Macro Vision

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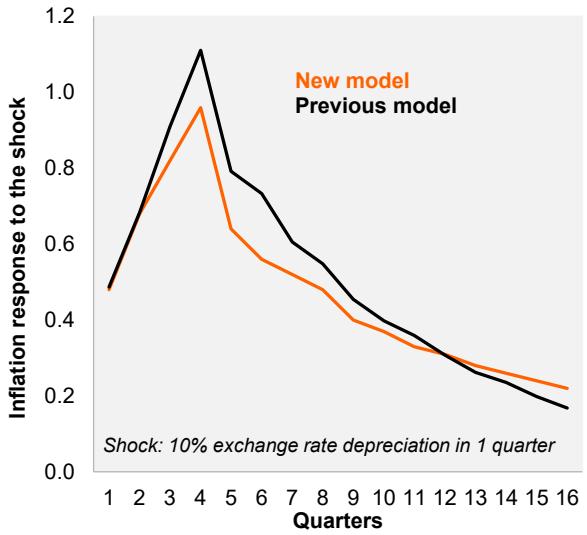
BRAZIL – Inflation in the relevant horizon: simulating the Central Bank's model

- This paper discusses the most important updates in the small-scale model of the Brazilian Central Bank (BCB), presented in the June Inflation Report, and simulates alternative scenarios based on the model.
- The rule of thumb of the inflation targeting regime still stands. According to this rule, for every 30bp-deviation of inflation expectations from the target in the relevant horizon (six quarters ahead), an adjustment of approximately 100bps in the Selic rate is required. However, in times of greater uncertainty, a higher Selic rate may be insufficient to move inflation and/or the exchange rate expectations, so that inflation gets higher and more distant from the target.
- Given the recent currency depreciation —even as the Central Bank signaled that the interest rate would remain unchanged— we used the model to simulate the impact of the strategy of maintaining the Selic benchmark rate at 10.50%pa for different exchange rate levels and for different responses by inflation expectations and the currency to the interest rate. In particular, if the currency stabilizes near recent highs (5.70 reais per US dollar), inflation over the relevant horizon (1Q26) would range between 3.3% and 3.5%, depending on the response by inflation expectations and the exchange rate to the interest rate shock.
- Historically, the Central Bank's Monetary Policy Committee (Copom) does not react when inflation expectations show modest deviations from the target. In previous cycles, the Central Bank started to raise the interest rate when it foresaw a cycle of at least 100bps.

In the June Quarterly Inflation Report, the Brazilian Central Bank updated its small-scale model, used to calculate the inflation projections that support the Copom's decision-making process. In the Central Bank's models, benchmark interest rate moves are transmitted to inflation through several channels: more directly, via the output gap and exchange rate, and indirectly, via expectations, with estimated elasticities capturing the average historical effect of a full-blown operation in these channels. This paper discusses the main changes and simulates alternative scenarios for the model.

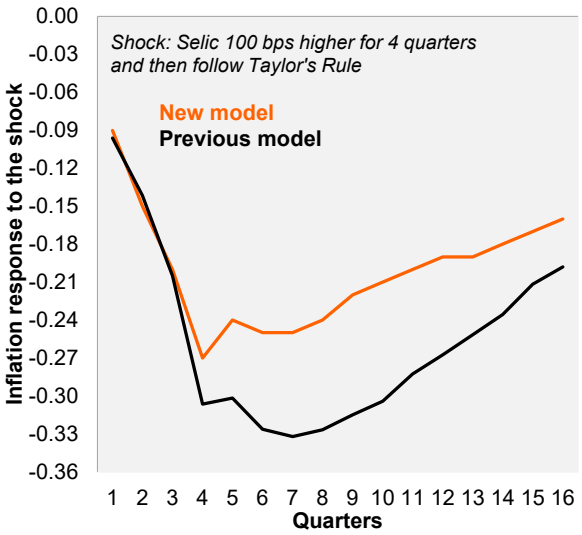
The changes are modest. Overall, there were small reductions in the estimated elasticities of a higher Selic rate and weaker exchange rate (the so-called exchange rate pass-through) on inflation and an increase in the estimated impact of the output gap on inflation (see comparative graphs of impulse response functions below). Importantly, the rule of thumb of the inflation targeting regime —according to which for every 30bp-deviation from the target in the relevant horizon (six quarters ahead), an adjustment of approximately 100bps in the Selic rate is needed— still stands.

Reduced FX pass-through...



Source: BCB, Itaú

...and impact of a Selic shock on inflation



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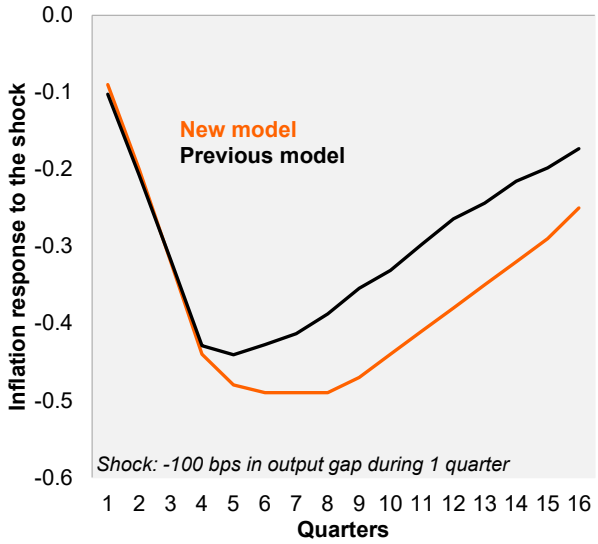
On the other hand, the impact of an output gap shock became more intense



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The latest Copom documents presented projections based on this model in two scenarios: (i) reference (usual), which considers the Selic rate trajectory according to the Focus survey and (ii) alternative, which considers the Selic rate unchanged at 10.50%pa over the entire relevant horizon (i.e. until the end of 2025). Both scenarios assumed the exchange rate at 5.30 reais per dollar. However, while in the reference scenario inflation projections were at 4.0% in 2024 and 3.4% in 2025, the alternative scenario assumed inflation at 3.1% at the end of 2025.

The unchanged Selic scenario is particularly important, given that the Central Bank recently communicated that it chose to interrupt the easing cycle and that monetary policy should remain contractionary for long enough for the disinflation process to become consolidated and expectations to become anchored around the target. This ends up being the simplest and most direct way to base the decision to keep the monetary policy rate stable for an extended period.

In the BCB model, in a simplified manner, an unchanged Selic rate at 10.50%pa has four transmission channels to inflation: (1) via the output gap (which evolves according to the IS curve) in the Phillips curve, (2) via the exchange rate (which evolves according to the uncovered interest rate parity) in the Phillips curve. Furthermore, it is worth highlighting that expectations are endogenous in the model and, therefore, it is also important to consider the (3) effects of the output gap on expectations and (4) the effects of the exchange rate on inflation expectations, according to the equations below. [1]

IS curve (i)

$$h_t = \beta_1 h_{t-1} - \beta_2(r_t - r_t^*) + \beta_3 X_t + \varepsilon_t^h$$

Phillips curve (ii)

$$\pi_t^L = \alpha_1 \pi_{t-1}^L + \alpha_2 \pi_{t-1} + (1 - \alpha_1 - \alpha_2)\pi_t^E + \alpha_3 \Delta e_t + \alpha_4 h_t + \varepsilon_t^L$$

Uncovered interest rate parity (iii)

$$\Delta e_t = \Delta e_t^{PPC} - \delta\,(i_t^{dif} - i_{t-1}^{dif}) + \varepsilon_t^e$$

Expectations (iv)

$$\pi_t^E = \varphi_1 \pi_{t-1}^E + \varphi_2 E(\pi_t) + \varphi_3 \pi_{t-1} + \varepsilon_t^e$$

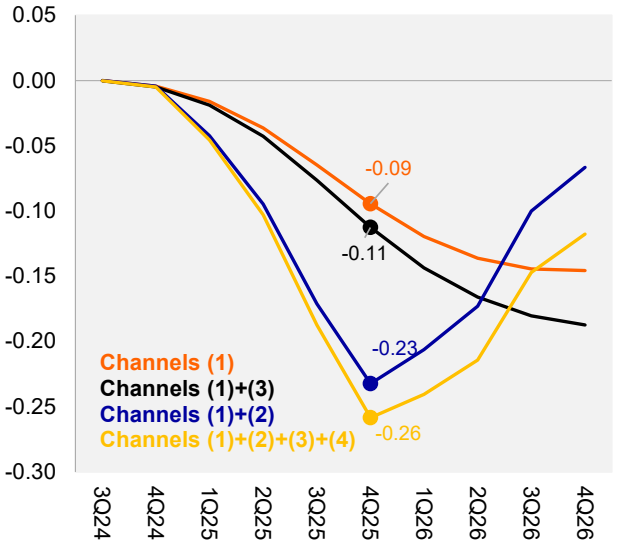
In other words, higher interest rates have a direct impact on inflation by affecting the output gap and exchange rate (channels (1) and (2) above), but also indirect impact via inflation expectations (channels (3) and (4)). A higher interest rate reduces the output gap (β_2, equation i) and impacts inflation via the Phillips curve (α_4, equation ii). At the same time, higher interest rates also impact the exchange rate (δ, equation iii), which in turn has direct impact on inflation (α_3, equation ii). The indirect impact comes from the expectations equation (equation iv), which has an inertial component (π_{t-1}^E) with inertia of the inflation expectation itself, an adaptive component (π_{t-1}) linked to past inflation, in addition to a consistency term with the inflation expectation of the model itself ($E(\pi_t)$). This last term is quite important and characterizes the endogeneity of expectations, so that changes in the output gap and exchange rate impact the dynamics of expected inflation, which in turn impacts current inflation via the Phillips curve $(1 - \alpha_1 - \alpha_2)$.

Keeping the equations in mind, we isolated the four transmission channels of a 10.50% Selic over the relevant horizon. Assuming that expectations are exogenous, and that monetary policy has no impact on the exchange rate ($\varphi_2 = 0, \delta = 0$), we were able to isolate only the effect of the gap on the Philips curve (effect (1)). In order to consider the effect of the gap on expectations (effect (3)), and consequently on inflation, we established that $\varphi_2 > 0$ and $\delta = 0$. Furthermore, to consider the effect of the exchange rate on inflation (effect (2)), we simply need to assume that $\varphi_2 = 0$ and $\delta > 0$. Finally, we get the total effect of the four channels, also considering the impact of the exchange rate on expectations (effect (4)) and using $\varphi_2 > 0$and $\delta > 0$.

The graph below straightforwardly illustrates the transition from 3.4% in 4Q25 in the reference scenario to 3.1% in the alternative scenario. To do this, it is necessary to consider the four transmission channels of monetary policy, which together justify a drop in inflation in 4Q25 of 26bps, with 9bps due to the output gap effect (1), 2bps due to the exchange rate (2) and 15bps due to inflation expectations (3 + 4). Hence, in the simulation presented by the Central Bank, not only the direct impacts of the interest rate at 10.50% on a widening output gap and exchange rate move via the Phillips Curve are considered, but also indirect impacts are contemplated via declining inflation expectations (in this case, to 3.7% in 2025 and 3.5% in 2026).

[1]The variables are described in the Annex.

Inflation response to monetary policy shock (4 transmission channels)



Source: BCB, Itaú

As the Central Bank stressed in the Inflation Report, it is important to illustrate these transmission channels because the same interest rate trajectory can produce different inflation responses according to the hypotheses raised about the behavior of other variables. In other words, the model captures the average historical relationships observed in the estimation period. It turns out that we may be facing a different scenario, in which the variables do not behave in the usual way. In that case, the inflation projection could be higher than the 3.1% in 4Q25 presented in the alternative scenario, depending on the behavior of expectations and on the exchange rate. If expectations do not respond to a higher Selic rate (that is, considering exogenous expectations), the alternative scenario would point to 3.2% inflation. Going beyond exogenous expectations, if the exchange rate does not respond to the interest rate shock, the alternative scenario would be 3.3% inflation (see table below)

Alternative scenario with Selic at 10.50% for the entire relevant horizon would take inflation from 3.4% to 3.1%, considering the full impact of an interest rate shock on inflation.

		Impact of the output gap on the PC (Channel 1)	BRL impact on PC (Channel 2)	Output Gap Impact on Expectations (Channel 3)	BRL impact on expectations (Channel 4)	Full impact (1)+(2)+(3)+(4)	Impact w/ exogenous expectations (1)+(2)	Impact with exogenous expectations and without BRL appreciation BRL (1)
4Q24	4.0	0.00	0.00	0.00	0.00	4.0	4.0	4.0
4Q25	3.4	-0.09	-0.12	-0.02	-0.03	3.1	3.2	3.3
Implicit in simulations								
Trajectory expectations						**3.7 2025 / 3.5 2026**	**3.8 2025 / 3.6 2026**	**3.8 2025 / 3.6 2026**
ΔBRL over the relevant horizon						**-2.0%**	**-2.0%**	**0.0%**

Source: BCB, Itaú

Critically, the Central Bank simulated the model with the exchange rate at 5.30 reais per dollar. Given the latest currency moves, it would be useful to observe the impact of the 10.50% interest rate strategy for different exchange rate levels. The table below shows the results, focusing on projections for 1Q26, which is a relevant horizon for the next Copom meeting. We also show the Selic rate needed to bring inflation back to the target in each of the scenarios presented.

BCB model simulations with different exchange rate levels							
BRL	Relevant Horizon IPCA (1Q26)	IPCA RH with Selic 10.50%			Necessary Selic to bring inflation to the 3% target		
		Total Impact (Output gap, BRL, expect)	Partial Impact (exogenous expectation)	Partial Impact (exogenous expectation and BRL)	Total Impact (Output gap, BRL, expect)	Partial Impact (exogenous expectation)	Partial Impact (exogenous expectation and BRL)
5.10	3.1	2.8	2.9	3.0	9.9	10.1	10.5
5.30	3.3	3.0	3.1	3.2	10.5	10.7	11.1
5.50	3.5	3.1	3.2	3.3	10.9	11.1	11.4
5.70	3.6	3.3	3.3	3.5	11.3	11.5	11.9
5.90	3.8	3.5	3.5	3.6	11.9	12.1	12.4

Source: BCB, Itaú

Specifically, if the exchange rate becomes consolidated at a weaker level (5.70 for example), estimated inflation would move to at least 3.3% in the scenario in which the Selic remains unchanged at 10.50% in the relevant horizon (in case of a full-blown effect through the channels described above). If, for any reason, the Selic level is insufficient to move expectations, the projection would reach 3.4%. Additionally, if the interest rate had no effect on expectations or on the exchange rate, the projection would move even further to 3.5%. In this case, an increase in the Selic rate might already be necessary.

On the other hand, if the BRL appreciates and returns to the 5.10 level seen earlier this year, estimated inflation —in the scenario in which the Selic rate remains unchanged at 10.50% in the relevant horizon— could recede to 2.7%, signaling the possibility of additional interest rate cuts.

Historically, the Copom does not react when expectations show modest deviations from the target. In previous cycles, the Central Bank started to raise the interest rate when it foresaw a cycle of at least 100bps, as illustrated by the table below.

Historically, theshortest cycle has been approximately 100 bps.			
Bullish cycles	Cicle size	Deviation of expectations from the target in RH	Δ selic necessary to reach the inflation target in RH*
Oct-02	850	300	1001
Sep-04	375	119	397
Apr-08	250	-16	--
Apr-10	200	25	84
Jan-11	125	58	192
Apr-13	375	107	356
Oct-14	325	157	522
Mar-21	1175	35	116
Mean	459		381
Minimum	125		84
Maximum	1175		1001

*100 bps hike in selic: -30 bps in RH IPCA

Source: BCB, Itaú

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Annex

IS curve (i)	h_t output gap, $r_t - r_t^*$decoupling between the ex-ante real interest rate and neutral real interest, X_t other explanatory variables, ε_t^h error term
Phillips curve (ii)	π_t^L inflation in market-set prices, π_t inflation, π_t^E inflation expectations 12 months ahead, Δe_t exchange rate variation, ε_t^L error term
Uncovered interest rate parity (iii)	Δe_t^{PPC}exchange rate variation in the long term, which follows purchasing power parity, i_t^{dif} domestic and external interest rate differential, ε_t^eerror term
Expectations (iv)	$\mathrm{E}(\pi_t)$ expectation that is consistent with the model, ε_t^e model error term

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