Breakdown of 2021 inflation

This box presents an estimate for the 2021 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 semi-structural models of the Banco Central do Brasil (BCB).[2]

Inflation deviation from the target is broken down into six components: i) inertia from the previous year (deviation of the previous year's inflation from the target);[3] (ii) expectations (difference between Focus survey's inflation expectations and the inflation target); (iii) imported inflation (difference from the target); (iv) output gap; (v) electricity tariff flags;[4] and (vi) other factors.[5] It is worth mentioning that these estimates are approximations based on models and, therefore, are subject to the uncertainties inherent to the modeling and estimation process.

The estimation of components is based on a scenario in which all conditioning factors are neutral, i.e., do not generate impacts that lead inflation to deviate from the target.[6] As these neutral conditioning factors are replaced by the values effectively observed, we obtain the contribution of each factor for the deviation of inflation from the target.

Inflation in 2021 was 10.06%, 5.54 percentage points (p.p.) above that observed in 2020, 4.52% (Figure 1 and Table 1). Market prices inflation rose from 5.18% in 2020 to 7.70% in 2021, whereas administered prices inflation increased from 2.61% to 16.90%. Inflation in 2021 was 6.31 p.p. above the inflation target of 3.75%, set by the CMN, and 4.81 p.p. above the upper limit of the tolerance band of 5.25%.

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

i. The inertia from the previous year (as deviation from the target) contributed with 1.21 p.p. to the deviation of inflation from the target, mainly reflecting inflation acceleration in 2020Q4;[7]

ii. Inflation expectations (as deviation from the target) contributed with 0.25 p.p. to the deviation of inflation from the target. 12-month ahead inflation expectations (smoothed) from the Focus survey were below the target in early 2021, but followed an upward trajectory throughout the year, standing above the target as of March 2021 (Figure 3). Inflation expectations for 2021 followed a similar path.

1/ The breakdown of 2021 inflation was presented earlier in the Open Letter from the BCB Governor to the Minister of Economy and President of the National Monetary Council (CMN), on January 11, 2022. Inflation breakdown based on projection models has been presented annually in the Inflation Reports (IRs). See, for example, the box "Breakdown of 2020 inflation" of the March 2021 IR. Details on methodological procedures are available in the box "2017 inflation decomposition", of the March 2018 IR, and in Cusinato et. al (2016).

2/ See boxes "Revision of the small-scale aggregate model", of the December 2021 IR, and "Revision of the medium-term projection models for administered prices" of the September 2017 IR.

3/ The component "inertia from the previous year" includes the effects from all factors affecting inflation up to December 2020.

4/ In this IR, we chose to individualize the effect of electricity tariff flags as one of the breakdown's component due to its importance for inflation in 2021. In previous reports, the effect of electricity flags was included in "Other factors".

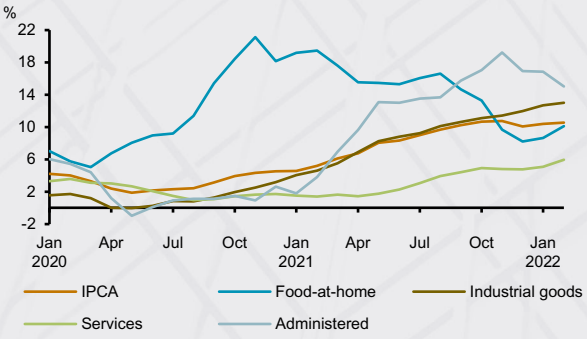
5/ The item "Other factors" includes factors not considered in the previous items, such as, for instance, specific factors conditioning administered price models as well as the model's residual term.

6/ In the case of seasonal variables, neutral conditioning factors also include a seasonal component.

7/ See box "Breakdown of 2020 inflation", of the March 2021 IR.

Figure 1 – Inflation: IPCA and components

Year-on-year inflation



Sources: IBGE and BCB

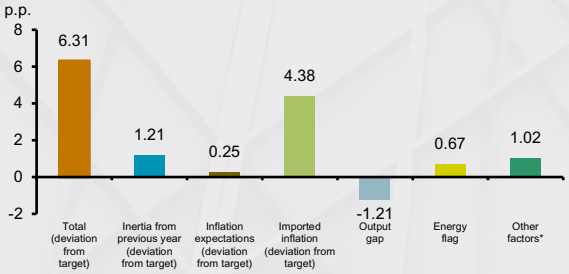
Table 1 – Selected components of IPCA

Selected components and items	Change (%)	Contribution to IPCA change (p.p)
Administered prices	16.90	4.34
Gasoline	47.49	2.33
Bottled gas	36.99	0.41
Household electricity	21.21	0.98
Maket prices	7.70	5.72
Food-at-home	8.23	1.25
Industrial goods	12.00	2.75
Automotive vehicles (new or used)	15.74	0.76
Electrical home appliances	12.11	0.21
Ethanol	62.24	0.41
Services	4.75	1.72
Consumer Inflation (IPCA)	10.06	10.06

Sources: IBGE and BCB

Figure 2 – Contributions to the deviation of inflation from target in 2021

Factors' contributions



* Contribution to the 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 eletricity under the flag system.

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

iii. Imported inflation (as deviation from the target) was the main contributor to the inflation deviation from the target (contribution of 4.38 p.p.).[8] The main underlying factor was changes in commodity prices measured by the Commodities Index – Brazil (IC-Br) in USD and oil price, with respective contributions of 0.71 p.p. and 2.95 p.p. to the inflation deviation.[9] Both the IC-Br and the oil price, after declining in 2020Q1, increased in the subsequent periods (Figures 4 and 5). The exchange rate, in turn, oscillated throughout the year, depreciating in 2021Q1, 2021Q3 and 2021Q4, and appreciating in 2021Q2 (Figure 6). Considering the entire year, the exchange rate variation contributed with 0.44 p.p. to the deviation of inflation from the target[10];

iv. The output gap was the factor responsible for the main negative contribution for the inflation deviation from the target (-1.21 p.p.). The output gap is a unobservable variable, whose measurement, subject to high uncertainty, is carried out by the BCB through different methodologies. Using the

8/ External price contributions were constructed assuming deviations in relation to 2.0% p.a. for commodity price changes in USD, consistent with long-term external inflation at the same level, and 1.75% 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.

9/ The contribution of the oil price only refers to its estimated effects on fuels of administered prices (and its pass-through via the used model), whereas the IC-Br contribution is calculated by using its impact on the equation of market prices in the model. Since it includes oil among its components, a share of the estimated IC-Br contribution also refers to the oil price.

10/ The contribution of imported inflation also includes the contribution of the price of anhydrous ethanol.

methodology based on a Bayesian model estimation[11], the output gap, after a significant widening in 2020Q2 due to the outbreak of the Covid-19 pandemic, started a narrowing trajectory in the subsequent periods. The year 2021 was marked by the progress of the vaccination campaign and the normalization process of economic activity that began in the second quarter of 2020. However, the narrowing of the output gap decelerated throughout 2021, as the gap reached, in 2021Q4, a value slightly wider than in 2021Q3 (Figure 7). This process mainly reflected the natural loss of intensity of the economic activity normalization process that started in the second half of 2020 and the monetary tightening that started in 2021Q1;

Figure 4 – IC-Br (index in US$)
Monthly average
Dec/2019 = 100

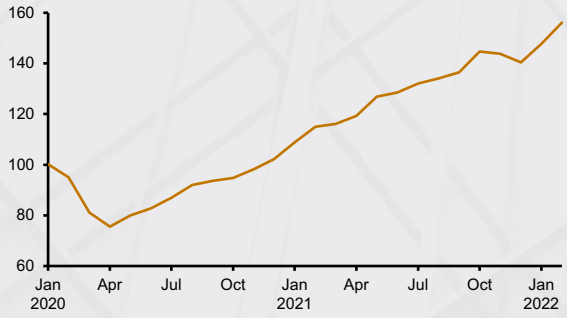
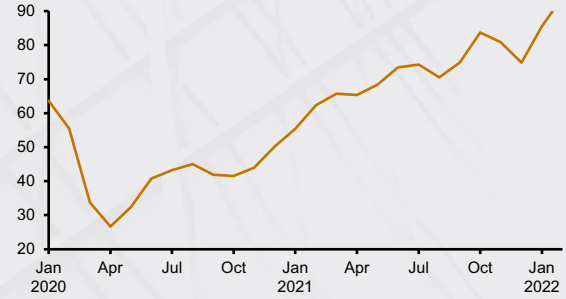


Figure 5 – Brent oil price
Monthly average
USD/Barrel



Sources: Bloomberg and BCB

Figure 6 – Nominal exchange rate
Monthly average
USD/BRL

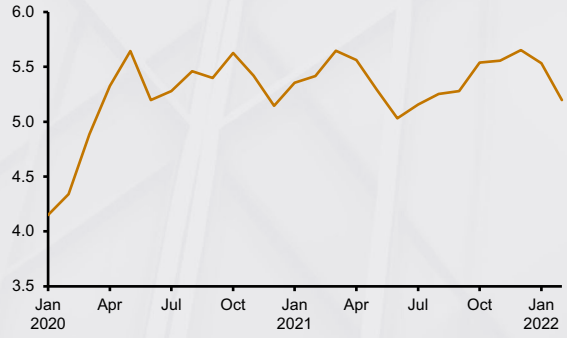
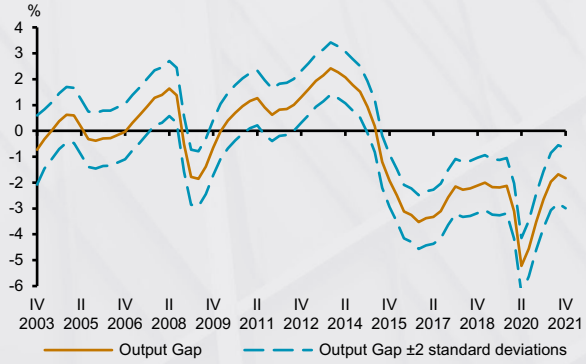


Figure 7 – Output gap estimates



Note: Figure data: 2003Q4–2021Q4. The output gap presented in the figure is the output gap estimated for the Open Letter, thus, it might have some differences to the one presented in Chapter 2, since it uses a different information set.

v. Electricity tariff flags contributed with 0.67 p.p. to the inflation deviation from the target[12], reflecting the poor rainfall regime that led to the activation of thermoelectric power plants and other energy sources with higher costs. Following the adoption of the yellow flag between January and April, the red flag level 1 was activated in May (Table 2). Between June and August, the red flag level 2 was adopted, with higher values as of July. In September, the water scarcity flag was created and activated, resulting in an increase of 49.6% over the previous flag, and of 5.8% over the previous month's electricity tariff; and

vi. Finally, the other factors contributed with 1.02 p.p. to the inflation deviation from the target in 2021. Some specific conditioning factors of administered price models[13] contributed to this component, such as the X and Y factors of the model of medicine prices (contribution of 0.13 p.p.), the Assistance

11/ 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.

12/ As a neutral conditioning factor for the electricity tariff flags, the green flag was assumed for the entire relevant horizon.

13/ For details about these models, see the box "Revision of the medium-term projection models for administered prices" of the September 2017 IR.

Expenses Value Index (IVDA) of private health plans (0.08 p.), and the General Price Index – Market (IGP-M), which is used as an index for some administered price items (0.34 p.p.).[14] It is noteworthy that a sharp upward trend of industrial goods prices started as of the end of 2020, leading to an inflation of 12.00% in 2021 (Figure 8), reflecting logistical issues and imbalances between global supply and demand. Using a small-scale disaggregated model that includes a specific equation for industrial goods prices inflation[15], one finds that industrial price shocks contributed with 1.77 p.p. to IPCA inflation in 2021.[16]

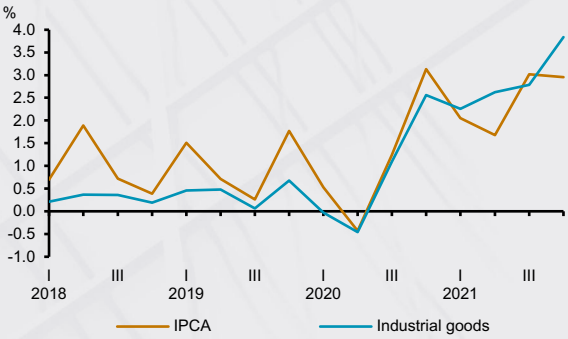
Table 2 – Energy flag

Year	Month	Energy flag	Value (R$/100kWh)
2020	Dec	Red 2	6.24
2021	Jan	Yellow	1.34
	Feb	Yellow	1.34
	Mar	Yellow	1.34
	Apr	Yellow	1.34
	May	Red 1	4.17
	Jun	Red 2	6.24
	Jul	Red 2	9.49
	Aug	Red 2	9.49
	Sep	Water Scarcity	14.20
	Oct	Water Scarcity	14.20
	Nov	Water Scarcity	14.20
	Dec	Water Scarcity	14.20
2022	Jan	Water Scarcity	14.20
	Feb	Water Scarcity	14.20

Sources: Aneel and BCB

Figure 8 – Inflation: IPCA and industrial goods

Quarterly inflation



Sources: IBGE and BCB

Summing up, this box presented the estimations of the breakdown of the deviations of the inflation rate from the target in 2021. According to this breakdown, the main factor was the imported inflation, resulting from a strong increase of commodity prices. Also contributed to inflation deviation, the inertia from the previous year, the electricity tariff flags, and other factors, largely related to imbalances between demand and supply in global production chains. The output gap contributed in the opposite direction.

References

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", Banco Central do Brasil, Trabalhos para Discussão nº 440.*

14/ As neutral conditioning factors are assumed the factors X and Y equal to zero and IVDA and IGP-M variations equal to the inflation target. IGP-M contribution does not include impacts on market prices, such as residential rent.

15/ See the box "New small-scale disaggregate model", of the March 2021 IR for the disaggregated model.

16/ The shocks represent the entire unexplained part of the Phillips curve for industrial goods prices. Therefore, they do not capture the impact of production bottlenecks only. However, considering broad evidence about the impact of these bottlenecks, they can be considered the main factor.