

Methodological revision of the Commodities Index – Brazil (IC-Br)

The Brazilian Central Bank releases the Commodities Index – Brazil (IC-Br) monthly, whose weighting structure seeks to reflect the relevance of each commodity to the dynamics of domestic inflation¹. This box revises the methodology of calculation of the IC-Br, taking into account the dynamism of the economic relations and the increase of the sample available to estimate the weights.

The revision includes the following changes:

- i. Sample period used in the weights estimation was extended from 8 to 13 years;
- ii. Use of information about intermediate consumption of commodities, from the Resource and Usage Table (RUT);
- iii. Addition of a second step in the calculation of the weighting structure, which consisted of a procedure to optimize weights in terms of the correlation with the Broad National Consumer Price Index (IPCA);
- iv. Inclusion of new commodities in the agricultural and livestock and metal segments²; and
- v. Increase in the relative weight of oil in recent months, in line with the new pricing policy adopted by Petrobras³.

Of note, the definition of IPCA weighting is not trivial, since commodities are, to a large extent, primary inputs for goods and services production in the consumption basket. Besides, the influence of commodities on Brazilian inflation is not limited to the increase in the cost of production, since fluctuations in the prices of these products tend to change the terms of trade, with implications on domestic income and demand.

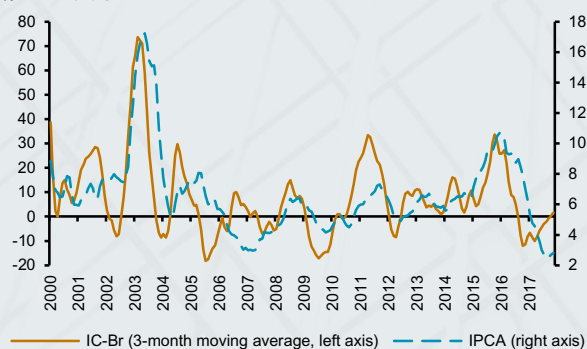
1/ The indicator is drawn from international commodity prices converted into Brazilian reais. The methodology for constructing the index was initially presented in the box "Transfer of Commodity Prices to the IPCA and Commodities Index-Brazil)", of the Inflation Report of December 2010, and subsequently updated in the box "Methodological Revision of Commodities Index – Brazil (IC-Br)", of the December 2011 Inflation Report.

2/ Cocoa, orange juice, gold and silver were also included.

3/ In October 2016, Petrobras changed its pricing policy, establishing monthly revisions of gasoline and diesel oil prices based on the international market parity. In June 2017, residential LPG prices also began to be revised monthly and in October 2017, the company informed that daily revisions in gasoline and diesel prices could be announced. At the beginning of December, Petrobras announced that it would revise its LPG pricing policy, which, however, would continue to be referenced to the international market prices.

Figure 1 – IC-Br x IPCA

% in 12 months



Source: IBGE and BCB

Particularly regarding the IC-Br, as commodity prices are considered in Brazilian reais, the indicator also captures the inflationary impact arising from changes in the exchange rate. In effect, the movements of the IC-Br anticipate a relevant part of the inflationary cycles in Brazil (Figure 1).

In this methodological revision, in order to obtain more appropriate pass-through estimates, the weights evolution based on the Laspeyres index⁴ was maintained, but the sample used in the estimation of the initial weights was divided into two periods⁵. Similar to the previous versions, the determination of the weights was based on the estimation of VAR⁶ models to obtain the estimates of the inflationary pass-through of each commodity, with the particularity of considering two samples.

At the same time, RUT data from National Accounts were used to estimate the weighting that mainly reflects the inflationary effect of commodities as a result of production costs changes⁷. Initially, the products whose description was closest to the commodities of IC-Br⁸ were identified. Next, the weight of the intermediate consumption of the products in the value of the final production of each economic activity was estimated. The relevance estimation of each commodity in the prices formation of the goods and services consumed by the families was obtained by multiplying the weight of the intermediate consumption of commodities in each activity by the respective weights of the activities in the consumption of the families.

Later, for each period of the sample, the respective arithmetic means of the weights vectors estimated in the previous steps were used as initial condition for the process of optimization of the weights⁹. In this step, the optimal weights structure that maximizes the average of the correlations between the index and the six-

- 4/ The estimated weights are attributed to the sample median month, which serves as reference for the monthly weights updating, according to changes occurred in the relative prices in the previous month.
- 5/ From July 1999 to June 2007 and from July 2007 to October 2017. The cutoff choice was based on the criterion mentioned in the box "Commodity Prices Influence on the Exchange Rate Pass-through", of the March Inflation Report 2015. In that box, it is argued that as of mid-2007, the exchange rate pass-through into inflation has declined, in line with the higher negative correlation between foreign exchange and commodity prices observed in the period.
- 6/ The VAR models used aim to correlate the individual impact of commodities on the IPCA, controlling for foreign exchange, activity and interest rate variables.
- 7/ For the two sample periods the averages of the weights calculated with RUT from 2010 to 2015 were used.
- 8/ Examples: the product "Corn grain" was used for the corn commodity; "Beef meat and other meat products" was attributed to the beef cattle commodity; and the product "Non-ferrous metal ores" has also been divided into aluminum, copper, lead, nickel, tin, zinc, gold and silver; and the product "Oil, natural gas and support services" was distributed between oil and natural gas according to the weight of its derivatives in the IPCA.
- 9/ The weights were allowed to vary within a range around the values found in the previous steps.

month inflation¹⁰ ahead was calculated in a recursive way. Thus, the weights final vector is defined by:

$$W_{final} = \arg \max \bar{\rho}$$

$$\text{where } \bar{\rho} = \frac{\sum_{t=1}^6 \rho_t}{6}$$

Finally, in order to consider the increase in the transfer of international oil prices to the prices of its domestic derivatives, the weighting was adjusted from October 2016 onwards, as a result of Petrobras' new pricing policy¹¹.

Figures 2 to 5 present the IC-Br and its segments calculated with the new methodology, compared with the previous versions. The evolution of the indexes followed a similar pattern, with occasional divergences, concentrated in the power sector index. The new weighting structure did not significantly change the relative weight of the segments in the formation of the IC-Br. In the average of the period between October 2016 and November 2017, the respective weights of the agricultural and livestock, metal and power sectors went from 71%, 19% and 10%, in the previous version, to 64%, 18% and 18% in the new version.

As illustrated by Figure 6, the correlation between the new IC-Br and inflation highlights an improvement over the previous index and, as expected in relation to other commodity indices (all measured in Brazilian reais). In the considered lags, the new IC-Br generated an average correlation 18% higher than the previous index.

Further evidence of the efficiency gain with the adoption of the new IC-Br is illustrated in Figure 7, which compares adjusted R² results from alternative inflation regressions using different commodity indexes. International indexes in general do not add information in relation to a non-commodity model, in contrast to the IC-Br, whose coefficient of determination of the new version was higher than in the old series¹².

In short, this box updates the IC-Br calculation methodology, aiming to adapt the index to structural

Figure 2 – Commodity Price Index – Brazil (IC-Br)

Dec/2005 = 100 (monthly average)

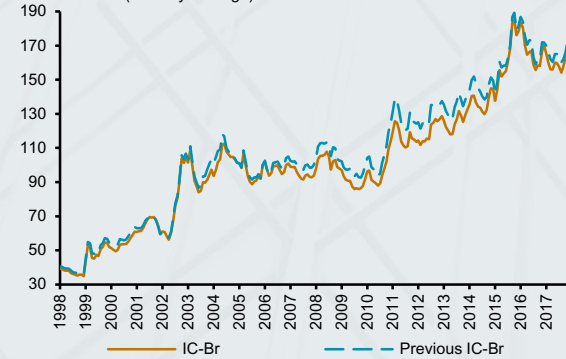


Figure 3 – IC-Br Agriculture

Dec/2005 = 100 (monthly average)

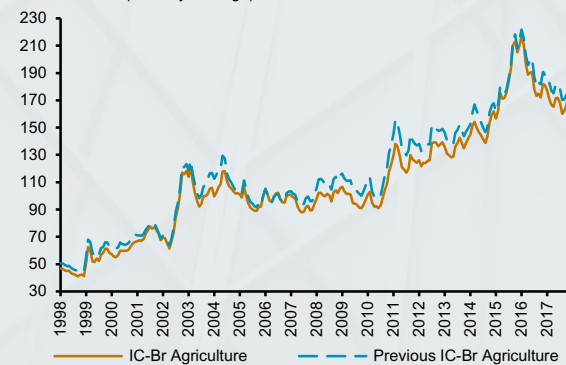
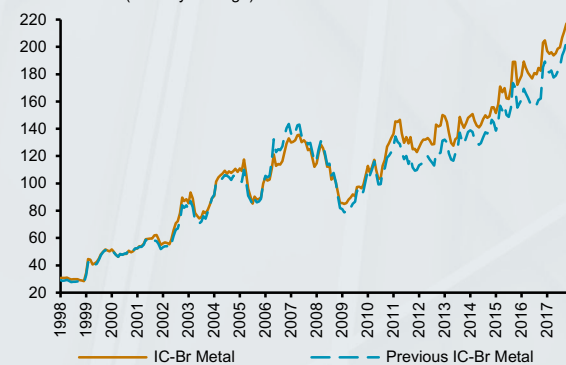


Figure 4 – IC-Br Metal

Dec/2005 = 100 (monthly average)

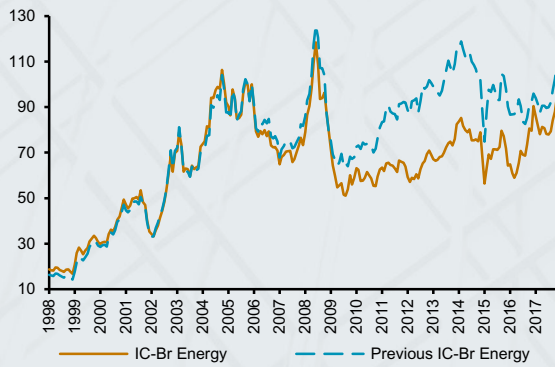


10/ The IPCA historical series recalculated with the classification and weighting structure of POF 2009, implemented in January 2012, was used.

11/ The adjustment consisted in withdrawing the maximization effect of the correlations from the weight of the oil, and the consequent increase of the weight of this commodity.

12/ For this exercise a simple linear regression of inflation with some explanatory variables (such as gap, exchange rate and seasonal dummies) was estimated using quarterly data from 2004 to 2017. The final result was robust to variables changes.

Figure 5 – IC-Br Energy
Dec/2005 = 100 (monthly average)



changes observed in the Brazilian economy and to maximize its correlation with the IPCA, considering the commodity prices relevance for inflationary cycles in Brazil. The results given by the exercises explain the efficiency gain of the revision, in terms of the identification of the impacts of international commodity price changes on the IPCA dynamics.

Figure 6 – Correlation with the IPCA

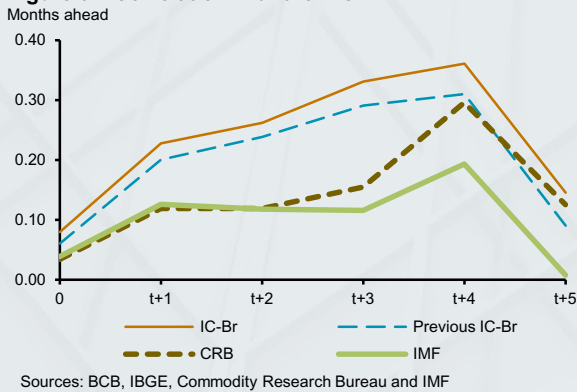


Figure 7 – Commodity Index adjustment

