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SPECIAL REPORT – INFLATION

Anchoring of Inflation Expectations, Inertia and Risks for Inflation Outlook

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- **In an inflation-targeting regime (or, more specifically, an inflation-forecast targeting regime), the managing of inflation expectations is one of the most effective tools to control inflation dynamics.**
- **The anchoring of inflation expectations around the target, therefore, is of paramount importance for the Central Bank of Brazil (BCB), and recently there is a growing divergence between the BCB's forecast for IPCA 2022, and survey-based and market-based forecasts.**
- **In this report we calculate an anchoring index to investigate the level of anchoring of inflation expectations in Brazil to study its relation with the inflation inertia coefficient in a Phillips Curve.**
- **The findings of the study suggest (although there is still uncertainty) that after a period of strong anchoring (2017-2019), inflation expectations could be less anchored now and, as a consequence, the inertia coefficient could to be rising (to the detriment of the inflation expectations coefficient).**
- **If the signs pointed out here prove to be right, then they could be at least a part of the explanation for the divergence between the BCB's and the survey- and market-based forecasts for IPCA 2022 inflation. Hence, there might be an upside risk for the BCB's forecast, with possible consequences for the monetary policy as well.**

Introduction

In an inflation-targeting regime, the managing of inflation expectations is one of the most effective tools to control the inflation dynamics. Svensson (1997)[1] goes further and highlights that the inflation targeting approach implies an inflation-forecast targeting approach, where the central bank's inflation forecast is an explicit intermediate target, as it cannot control perfectly the current inflation itself.

The anchoring of inflation expectations around the target, therefore, is of paramount importance for a central bank following such regime, as is the case of the BCB, which publishes its own inflation forecasts. But it is worth noting that, for that system to work, it is not enough that the central bank's forecast is anchored around the target; it is also necessary that the market's expectations (or society's expectations as a whole) are anchored around the target, as ultimately, economic agents are the ones (and not the BCB) setting prices for the economy.

Recently there is a growing divergence between the BCB's inflation forecast for 2022 (its current monetary policy horizon) and the consensus forecast. The BCB is forecasting 3.5% for IPCA 2022 inflation, whereas the survey-based forecasts are at 4.0% (with a rising trend for seven weeks in a row) and market-based forecasts (the break-even inflation embedded in the yield curve) are already at 5.6% and on a rising trend. The target for 2022 is 3.5%, and our own forecast is even higher than the consensus: we project 4.3% for IPCA 2022, with upside risk.

In this report we calculate an anchoring index to investigate the level of anchoring of inflation expectations in Brazil and study its relation with the inertia coefficient in a Phillips Curve. The rationale is that a lower level

[1] "Inflation forecast targeting: Implementing and monitoring inflation targets", Svensson, L. E. O, 1997, European Economic Review, v. 41-6, p. 1111-1146

of expectations anchoring can increase the power of inertia, which could be one of the explanations between the divergence of the BCB's forecast and the consensus forecast (as per recent BCB's communication, they are not envisioning a relevant role of inertia for the inflation trajectory further ahead).

We highlight that the anchoring of the fiscal policy might also be impacting the anchoring of inflation expectations. We also calculate a fiscal anchoring index and show that the fiscal policy anchoring power is lowering, which might be another explanation for the rise in inflation expectations and the consequent distancing from the target.

If the anchoring of inflation expectations is indeed being reduced, this poses upside risks for our inflation outlook, as well as that of the BCB and the market. First, by the channel of rising inertia, which generates a self-fulfilling behavior for inflation dynamics, making it harder for the BCB to bring inflation down (or in other words, making it costlier—in terms of interest rate hikes—to reduce inflation via the reduction of inflation expectations). Second, the lower level of expectations anchoring itself might make the process of expectations formation also more inertial, with inflation expectations also entering a more self-fulfilling process, being less impacted by the BCB's actions. Our current high-frequency tracking is at 8.5% for IPCA 2022, 4.3% for IPCA 2022 and a convergence to the target of 3.25% only in IPCA 2023; but the risks highlighted in this study suggest that the disinflation process (in the absence of downward shocks) can be slower, posing upside risks, particularly for IPCA 2022 and IPCA 2023.

The anchoring of inflation expectations

The anchoring of inflation expectations is, in theory, an unobservable variable. However, we can measure it through indices proposed in the economic literature. De Mendonça and Souza (2007), for example, propose an index where the anchoring of inflation expectations is measured by how distant they are from the target and its tolerance bands.

The De Mendonça and Souza (2007)[2] index works as follows: if the 12-month forward inflation expectation (as measured by survey-based forecasts[3]), $E(\pi)$, is exactly at the target, π_t, the index is equal to 1. If inflation expectations are out of the tolerance band, $E(\pi) \geq \pi^*_{t,max}$ or $E(\pi) \leq \pi^*_{t,min}$ (either the upper or the lower bound), the index is 0. If it is within the tolerance band, $\pi^*_{t,min} < E(\pi) < \pi^*_{t,max}$, the index is between 1 and 0.

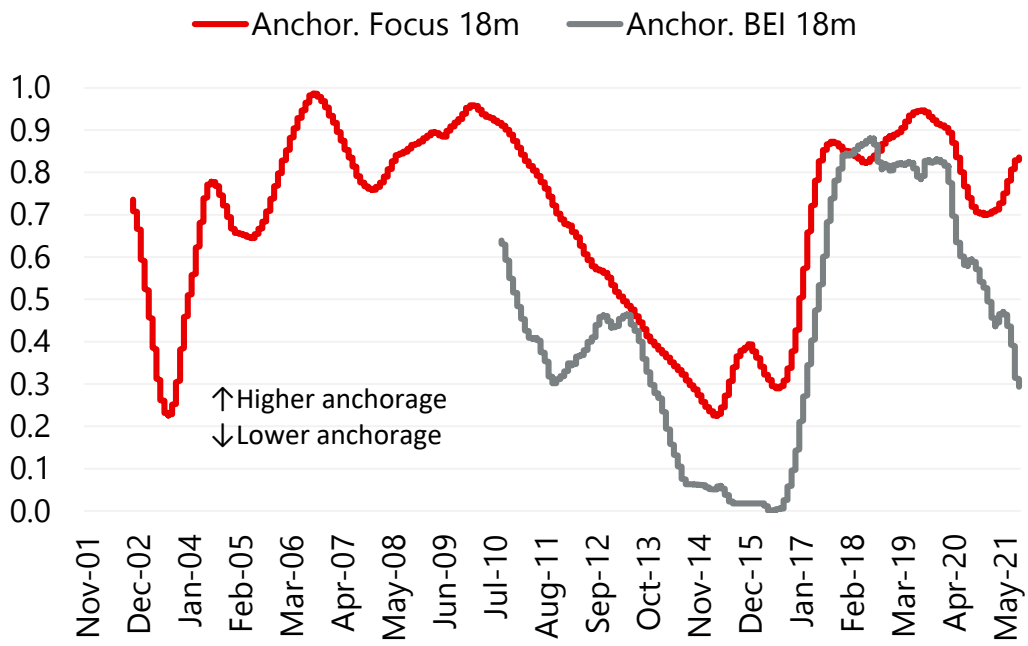
$$IEAI_{sb} = \begin{cases} 1 & ,if\ E(\pi) = \pi_t \\ 1 - \dfrac{1}{\pi^*_t - \pi_t}[E(\pi) - \pi_t] & ,if\ \pi^*_{t,min} < E(\pi) < \pi^*_{t,max} \\ 0 & ,if\ E(\pi) \geq \pi^*_{t,max}\ or\ E(\pi) \leq \pi^*_{t,min} \end{cases}$$

Relying on that baseline index, we make some adaptions. First, based on Vereda et. al. (2021)[4], we stretch the expectations horizon to 18-months. The rationale is that in 12-months the expectations might be influenced by temporary shocks, as in that period the BCB may not be able to fully act to curb expectations, if necessary. In 18-months ahead, however, monetary policy has already had its full impact, so expectations should not be influenced by temporary shocks. Second, we rely on De Mendonça, Garcia and Vicente (2020)[5] to propose an additional index substituting the survey-based expectations by market-based expectations (the so-called, break-even inflation, embedded in the yield curve). This adaptation is justified by the argument of De Mendonça, Garcia and Vicente (2020) that: "Using data from the Brazilian market, we present robust evidence that both survey-based and market-based inflation expectations have useful content to explain realized inflation. Moreover, we find that these proxies of inflation expectations provide different assessments of the central bank's ability to anchor inflation expectations. The findings point out that central banks must monitor both survey-based and market-based inflation expectations to improve their monetary policy conduct.".

[2] "Credibilidade do regime de metas para inflação no Brasil", De Mendonça, H. F. and Souza, G. J.G, 2007, Pesquisa e Planejamento Econômico.
[3] The BCB's Focus survey.
[4] "Expectativas de inflação, metas percebidas pelos agentes e credibilidade das autoridades monetárias", Vereda, L., Mamede, V., Karp, D. and Lerípio, R., 2020, Pesquisa e Planejamento Econômico, v. 50-3.
[5] "Rationality and anchoring of inflation expectations: An assessment from survey-based and market-based measures", De Mendonça, H. F., Garcia, P. M., Vicente, J. V. M., 2020, Journal of Forecasting, v. 40-6, p. 1027-1053.

The image below presents the series for both inflation anchoring indices, those being the survey-based and market-based ones. The indices are calculated using daily data, but we smooth it with a 63-day (3-month) moving average, as anchoring is something that should not be too volatile but take time to change. The fact that the market-based index starts in 4Q10 is because of data availability restrictions.

Figure 1. Inflation Expectations Anchoring Indices



Sources: Santander, based on De Mendonça and Souza (2007), De Mendonça, Garcia and Vicente (2020) and Vereda et. al. (2021).

From 2004 to 2010, anchoring remained at high levels, close to 1, but then started to fall. From 2011 to mid-2016, realized inflation was running close (or above) the upper bound of the BCB's target, justifying rising inflation expectations. Moreover, during this period a whole new macroeconomic framework was proposed ("*Nova Matriz Ecônomica*"), which was seen by the market as a framework less committed to fiscal sustainability. As a result, the inflation expectations anchoring lost power and was approaching 0. Since mid-2016 until the beginning of 2020, the BCB's management was changed twice and both administration's communications were perceived by the market as more committed to the central inflation-targeting. Also, the previous macroeconomic framework ("*Tripé Macroeconômico*") was resumed, with several economic reforms being passed by the Congress (such as, the spending cap rule, the social security reform, the job market reformulation, and change of the BNDES's reference interest rate). This resulted in a rapid re-anchoring of inflation expectations that came back to levels closer to 1.

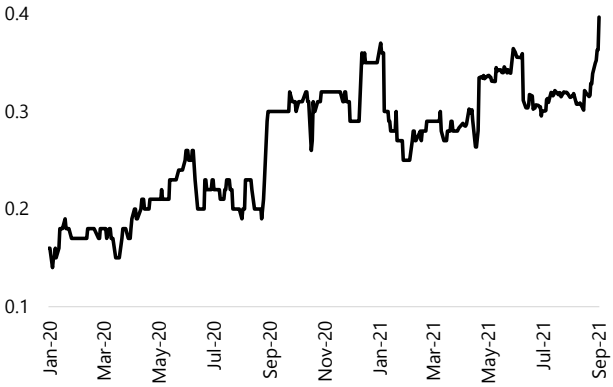
Since 2Q20, however, with the COVID-19 pandemic shock, the anchoring started to fall again and in the very recent period there has been a divergence between the two anchoring metrics. The survey-based inflation expectations anchoring index is rising again, whereas the market-based one continues to fall and is already below 0.5. The BCB recently argued in public communications that the level of anchoring is higher now than during the first-phase of the pandemic, which is in line with what the survey-based measure indicates. However, using the market-based anchoring index, the BCB's argument would not be valid and we know from De Mendonça, Garcia and Vicente (2020), that market-based expectations also have relevant information to explain realized inflation—and, as a consequence, should be also monitored by the BCB. Therefore, there is at least uncertainty about the current level of inflation expectations anchoring.

It is worth highlighting, however, that despite being more volatile, the market-based expectations tend to anticipate the survey-based forecasts (as per Granger-causality tests). Hence, there is a chance that the survey-based forecasts are still lagging the market-based ones and anchoring measured by survey-based expectations might also start to deteriorate further ahead.

Complementary, another way to measure inflation expectations anchoring is the one shown in Vereda and Curi (2016)[6], which calculates the disagreement in expectations of professional forecasters (in surveys, such as the Focus, by the BCB). According to them: "the levels of the term structures of disagreement in expectations about the IPCA inflation rate (…) have a strong negative relationship with central bankers' [*anchoring power*]".

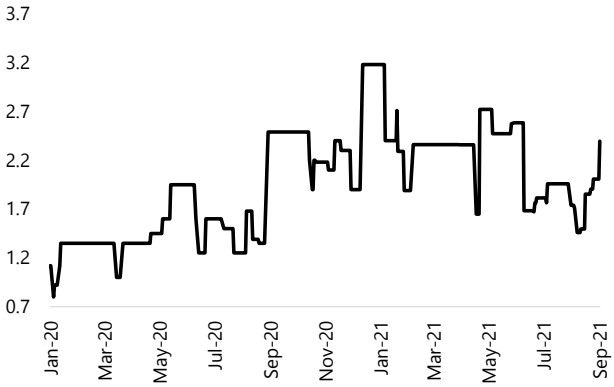
Figures 2 and 3 show two different measures of disagreement in inflation expectations: the standard-deviation of the Focus' survey forecasts and the amplitude (maximum-minimum) of the Focus' survey forecasts.

Figure 2. Standard-Deviation of Focus' IPCA 2022 expectations



Sources: BCB, Santander

Figure 3. Amplitude of Focus' IPCA 2022 expectations



Sources: BCB, Santander

Additionally, the monetary authority is not the only force driving expectations, and besides usual inflation determinants, the fiscal policy trajectory might also impact inflation expectations. In order to study this issue, we construct two fiscal policy anchoring indices, one backward looking and another forward-looking. We underscore that these are ways to measure a non-observable variable, so the dynamics of the series is more relevant than the level itself.

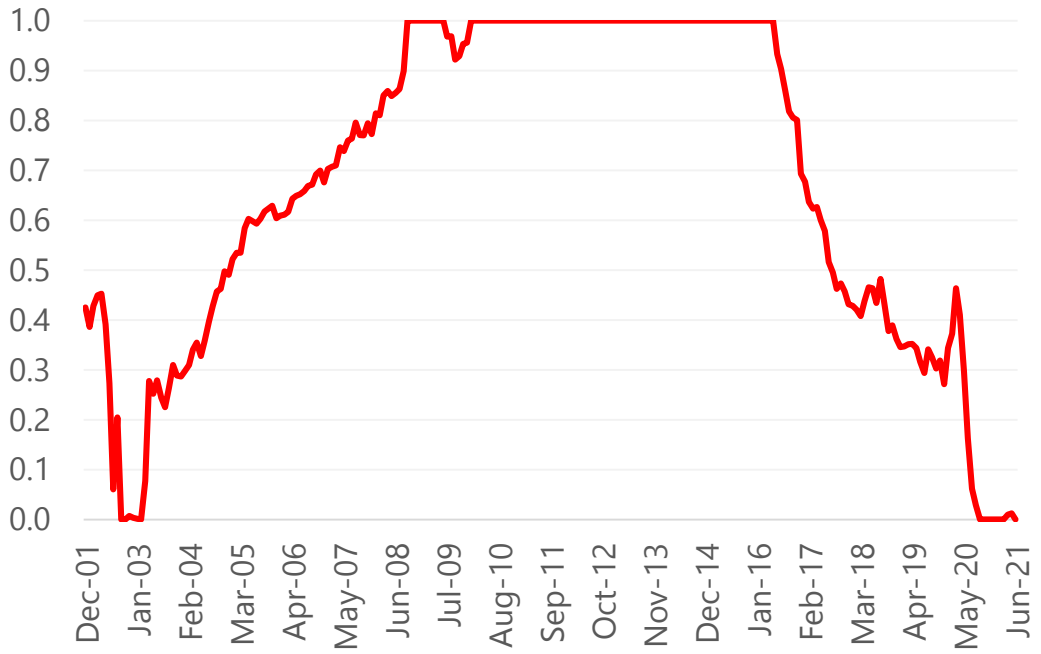
The first is based on Montes and Machado (2014)[7], which relies on the IMF suggested thresholds for debt-to-GDP ratio: if the debt-to-GDP ratio is below 40%, than the fiscal anchoring is 1, its maximum; if the debt-to-GDP is above 60%, then anchoring is 0, the lowest; finally, if debt-to-GDP is between 40% and 60%, the fiscal anchoring index is between 1 and 0.

$$FPAI_{bl} = \begin{cases} 1 & ,if\ \frac{debt}{GDP} \leq 0.4 \\ 1 - \frac{\frac{debt}{GDP} - 0.4}{0.2} & ,if\ 0.4 < \frac{debt}{GDP} < 0.6 \\ 0 & ,if\ \frac{debt}{GDP} \geq 0.6 \end{cases}$$

[6] "Disagreement in expectations and the credibility of monetary authorities in the Brazilian inflation targeting regime", Vereda, L. O. and Curi, A., 2016, EconomiA, v. 17, p. 56-76

[7] "Efeitos da credibilidade e da reputação sobre a taxa Selic e a transmissão da política monetária para o investimento agregado pelo canal dos preços dos ativos", Montes, G. C. and Machado, C. C., 2014, Pesquisa e Planejamento Econômico, v.44-2.

Figure 4. Backward-Looking Fiscal Anchoring Index



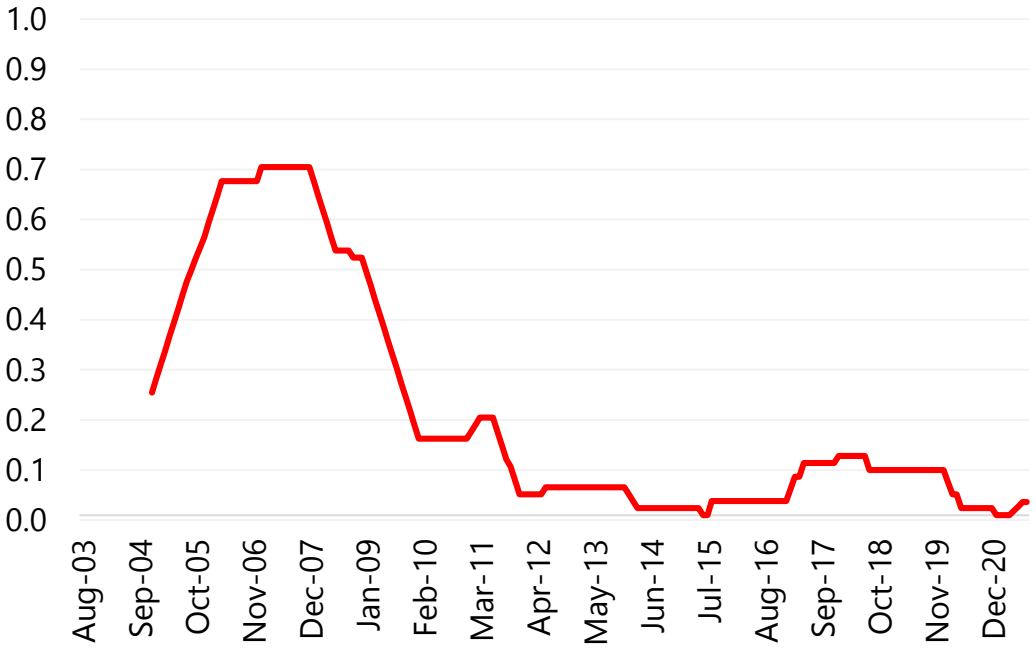
Sources: Santander, based on Montes and Machado (2014)

The second is based on De Medonça and Silva (2016)[8], which uses the difference between survey-based expectations for the government fiscal primary result and the government's target for that variable. The index is constructed in a similar way as the inflation expectation anchoring index, in the sense that if expectations are close to the target, then anchoring is high, close to 1, and if it departs from the target, the anchoring lowers and moves close to 0.

$$IEAI_{fl} = \begin{cases} 1 & ,if\ FPS_{min}^{ideal} \leq E_t(FPS_{t+12}) \leq FPS_{max}^{ideal} \\ 1 - \frac{1}{FPS_{max}^{tolerance} - FPS_{max}^{ideal}}\left[E_t(FPS_{t+12}) - FPS_{max}^{ideal}\right] & ,if\ FPS_{max}^{ideal} < E_t(FPS_{t+12}) \leq FPS_{max}^{tolerance} \\ 1 - \frac{1}{FPS_{min}^{tolerance} - FPS_{min}^{ideal}}\left[E_t(FPS_{t+12}) - FPS_{min}^{ideal}\right] & ,if\ \ FPS_{min}^{ideal} > E_t(FPS_{t+12}) \geq FPS_{min}^{tolerance} \\ 0 & ,if\ E_t(FPS_{t+12}) < FPS_{min}^{tolerance}\ or\ E_t(FPS_{t+12}) > FPS_{max}^{tolerance} \end{cases}$$

[8] "Observing the influence of fiscal credibility on inflation: Evidence from an emerging economy", De Mendonça, H. F. and Silva, R., Economics Bulletin, v. 36-4, p. 2333-2349

Figure 5. Forward-Looking Fiscal Anchoring Index



Sources: Santander, based on Montes and Machado (2014)

Again, regardless of the ending-point (as these are just ways to measure an unobservable level and, as a result, each haves their upsides and downsides), Figures 4 and 5 show that, both indices present low levels of anchoring in the recent past. Therefore, the uncertainty regarding the fiscal policy path (or the sustainability of the debt-to-GDP ratio) might also be impacting the anchoring of inflation expectations.

Inflation inertia and risks for the inflation outlook

Inflation inertia is formally defined by the autoregressive component of inflation, α_1, on an equation to explain current inflation, π_t. This autoregressive coefficient must be between 0 and 1 in order to make economic sense and in order for inflation to be stationary (a mean-reverting process). However, on a common Phillips curve[9], besides inertia, inflation expectations, $E(\pi_{t+6})$, are also considered as an explaining variable for inflation (among other control variables, such as commodity prices, p^*_{t-1}, the exchange rate, e_{t-1}, and the output gap, h_{t-1}). Considering the verticality condition of the Phillips Curve in the long-run, usually a restriction is imposed in the estimation of that equation, forcing the inertia's (α_1) and the expectation's $(1-\alpha_1)$ coefficients to sum 1; and it is important to state that those coefficients might change over time, as the economy develops, so for one coefficient to increase, the other has to decrease. If inertia is close to 0, temporary shocks tend to fade very quickly and do not become a relevant part of future inflation—agents' inflation expectations are anchored, so the price-setting behavior is more focused on expectations and not on past inflation. If inertia is close to 1, then shocks tend to fade at a much slower pace, becoming a relevant part of future inflation—that is, inflation expectations are less relevant to explain future inflation and it becomes more difficult for the BCB to control inflation by managing expectations.

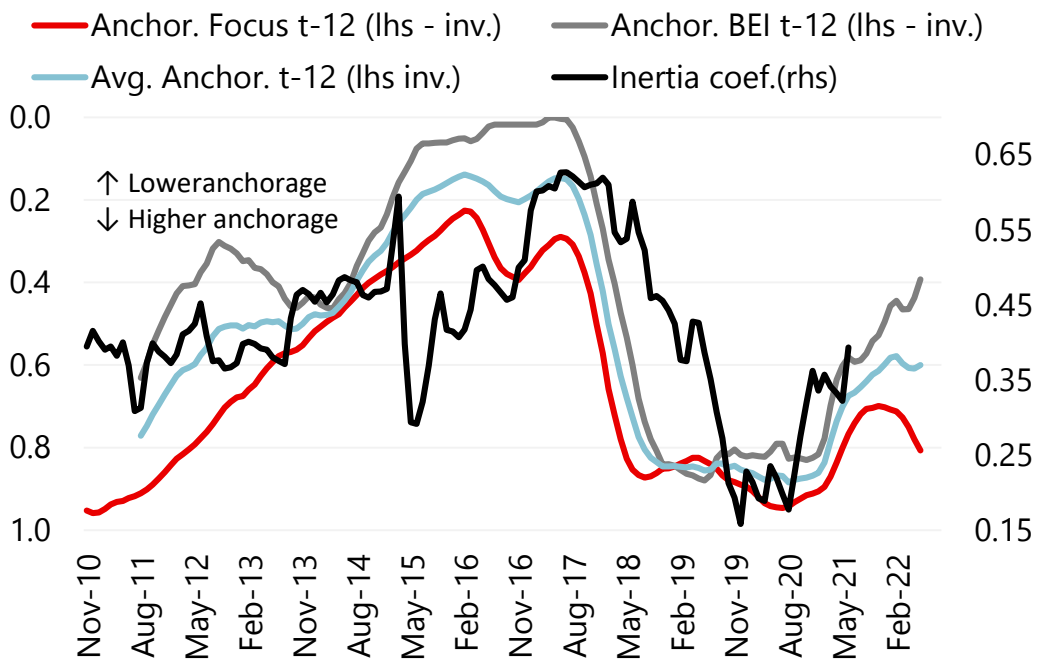
$$\pi_t = \alpha_0 + \alpha_1\pi_{t-1} + (1-\alpha_1)E(\pi_{t+6}) + \alpha_2\Delta(p^*_{t-1}e_{t-1}) + \alpha_3 h_{t-1} + \epsilon_t$$

We estimate the inertia coefficient in rolling-windows to analyze how it has been evolving over time. Moreover, we compare it to the expectation's anchoring index (lagged by 12 months). Figure 2 shows those series and suggests that during 2010 to mid-2016, when the anchoring of expectations was getting lower, the inertia coefficient was getting stronger. From mid-2016 until 2020Q1, expectations anchoring was increasing and the inertia coefficient was decreasing. From 2020Q2 until now, it seems that inertia is rising, in line with the reduction of the expectations

[9] Here we estimated it with quarterly data, as the BCB's does in its main models, but we also tested other specifications and results were similar

anchoring power. Moreover, as the anchoring index anticipates the inertia coefficient, we can make conjunctures about the future of inertia's coefficient behavior.

Figure 6. Inflation Expectations Anchoring Indices and Inflation Inertia Coefficient



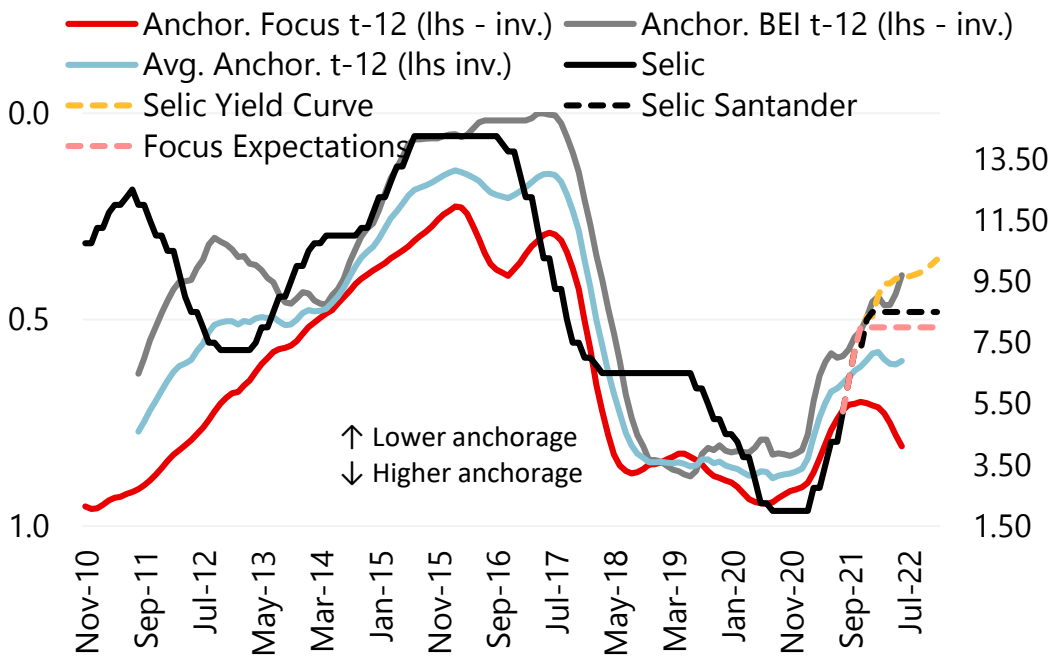
Sources: IBGE and Santander.

Again, there is high uncertainty: by the survey-based anchoring index, inertia might fall some months ahead, while by the market-based index, inertia could rise further; using the average of the indices, inertia would be relatively unchanged at a higher level than it was hovering between 2017-2019. However, we stress once again, that market-based expectations tend to anticipate the survey-based expectations, so the survey-based index might start to rise shortly. All in all, it seems reasonable to say that inertia has risen in the short-term, but it might be soon to say that it is permanently higher.

In recent public communications, the BCB has been arguing that it is not seeing inertia playing a relevant role in future inflation; in parallel, the BCB is questioning the divergence between its expectation for IPCA 2022 compared to the survey- and market-based forecasts. We believe, that among many other possible explanations, it is possible that professional forecasters and market participants might be considering a higher inertia coefficient, implying that the high inflation level of 2021 would generate a higher carry-over for 2022. Moreover, not only might the impact of inertia be higher by the power of its coefficient, but also because past inflation is becoming higher and higher.

Hence, we conjecture that if inertia's coefficient is stronger (at least for the short-term) this poses upside risks for the BCB's inflation forecast (and also for the survey- and market-based forecasts) and consequently for the interest rate forecasts.

Figure 7. Inflation Expectations Anchoring Indices, Selic Rate and Expectations



Sources: IBGE and Santander.

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