank’s actual intentions. Indeed, it is one thing to state that it aims at faster convergence; it is another once we try to gauge the Central Bank incentives to do so.

More to the point, people can believe the Central Bank, or not. If they believe the pledge for faster convergence, they would set their inflation expectations to be equal to the target (the case  $\mu = 0$ , discussed above). In this case, BCB could choose between a fast convergence ( $\mu = 0$ ), or slow convergence ( $\mu > 0$ ).

Should it go for fast convergence, it can be shown that the output gap would be, on average, zero, that is, the economy would operate at its potential. Yet, in case people believe in fast convergence, but BCB actually opts for slow convergence, it would obtain short term gains, that is, the output gap would be positive (the economy would be operating above potential, or unemployment below the natural rate).

Hence, an output minded Central Bank would go for slow convergence, even if agents believe in fast convergence.

Suppose, instead, that people do not believe in the Central Bank promises, and therefore insist in setting their inflation expectations as a weighted average of past inflation and the target. Under these circumstances, if the Central Bank attempts fast disinflation, it will cause a negative output gap, in order to offset the inflationary effects of above target expectations, that is, disinflation would be costly.

If, however, faced with incredulous agents, who believe that inflation would remain above the target, the Central Bank would go for slow convergence, it can be shown that it would get a positive output gap as well.

<sup>4</sup> In this case we would combine equations (1), (2) and (3a) to arrive at a third degree difference equation, which would be too hard to solve, certainly for me. Having said that, the final solution would most likely be a second order difference equation according to which expected inflation would be a weighted average of inflation two periods ago, inflation one period ago and the inflation target. Should someone actually crack it, please let me know.

<sup>5</sup> We are being possibly too generous here. There are legitimate doubts on whether BCB has actually pursued 4.5% at any time after 2011, but we are leaving this stone unturned. That said, there is no dispute that BCB has extended the convergence period from 2011 onwards.

The possible outcomes of these combinations can be summarized in the table below<sup>6</sup>.

Convergence	Expected output gap	
	Expected inflation	
	$E_t \pi_t = \bar{\pi}$	$E_t \pi_t = \theta \pi_{t-1} + (1 - \theta) \bar{\pi}$
Fast	Zero output gap	Negative output gap
Slow	Positive output gap	<b>Positive output gap</b>

Source: S&A

As one can see, by choosing slow convergence, the Central Bank would always obtain a better result in terms of economic activity than going for fast convergence. Knowing this, however, agents would not believe the Central Bank, regardless of its promises of fast convergence, and would set their expectations under the assumption that the Central Bank would opt for slow convergence.

In other words, the (sub-game perfect Nash) equilibrium in this setting would be for agents to expect persistent inflation and the Central Bank to go for slow convergence (for this reason we mark the Southeast corner of the table above in yellow). The Central Bank would be locked in this equilibrium and unable to convince agents that it would be really serious about fast convergence. Does it ring any bells?

According to this interpretation, therefore, inflationary inertia, hence the low speed of convergence results from the Central Bank's difficulties of committing itself to the path of fast convergence, analogous to the classic problem of commitment to low inflation<sup>7</sup>.

In this setting, the apparent loss of monetary policy efficiency reflects actually a credibility issue. "Credibility" in the sense that we use here is not the everyday notion, that is, an intrinsic feature of the institution (or its board), but rather the congruence between its actions and objectives, that is, whether following a particular action (say, fast convergence) would be consistent with its preferences (a positive – or less negative – output gap) or not.

### Some final thoughts

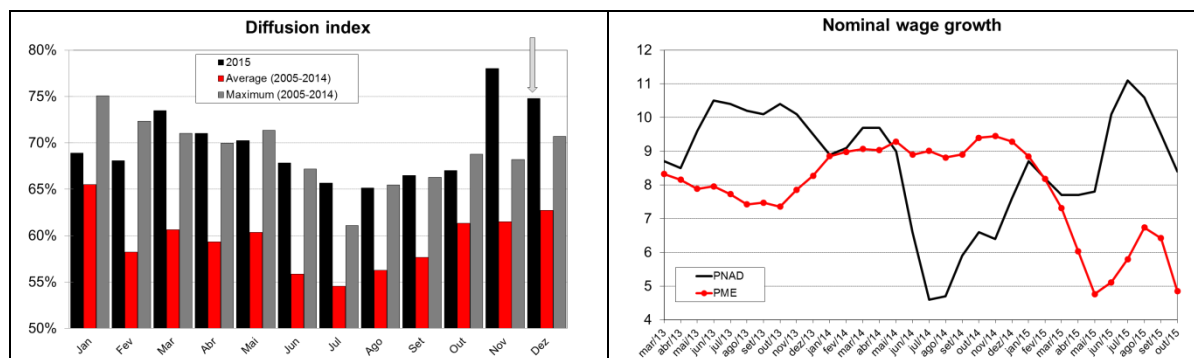
There are signs that inflation has become more resilient recently. To be sure, there is substantial noise in the data, as the adjustment of regulated prices pushed headline inflation and possibly contaminated, to some extent, even inflation measures that explicitly exclude regulated prices, such as market prices inflation, or core inflation calculated by the exclusion of regulated and foodstuff prices.

Noise apart, inflation has been not only high, but widespread, while nominal wage growth (according to PNAD data) appears to be much higher than would be warranted by an unemployment rate around 10% (in seasonally adjusted terms). These developments hint at an increasingly backward looking behavior<sup>8</sup>.

<sup>6</sup> Although we present this as a table, this should not be thought as a simultaneous game, but rather as a sequential one, in which agents first decide to believe BCB or not, and then BCB decides to go for fast or slow convergence.

<sup>7</sup> Robert Barro and David Gordon (1983) "A Positive Theory of Monetary Policy in a Natural Rate Model" [http://www.jstor.org/stable/1831069?seq=1#page\\_scan\\_tab\\_contents](http://www.jstor.org/stable/1831069?seq=1#page_scan_tab_contents)

<sup>8</sup> For a more thorough empirical analysis of the data, please refer to our report "Inflationary inertia and the inert Central Bank", June 17, 2015.



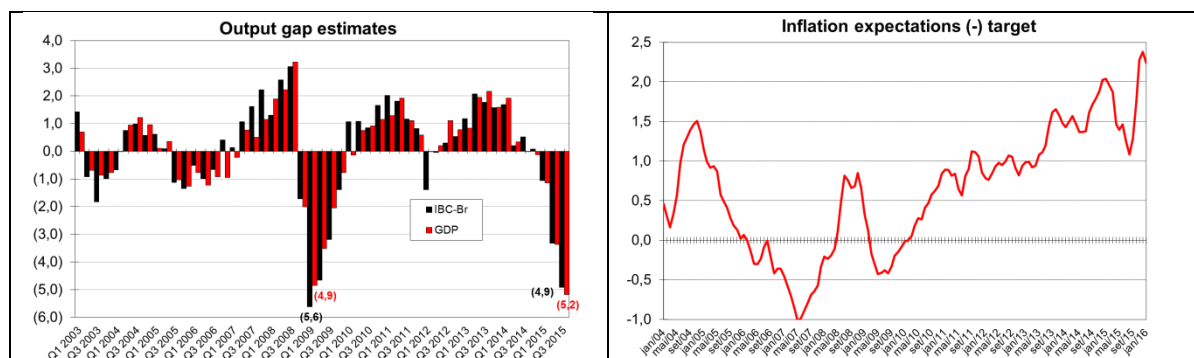
Source: S&A (from IBGE data) and IBGE

As for the cause, while we have argued that monetary policy stance does lead to inflationary inertia, there are most likely other factors at work, ranging from high inflation itself, which apparently encourages indexation practices, to the periodic adjustment of the minimum wage<sup>9</sup> according to past inflation.

This implies that, as we have seen, a loss in monetary policy efficiency: higher interest rates and a larger negative output gap are required to cope with inflation deviation from the target. Or, to put it differently, the costs of disinflation rise as price/wage setting behavior becomes more backward looking.

This brings us to the first crucial question, namely would not the current recession take care of the problem? Probably not.

In the chart below at the left we summarize estimates of the output gap using both GDP and IBC-Br<sup>10</sup>. GDP output gap in 3Q2015 stood at -5.2%, somewhat lower than our estimates for 1Q2009, at the height of that year's recession, which reach -4.9%. Back in 2009 the negative output gap contributed to pushing down inflation from 6.0-6.5% in the last quarter of 2008 to 4.0-4.5% one year later, that is, a sizable 1.5-2.0% disinflation.



Source: S&A (from BCB and IBGE data) and BCB

The current output gap is likely to be more negative than estimates for 3Q2015. For instance, IBC-Br based estimates for October 2015 put it at -5.3% versus -4.8% in

<sup>9</sup> PME data indicates that the usual median wage in the 6 metropolitan regions surveyed stood at nearly R\$ 1.500/month, whereas the minimum wage (R\$ 788/month last year) is little more than half of it. In other words, 50% of those employed receive wages that are nearly more than twice the minimum wage. We could not find figures on the minimum wage for PNAD (national) data. Taking, at least for the time being, PME data, there are good reasons to believe that, at least directly, minimum wage indexation has little bearing on overall wage indexation. Indirectly, however, that is, setting an example, it might be the case that minimum wage indexation encourages overall indexation.

<sup>10</sup> GDP based estimates are, of course, far more relevant than those based on IBC-Br, which is, after all, just an attempt to anticipated GDP behavior using monthly available figures. Yet, we have estimates of IBC-Br up to October 2015, whereas GDP data reaches only up to September 2015. As we make references to more recent monthly IBC-Br figures, it is important to have a glimpse at the difference between these estimates.

September. Having said that, should we expect disinflation at more than 1.5-2.0% for the next 12 months?

The answer would be positive, if inflation expectations and inertia were commensurable to those observed (or estimated) in 2009. This is certainly not the case.

Back in 1Q2009 inflation expectations 12 months ahead were about 10bps above the 4.5% target, whereas as we speak, inflation expectations 12 month ahead stand at 2.0-2.5% above the target. By the same token, as argued, inflation persistency has increased. Both developments hint at the need of an even deeper output gap to promote the necessary disinflation from over 10% right now to something around 6.5% at the end of the current year and 4.5% in 2017.

At this point, we cannot ascertain how much, but the current output gap, notwithstanding the severity of the recession, does not look to be up to the task. It looks like [we're gonna need a bigger boat](#).

Having said that, the second crucial question is whether disinflation is worth it.

The answer, I argue, is yes. Although the costs of disinflation reach have become higher as inflationary inertia has increased and expectations have drifted away from the target, it does not follow that one can (or should) avoid permanently these costs. At the end of the day, after all, there is no permanent trade-off between inflation and unemployment.

Avoiding higher unemployment (or a more negative output gap) now does not preclude having to face the problem down the road, but then under conditions that are likely to be worse than they are now, as much as current conditions are much worse than those BCB faced some years back.

In case BCB does not react to higher inflation (that is, setting parameter  $\alpha$  in its reaction function at zero) it risks turning inflation into a non-stationary process. Higher inflation (actual or expected) reduces the real interest rate and feedback into higher inflation expectations, which reduce real interest rates even further and so on. It does not take much to figure out that such process is inherently unstable.

Under these circumstances, the costs of pushing inflation down in the future would increase as well, as they have done in recent years. The cynic in me rushes to note that this would probably be someone else's problem, but, institutionally speaking, today's Central Bank is only laying the ground for a much bigger problem for tomorrow's Central Bank.

Hence, in order to avoid the bigger problem in the future, BCB would have to deal with inflation now. The events of past few days suggest that it will not, increasing risks of inflation reaching even higher than currently expected. BCB is playing with fire once more, but this time there is a lot more gasoline to burn.