What determines the behavior of industrial goods inflation?

This box analyzes the main determinants of the evolution of industrial goods prices. Among the factors that have influenced the dynamics of these prices, we highlight the behavior of domestic and imported inflation, agents’ expectations for future inflation and the level of industrial activity.

Inflation as measured by the Brazilian CPI (IPCA) is relevant to explain the recent movement of industrial goods prices, either through the inertial mechanisms of pricing or through the formation of expectations. In this sense, the 12-month change of industrial goods prices showed a similar path to the IPCA (Figure 1), although changes in the industrial products tax (IPI) rates from December 2008 to March 2010 and from April 2012 to December 2014 have produced some detachment in these series.

Recent volatility of the exchange rate and of commodity prices (Figure 2), as well as the contraction of activity in the industrial sector over the last quarters (Figure 3), may have also influenced the recent dynamics of industrial goods prices.

To empirically assess the effects of these factors on industrial goods inflation, the following equation was estimated:

\[
\pi_i^{IG} = \alpha_1 \pi_{i-1} + \alpha_2 E_i \pi_{i+1} + (1 - \alpha_1 - \alpha_2) \Delta e_{i-m} + \alpha_3 h_{i-j} + \sum_{k=1}^{4} q_k d_k + \epsilon_i \quad (1)
\]

Where,

- \( \pi_i^{IG} \) is the inflation rate of industrial goods;
- \( \pi_i \) is the inflation rate;
- \( E_i \) is the expectations operator;

1/ In November 2016, the weight of the industrial goods subgroup in Brazilian CPI (IPCA) was 23.6%.
2/ The transmission of imported inflation typically occurs in two stages: in the first, exchange rate movements are transmitted to the prices of imported goods; in the second, changes in the prices of imported goods are transmitted to retail and consumer prices.
3/ The smaller the production in the industrial sector in relation to the potential production, the greater the expected deceleration of industrial goods inflation.
A variable controlling for the dynamics of IPI rates was also tested, but no statistical significance was found. This result is possibly related to the fact that the impacts of changes in the IPI rates are restricted to a few months and to some products of the industrial goods basket.

\[\Delta e^f_t\] is the imported goods inflation rate (changes in the exchange rate and of foreign goods prices);

\[h_t\] is a measure of the output gap (obtained using the capacity utilization index published by CNI);

\[d_{it}\] are seasonal dummies; and

\[\varepsilon_t\] represents an unmodeled supply shock.\(^4\)

The model above, which can be seen as a sectoral Phillips curve, was estimated using percentage changes in quarterly data, from the third quarter of 1999 to the third quarter of 2016, by Ordinary Least Squares (OLS). Additionally the evolution of the parameters of the model over time was evaluated through rolling regressions.

To represent the inertia of industrial goods inflation, IPCA inflation was used with the premise that price makers consider the headline index, that is, IPCA, when pricing their products. In all the alternatives tested, this term proved to affect the prices of industrial goods.

The expectations term was also significant to explain variations in industrial goods inflation. In order to mitigate problems of endogeneity in the estimation by OLS, the median inflation expectations of the Focus-Market Readout for the subsequent quarter was used.

Different proxies were tested for imported goods inflation and the output gap. For foreign inflation, a measure that showed good performance was the change in the Commodity Research Bureau (CRB) index expressed in the national currency.

For the output gap measure, the difference between the level of industrial capacity utilization (UCI) published by the National Confederation of Industry (CNI) and its trend, extracted using the Hodrick-Prescott (HP) Filter, was chosen. As expected,

\(^4\) A variable controlling for the dynamics of IPI rates was also tested, but no statistical significance was found. This result is possibly related to the fact that the impacts of changes in the IPI rates are restricted to a few months and to some products of the industrial goods basket.
It is important to note that the coefficients presented here are average values obtained from a set of models with different specifications. We opted for an agnostic approach to the best model, mitigating the uncertainty problem in modeling.

It should be noted that, in fact, the effects of exchange rate tend to be lower when the economy is sluggish. For more details on the non-linear mechanisms of the exchange rate pass-through, see Boxe “Repasse Cambial para Preços” (Relatório de Inflação for March 2015).

A simple forecasting exercise with the estimated model suggests a decline in industrial goods inflation in 12 months in the coming quarters. It should be noted, however, that, as the Boxe “Inércia Inflacionária e Determinantes das Expectativas de Inflação” (Relatório de Inflação of September 2015) has shown, short-term inflation surprises tend to significantly affect short- and medium-term expectations, and in turn, the dynamics of industrial prices.

The rolling regression analysis showed evidence that the inertial coefficient increased over time, contrasting to the expectations coefficient (Figure 4). These results indicate that the ongoing disinflation process in the Brazilian economy will probably contribute to the deceleration of industrial goods inflation in the coming quarters.

During the same period, there was also a reduction in the pass-through coefficient of imported goods prices to industrial prices and an increase in the coefficient of the output gap (Figure 5).

Summarizing, the exercise presented in this box indicates that there was an increase in the inertial coefficient, a reduction in the pass-through coefficient of imported goods inflation and an increase in the coefficient of the output gap in recent years. These results suggest that the ongoing disinflationary dynamics in the Brazilian economy should also be observed in industrial goods inflation.

References
