

Breakdown of 2020 inflation

This box presents an estimate for the 2020 inflation breakdown, measured by the National Extended Consumer Price Index (IPCA), as a deviation from the target set by the National Monetary Council (CMN).¹ The objective is to measure the contribution of the main determinants of inflation, based on the semi-structural models of the Banco Central do Brasil (BCB).

In line with the BCB's efforts to improve its communication and transparency with society, besides the usual breakdown, this box presents an estimate of the impact of monetary policy on the 2020 inflation rate using the base interest rate (the Selic rate) set by the Monetary Policy Committee (Copom).

Inflation deviation from the target is broken down into six components: i) inertia of the previous year (deviation of the previous year's inflation from the target);² (ii) expectations (difference between agents' inflation expectations and the inflation target); (iii) imported inflation (difference from the target); (iv) output gap; (v) food shocks;³ and (vi) other factors.⁴ It is worth mentioning that these estimates are approximations based on models and are subject to the uncertainties inherent to the modeling and estimation process.

The basis for the estimation of the components is a scenario in which all conditioning variables are neutral, that is, they do not have impacts that lead inflation to deviate from the target.⁵ As we substitute the actual values for these neutral conditioning variables, we obtain the contribution of each factor to the inflation rate deviation from the target.^{6,7} This procedure also allows estimating the impact of monetary policy on inflation, as the Selic rate is one of the conditioning factors present in the BCB's semi-structural models.⁸

The food shock calculation is based on the combination of two elements. The first is computed from the term representing climatic factors in the Phillips curve of the small-scale aggregate model.⁹ The second is based on the food-at-home prediction errors in the Phillips curve of the small-scale disaggregate model¹⁰,

1/ The inflation breakdown based on projection models has been presented annually in the Inflation Reports. See, for example, box "2019 inflation breakdown" in the March 2020 Inflation Report. For methodological procedures details, see box "2017 inflation decomposition", in the March 2018 Inflation Report, and Cusinato et. al (2016).

2/ Component "inertia of the previous year" includes the effects from all factors affecting inflation up to December 2019.

3/ In this report, the term "food shock" is used instead of "supply shock" due to the difficulty in thoroughly characterizing as only supply the values resulting from the procedure, especially when analyzing the 2020 food-at-home inflation.

4/ The item "other factors" includes specific factors not considered in the previous items and the model residual term.

5/ In the case of seasonal variables, the neutral conditioning paths also include a seasonal component.

6/ External price contributions were constructed assuming deviations in relation to 2.0% p.a. for commodity price changes in US\$, consistent with long-term external inflation at the same level, and 2.0% p.a. for the exchange rate, given by the difference between the inflation target and the long-term external inflation considered, consistent with long-term modeling conditions of the Phillips curve for market prices.

7/ The contribution of the output gap is constructed using the output gap path obtained by applying, on the data sample, the Kalman filter calibrated with parameters of the Bayesian estimation of the model. See boxes "New small-scale aggregate model with Bayesian estimation", in the September 2020 Inflation Report, and "Results from the new small-scale aggregate model with Bayesian estimation", in the December 2020 Inflation Report.

8/ More specifically, the path of the Selic rate one year ahead. The Selic rate deviation is calculated relative to the real neutral Selic rate, estimated by applying the Kalman filter calibrated with parameters of the Bayesian estimation of the model. See boxes mentioned in the previous footnote.

9/ See box "New small-scale aggregate model with Bayesian estimation", in the September 2020 Inflation Report.

10/ See box "New small-scale disaggregate model" in this Inflation Report.

and it uses actual values for the conditioning variables.¹¹ To both elements is also added the inertial effect of these components for the subsequent quarters of the same year. Therefore, this food shock definition does not incorporate the estimated effects of the variables included in this Phillips curve specification, such as, for example, the effect of commodity prices.

Inflation in 2020 was 4.52%, 0.21 p.p. higher than that of 2019, 4.31% (Figure 1 and Table 1). Market prices inflation rose from 3.89% in 2019 to 5.18% in 2020, while administered prices inflation fell from 5.54% to 2.61%. Inflation in 2020 was 0.52 p.p. above the 4.00% inflation target set by the CMN, within the limits of the tolerance interval.

Figure 1 – Inflation: IPCA, market and administered prices
12-month accumulated

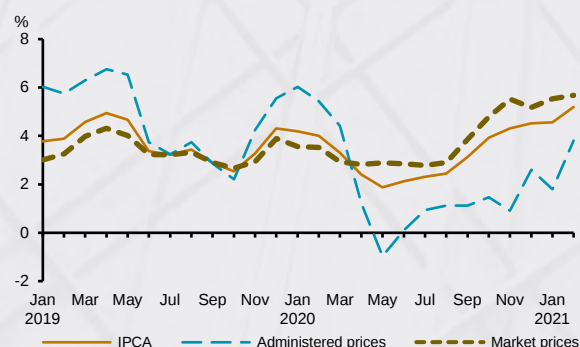
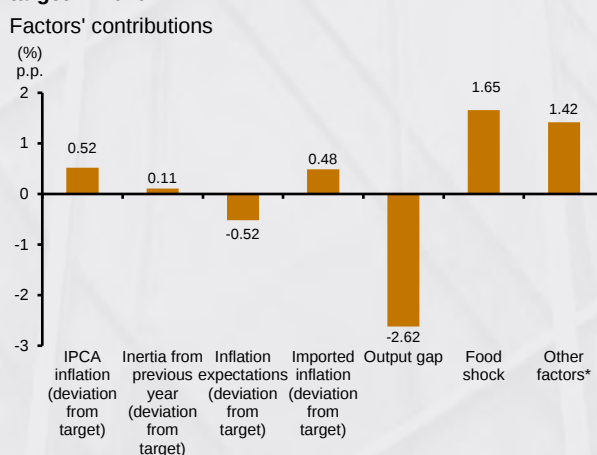


Table 1 – Inflation: IPCA, market and administered prices

	% change in the period				
	2020				
	I	II	III	IV	Year
IPCA	0.53	-0.43	1.24	3.13	4.52
Market prices	0.71	0.18	0.93	3.29	5.18
Administered prices	0.01	-2.20	2.15	2.69	2.61

Figure 2 – Contributions to the deviation of inflation from target in 2020



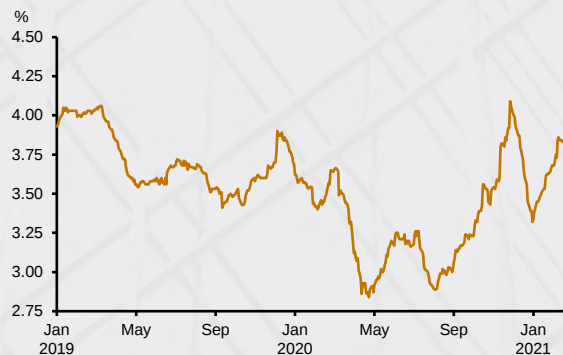
* Contribution of IPCA inflation as deviation from the target after excluding the following factors: inertia associated with the portion of the previous year's inflation that deviated from target; expectations as a deviation from target; imported inflation as a deviation from target; and food shocks.

The main results of the 2020 inflation breakdown are the following (Figure 2):

- i. The inertia from the previous year (as deviation from the target) contributed to inflation being above the target (contribution of 0.11 p.p.) due to the acceleration of inflation in 2019Q4, mainly due to the effects of swine fever on protein prices;
- ii. Inflation expectations (as deviation from the target) contributed to inflation falling below the target (contribution of -0.52 p.p.). During 2020, according to the Focus survey (Figure 3), the (smoothed) 12-month-ahead expectations for inflation, although fluctuating, were below the target for the entire considered period, except for a short period in December 2020. Inflation expectations for 2020 fluctuated in the range between 1.5% and 4.4%, reaching values above the 4.00% target only in December 2020;

11/ This methodology has been adopted since the breakdown made for 2018 inflation, as described in the box “2018 Inflation Breakdown” in the March 2019 Inflation Report.

Figure 3 – 12-month-ahead inflation expectations (smoothed) – Focus survey



iii. Conversely, imported inflation (as deviation from the target) had a positive contribution to the deviation of inflation from the target (0.48 p.p.). The responsible factor was the exchange rate depreciation observed in the first half of 2020 (Figure 4), mainly reflecting the outbreak of the Covid-19 pandemic. Considering the whole year, the exchange rate change (as deviation from the value of 2.0%) contributed with 1.98 p.p. to the inflation deviation from the target. In turn, changes in commodity prices (as deviation from the value of 2.0%), measured by the Commodities Index – Brazil (IC-Br) in US dollar and by oil prices, contributed with -1.50 p.p. to the inflation deviation from the target. Both IC-Br and oil prices decreased in 2020Q1, with a gradual recovery in the following quarters of the year (Figures 5 and 6);

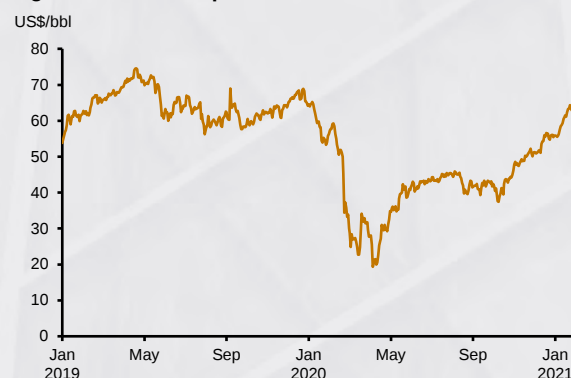
Figure 4 – Nominal exchange rate



Figure 5 – IC-Br (index in US\$)

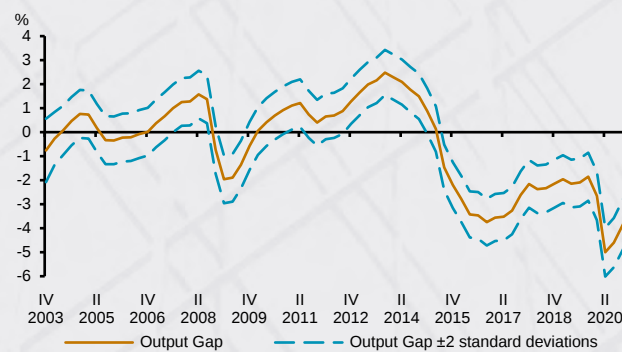


Figure 6 – Brent oil prices



iv. The output gap was the main negative contributor to the inflation deviation from the target (-2.62 p.p.). The output gap is an unobservable variable subject to high uncertainty, and it is measured by the BCB using different methodologies. At the beginning of 2020, according to a methodology based on a Bayesian model estimation, the negative output gap was narrowing. However, the Covid-19 pandemic induced a significant output gap opening in the second quarter of the year. The ensuing economic recovery process led to a further narrowing of the output gap, while still not reaching pre-pandemic levels (Figure 7);

Figure 7 – Output gap estimates

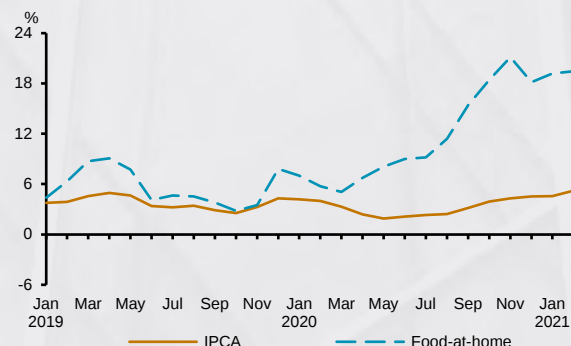


Note: Figure data: 2003Q4-2021Q1.

v. Food shocks were the main factor contributing positively to the inflation deviation from the target in 2020, with a contribution of 1.65 p.p. After increasing 7.84% in 2019, food-at-home prices rose 18.15% in 2020 (Figure 8). Unlike 2019, when there was a predominance of the swine fever shock in China, in 2020 the rise in food prices was widespread, encompassing fresh, semi-processed, and industrialized foods. The products with most relevant increases in the year were meat (17.97%), rice (76.01%), soybean oil (103.79%), tomato (52.76%) and potatoes (67.27%). These increases reflected a number of factors. The breakdown performed in this box displays the effects of exchange rate depreciation and the recovery of commodity prices on the imported inflation item. In turn, extra income transfers, due to the beneficiaries' profile, may have affected food prices via a sectoral increase in demand, not fully captured by the output gap term in the Phillips curve of food-at-home prices, as it reflects a broader set of factors. Therefore, the calculated food shock contribution may be reflecting both supply and demand elements;¹²

Figure 8 – Inflation: IPCA and food-at-home

Year-on-year inflation



vi. Finally, the other factors made a contribution of 1.42 p.p. to the deviation of inflation from the target in 2020. Some specific conditioning factors of administered price models contributed to this component, such as the electricity tariff flag system (contribution of 0.26 p.p.)¹³, the Assistance Expenses Value Index (IVDA) of private health plans (0.05 p.p.)¹⁴ and the General Price Index – Market (IGP-M), which is used as an index for some administered price items (0.08 p.p.).¹⁵

12/ See box "Inflation of the sub-items most consumed by households with income from 1 to 3 minimum wages" in the December 2020 Inflation Report.

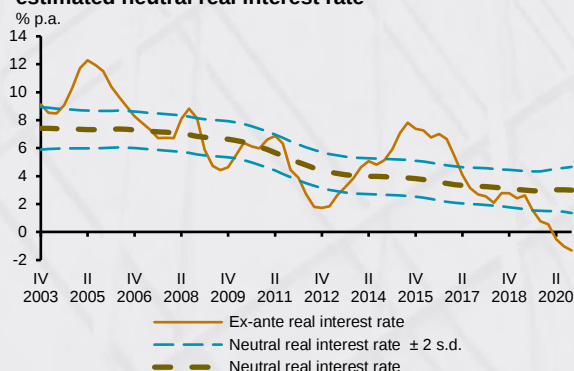
13/ As a neutral conditioning for the flag system, a green flag is assumed throughout the relevant horizon.

14/ As a neutral conditioning, it is assumed IVDA as equal to the inflation target. The IVDA used by the National Supplementary Health Agency (ANS) to determine the maximum annual premiums rise for private health plans between May 2019 and April 2020 was 8.33%. In August 2020, ANS suspended the increases until the end of 2020, and the Brazilian Institute of Geography and Statistics (IBGE) discounted from the September 2020 IPCA factors accrued in advance between May and August for the item health plan. Thus, the IVDA contribution was calculated considering only the period from January to April 2020.

15/ As a neutral conditioning, it is assumed the IGP-M variation as equal to the inflation target. This contribution does not include impacts of the IGP-M on market prices, such as residential rent.

As for monetary policy contribution, it is noteworthy that the Selic rate below its equilibrium level has played an important role in activity recovery and in closing the output gap, presenting an upward influence on inflation through this channel. In addition, the Selic rate also affects inflation through other channels, such as the exchange rate and inflation expectations. The Selic rate compounded over four quarters ahead, discounted from inflation expectations, both variables extracted from the Focus survey, has been negative as of 2020Q2 (Figure 9). It is estimated that the maintenance of this measure of real Selic rate below the estimated neutral real interest rate had a total upward contribution of 1.04 p.p. to 2020 inflation.¹⁶

Figure 9 – Ex-ante real Selic rate and the estimated neutral real interest rate



In summary, this box presented an estimate for the 2020 inflation breakdown as a deviation from the target. According to this breakdown, among the factors explaining the positive inflation deviation from the target, the highlights are food shocks and, to a lesser extent, imported inflation and the inertia from the previous year. In the opposite direction, contributed the output gap and inflation expectations. In addition, this box provided an estimate of the Selic rate effect on the 2020 inflation.

Reference

CUSINATO, R. T., FIGUEIREDO, F. M. R., MACHADO, V. G., MELLO, E. P. G. and PEREZ, L. P. (2016). "*Decomposição de Inflação: revisão da metodologia e resultados para 2012 a 2014*", BCB, Working Paper 440.

16/ As in the case of the components of the inflation breakdown, the estimated effect of the Selic rate does not consider its effect on the 2019 inflation extended to the following year through inflationary inertia. The latter is incorporated in the "inertia from the previous year" component.