Breakdown of 2010 Inflation

Following the procedure adopted in previous years, this box presents estimates, based on projection models used by the Banco Central do Brasil, of the various contributing factors for inflation in 2010. In this regard, the variation in the Broad National Consumer Price Index (IPCA) is broken down into six components: i) exchange rate variation; ii) inertia associated with the portion of inflation that exceeded the target, accumulated from the last quarter of the previous year; iii) difference between agents' inflation expectations and the inflation target; iv) supply shock; v) inflation of market prices, excluding the effects of the four preceding items; and vi) inflation of contractually administered and monitored prices, removing the effects of items "i)" and "ii)".¹ It is worth highlighting that the estimates presented in this breakdown process are approximations, based on models, and are therefore subject to uncertainties inherent to the modeling process.

In comparison to what was presented in previous years, the methodology adopted in this box differs by including the item (iv), supply shock. The supply shock was identified in two steps: in the first step, the one-step-ahead prediction error was calculated from the *Phillips* curve of market prices. This prediction error includes a component that can be identified as supply shock, which impacts the inflation of market prices. In the second step, the prediction error was projected in the space generated by innovations in commodity price indexes in *reais* – measured by the Commodity Research Bureau (CRB) index

^{1/} The basic procedure is described in Freitas, Minella and Riella (2002), "Methodology for Calculating Inflationary Inertia and Shock Effects of administered prices," Technical Note of the Central Bank of Brazil, n. 22. In this box, in addition to what is described in the basic procedure, the component "supply shock" was estimated.

and the Brazil Commodity Index $(IC-Br)^2$ –, in the international price of oil in *reais*, and by the mismatch between domestic wholesale and retail price indices. These variables work as instruments to identify the supply shock used in the breakdown.

Before presenting the estimates of the inflation breakdown, it is worth to present a brief background on supply shocks.

Supply shocks are defined as surprises that directly affect production conditions, such as agricultural crop failures, shortages of energy, increases in productivity of firms, terms of trade improvements, among others, and they may be positive or negative. Although their definitions are quite straightforward, generally the identification of the shocks is complex, because many times the shocks are not easily classified or may embed elements of supply and demand, making the process uncertain and dependent on the use of economic models.

For the purpose of monetary policy implementation, the relevance of a shock depends on its magnitude and persistence, as well as on structural features of the economy. For example, persistent exchange rate movements tend to be further transferred to prices. Or still, economies with high share of food in the consumption basket of families tend to be more strongly affected when these prices increase in international markets. From another perspective, since the magnitude of the shock, in general, is revealed over time, a commonly accepted rule in central banks suggests calibrating the policy response as the effects are unveiled overtime (Blinder (1998)).³

In the specific case of supply shock, monetary policy may face a trade-off between stabilizing output and controlling inflation. If the shock is positive – such as productivity gains – the situation is not conflicting, because the shock contributes to increase the aggregate supply and aligns with monetary policy efforts to keep prices stable. If it

^{2/} CRB is the commodity index produced by the Commodity Research Bureau and IC-Br is the Brazil Commodity Index presented in the box "Transfer of Commodity Prices for the IPCA and Brazil Commodity Index (IC-Br)" in the December 2010 *Inflation Report*.

^{3/ &}quot;Step 1: Estimate how much you need to tighten or loosen monetary policy to "get it right". Then do less. Step 2: Watch developments. Step 3a: If things work out about as expected, increase your tightening or loosening toward where you thought it should be in the first place. Step 3b: If the economy seems to be evolving differently from what you expected, adjust policy accordingly." (Blinder, 1998, pp. 17-18).



Figure 1 – CRB and IC-Br Commodity Price indices

Table 1 – Inflation decomposition from 2003 to 2010 (in p.p.)

is negative – such as an electrical blackout, crop failures or oil price increases – it contracts the supply and pushes inflation up. Theory⁴ recommends that, in the presence of negative supply shocks, the optimal monetary policy does not react to the first order effects (primary effects). Such policy should prevent the so-called second-order effects, that is, those effects of localized increases in prices – stemming from sectors where supply shocks originated – to propagate for nominal wages, medium and long term inflation expectations and prices not directly affected by the cost variations.

In 2010, as shown in Figure 1, the prices of commodities in *reais* rose significantly. This process, a result, at least in part, of supply shocks, quickly reflected in the dynamics of consumer prices, so that inflation measured by the IPCA reached 5.91% in December 2010, from 4.31% in the previous year. Considering the two major price groups that make up the IPCA, inflation of market prices closed the year at 7.08% and the one of administered prices at 3.13%.

Component	2003	2004	2005	2006	2007	2008	2009	2010
IPCA (percentage variation)	9.30	7.60	5.69	3.14	4.46	5.90	4.31	5.91
Inertia	5.92	0.28	0.77	0.47	0.01	0.23	0.00	-0.09
Expectations	1.71	0.37	0.27	-0.13	-0.43	0.22	-0.10	0.21
Exchange rate pass-through	-1.11	-0.34	-2.06	-0.55	-1.12	0.63	-0.24	-0.22
Supply shock	1.24	3.52	-0.88	0.18	2.12	1.52	-0.25	1.97
Market prices inflation*	-0.12	0.83	4.29	1.58	2.91	2.25	3.72	2.95
Administered prices inflation**	1.66	2.93	3.31	1.60	0.96	1.05	1.18	1.10

* Excluding the effects of exchange rate pass-through, inertia, expectations and supply shock.

** Excluding the effects of exchange rate pass-through and inertia



Figure 2 – Breakdown of 2010 inflation

According to Table 1, controlling for the effects of the exchange rate pass-through, inertia, expectations and supply shocks, the major part of the variation of the IPCA, in recent years, was due to the behavior of market prices, followed by the one of the supply shock. In 2007 and 2008, the supply shock contributed with 47.6% and 25.8%, respectively, of total inflation. In 2009, it presented itself as disinflationary.

In 2010, according to Figure 2 and Table 1, discounting the effects of the exchange rate

4/ See, for example, the dynamic stochastic general equilibrium models of Aoki (2001) and Bodenstein et al (2008).



In relative terms, the effects of market and administered prices on inflation reached 49.9% and 18.6% respectively in 2010 (Figure 2). In relation to the set of items described in "(i)", "(ii)", "(iii)" and "(iv)", it was estimated that, in the aggregate, they increased the IPCA by 1.87 p.p. (31.5%), contrasting to what happened in 2009, when they reduced inflation by 0.59 p.p., but in line with what happened in 2007 and 2008, years in which the inflation was strongly influenced by supply shocks.

Figure 2 and Table 1 indicate that the variation of the exchange rate helped reduce the inflation rate in 2010, repeating what has been observed since 2003, except for 2008. In fact, the variation of the exchange rate was responsible for a reduction of 0.22 p.p. in the IPCA, equivalent to 3.8% of total inflation. The inertia also contributed to the decrease in the IPCA of 0.09 p.p., equivalent to 1.6% in overall inflation in 2010. In turn, the contributions of the supply shock and of the component given by the difference between inflation expectations and the inflation target were positive in 2010, increasing the IPCA by 1.97 p.p. and 0.21 p.p., respectively, equivalent to 33.3% and 3.6% of the inflation.

In comparison to the previous year, Figure 3 illustrates that the inflation of market prices (excluding the effects of exchange rate pass-through, inertia, expectations and supply shock) and the inflation of administered prices (excluding the effects of exchange rate pass-through and inertia) accounted for most of the inflation in 2009.

In summary, in 2004, 2007, 2008 and 2010, the component "supply shock" explained over 25% of observed inflation, approaching one half in some episodes. Specifically in 2010, the contribution of the supply shock was approximately one third. It should be noted that this shock is associated, in large part, with the dynamics of commodity prices in the second half of 2010. In fact, the rise in commodity prices was reflected, with a short lag, in the inflation indices, especially in the food and

Figure 3 – Breakdown of 2009 inflation



beverages group – the variation of the prices in this group in just four months (September-December 2010) reached 6.67%. Finally, it is important to note that, as recommended by theory, in line with the international experience, monetary policy should accommodate the first-order effects of the supply shock and remain vigilant to contain its propagation and attempts of relative price recomposition (the second-order effects).

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