Inflation outlook

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This chapter of the *Inflation Report* presents the Monetary Policy Committee's (Copom) assessment of the behavior of the Brazilian economy and of the international scenario since the release of the previous *Report* in December 2010. The chapter also presents the analysis of the inflation prospects up to the first quarter of 2013 and of the Gross Domestic Product (GDP) growth up to the end of 2011. Inflation projections are presented in two major scenarios. The first scenario, called the baseline scenario, assumes that the Selic rate will remain unchanged at 11.75% per year over the forecasting horizon, the level defined by Copom at its most recent meeting on March 1 and 2, and the exchange rate will remain at R$1.65 per US dollar. The second scenario, named the market scenario, is based on the expected paths for the basic interest rate and for the exchange rate drawn from the survey carried out by the Central Bank's Investor Relations and Special Studies Department (Gerin) among independent analysts. For a third scenario, called alternative scenario, which assumes that the exchange rate remains unchanged over the relevant horizon at recently observed levels, and the target for the Selic rate based on data from the expectations survey carried out by Gerin, inflation projections are presented for the end of the years 2011 and 2012. It is important to stress that these scenarios are used only as support for monetary policy decisions and their assumptions should not be viewed as Copom forecasts of the future behavior of interest and exchange rates. The projections released here are based on the information set available up to the cutoff date of March 11, 2011.

The projections for inflation and of GDP growth released in this *Report* are not point estimates. They consist of probability intervals which embody the degree of uncertainty that was present at the above mentioned cutoff date. Inflation projections depend not only on assumptions about the interest and exchange rates, but also on a set of assumptions on the behavior of exogenous variables. The most likely set of assumptions considered by the Copom is used to build the scenarios to which the Committee attaches the greatest

weight on making its interest rate decisions. On setting out these assumptions, the Copom seeks to foster transparency to the monetary policy, thereby contributing to effectiveness of policy decisions in controlling inflation, which is its primary objective.

6.1 Inflation determinants

Inflation, measured by the change in the Broad National Consumer Price Index (IPCA), after reaching 4.31% in 2009, 1.59 percentage points (p.p.) lower than in 2008, rose again in 2010, reaching 5.91%. In the first two months of 2011, the IPCA index increased by 0.83% in January and 0.80% in February. Thus, the twelve-month inflation reached 6.01% in February. The increase in inflation in the last twelve months was determined by the change in market prices. In fact, while regulated prices rose by 3.29% in the twelve months up to February, market prices increased by 7.17%. Within the set of market prices, stands out the price change for tradable goods (6.31%), influenced by the recent inflation dynamics of food items, as well as the price change recorded for non-tradable goods (7.91%). Reflecting the dynamism of domestic demand, services sector inflation has consistently remained higher than that of market prices. In the twelve months up to February, the change in services prices reached 8.39% (against 6.23% in the twelve-month period up to February 2010). In turn, the twelve-month change in regulated prices has positively contributed to the recent inflation dynamics as it has been below the center of the target since April 2010.

As with headline inflation, the three core inflation measures computed by the Central Bank show recent increase in the twelve-month accumulated indices and are above the center of the target. The exclusion core measure (IPCA-EX), which had moved from 5.72% in December 2008 to 4.73% in December 2009, rose to 5.45% in December 2010, and again to 5.63% and 5.92% in January and February 2011, respectively. Similarly, the change in the core by smoothed trimmed mean (IPCA-MS), which had reached 4.82% in December 2008 and had been reduced to 4.38% in December 2009, reached 5.63% in December 2010 and increased to 5.69% and 5.70% in the two following months. Additionally, inflation measured by the double weighted core measure (IPCA-DP), which reached 6.06% in December 2008 and had decreased to 4.73% in December 2009, reached 5.62% in December 2010, and rose in the next two months to 5.83% and 6.07%. In February, the average monthly change of the three core measures remained stable, standing at 0.69%, against 0.70% in January.

The IPCA diffusion index stood at 61.72% in February 2011, the same figure recorded in February 2010. Although there has been decline in relation to the January 2011's level (69.27%), the diffusion index remains high, which supports the hypothesis of acceleration in prices.

After a sharp reduction in 2009 (-1.43% versus 9.10% in 2008), broad inflation, measured by the General Price Index (IGP-DI), reached 11.30% in 2010. In the first two months of 2011, the IGP-DI monthly changes were 0.98% (January) and 0.96% (February). Thus, twelve-month inflation remained at a high level, reaching 11.27% in January, and 11.12% in February 2011. The strong acceleration in broad inflation is mainly due to IPA-DI, the main component of the index, which increased 13.85% in twelve months up to December 2010, 13.85% up to January 2011, and 13.69% up to February. By origin and for the same periods, agricultural products changed by 25.59%, 28.39% and 29.83%, whereas industrial products, by 10.13%, 9.32% and 8.65%. According to the Consumer Price Index (IPC-DI), the second component of the IGP-DI, the twelve-month inflation reached 6.24% in December 2010, 6.21% in January 2011 and 6.02% in February 2011. In the same way, the accumulated variation of the National Cost of Construction Index (INCC), also a component of the IGP-DI, slightly declined in the first two months of 2011, after increasing in all months of 2010. According to this index, twelve-month inflation reached 7.77% in December, then dropped to 7.52% in January and then to 7.44% in February. Note that all components of the IGP-DI index continue to register significant inflation. As emphasized in previous *Reports*, the Committee evaluates that the effects of wholesale prices over consumer price inflation will depend on current and prospective demand conditions, as well as on price setters' expectations for the future path of inflation.

The Index of Economic Activity of the Central Bank (IBC-Br) includes estimates for monthly production of the three sectors of the economy, as well as taxes on products and, therefore, it is an important coincident indicator of economic activity. After slowing down and reaching the minimum quarterly growth of 0.2% between June and August of 2010, the growth rate reached 1.0% between October and December 2010, relative to the previous quarter. In 2010, the IBC-Br index increased by 7.8% over the previous year. The Services Confidence Index (ICS), computed by Getulio Vargas Foundation (FGV), decreased by 3.0% in January 2011 compared to December 2010; by 1.3% compared to January 2010; and by 3.3% over the average index of 2010.

Industrial production increased 0.2% in January compared to December 2010, according to seasonally adjusted data by the Brazilian Institute of Geography and Statistics (IBGE), whereas the three-month moving average of industrial production fell by 0.2% between November 2010 and January 2011, the same rate registered in the last quarter of 2010. Based on rates of change in twelve months, industrial production exhibited expansion of 9.4% in January 2011, against 10.4% registered in December 2010. Comparing with December 2008, when industrial production registered the greatest decline during the 2008/2009 crisis, the recovery up to January 2011 amounted to 23.1%. The diffusion index, which measures the percentage of products that posted some increase in production, reached 56% in January, relative to the same month of the previous year, against 55.4% registered in December 2010, relative to the same basis of comparison.

Among the industry categories of use, and based on seasonally adjusted IBGE data, the production of durable consumer goods posted the greatest contribution to the change of the overall index in January 2011, relative to the previous month (6.0%). In the same period, the production of semi-durable and non-durable consumer goods expanded by 0.2%, whereas capital goods production increased by 1.8%. The production of intermediate goods decreased 0.4%. Considering the three-month moving average rates for January 2011, the durable consumer goods category grew by 1.8%, whereas capital goods production increased by 1.4% and the intermediate goods production registered growth of 0.1%. In turn, the production of semi durable and non-durable consumer goods contracted by 0.2%. Of notice, the production of capital goods increased 20.4% in the twelve-month period up to January 2011, the greatest expansion among the categories of use. This is an evidence of the robust investment activity, a relevant factor for economic recovery during the post-crisis period.

The rates of capacity utilization remain at high levels. The low idle capacity is a result of the recent expansion in economic activity, which has not been entirely met by maturing investments. In fact, the seasonally adjusted Level of Utilization of Installed Capacity (Nuci) computed by FGV reached 84.5% in February 2011, versus 84.7% in January. According to data from the National Confederation of Industry (CNI), seasonally adjusted by the Central Bank of Brazil, the Nuci remained stable at 82.8% in December 2010, against 82.7% in November. Regarding the twelve-month period up to January 2011, the absorption of capital goods showed a 26.1% increase. The production of inputs for civil construction rose by 11.5%, considering the same basis of comparison.

The seasonally adjusted inventory level indicator from the Manufacturing Industry Survey of FGV reached 101.3 in December 2010. In January 2011, this indicator decreased to 97.7, followed by a slight increase to 98.8 in February. In December 2010, 5.2% of the respondents expressed their inventory level as excessive, considering the seasonally adjusted series. This percentage reached 6.3% in January and 5.7% in February 2011. In summary, the data suggests that utilization rates remained high over the last months, signaling the small idle capacity in the manufacturing sector, despite the resumption of investment.

Unlike industrial production, the volume of expanded retail sales grew significantly at the margin by the end of 2010. In December 2010, expanded retail sales increased 14.8% relative to the same month of 2009, against 17.0% registered in November. It is worth noting that these rates are considerably higher than the 2.5% expansion of industrial production in December, relative to the same month of the previous year, as well as the 3.7% growth of IBC-Br on the same basis of comparison. Thus, the slowdown of industrial activity has not corresponded to moderation in retail sales, although this asynchrony tends to change in 2011. The expansion of retail sales is reflected, for example, in the imports of durable and non-durable consumer goods, which in December 2010 rose by 27.7% and 24.8%, respectively, relative to the same month of the previous year. In 2010, the volume of expanded retail sales increased by 12.2% with respect to the previous year, after posting growth rates of 6.8% in 2009 and 9.9% in 2008. For the next few quarters, retailing should continue to be bolstered by the growth of real wages, government transfers, credit expansion, though at a moderate pace, and consumer confidence.

After an increase of 5.2% in 2008 and a decline of 0.6% in 2009, the Brazilian economy expanded again in 2010, posting an expressive growth rate of 7.5% – the highest rate since 1986. According to seasonally adjusted IBGE data, compared to the immediately previous quarter, GDP exhibited high growth rates in the first and second quarters (2.2% and 1.6%, respectively). From the second semester on there was an economic slowdown, with growth rates of 0.4% in the third quarter of 2010, and 0.7% in the fourth quarter. The behavior of GDP suggests that the Brazilian economy resumed the expansion pattern prior to the financial crisis of 2008/2009 and, more recently, at a pace consistent with sustainable growth rates in the long-run. From the production viewpoint, the services sector, which exhibits less volatile growth rates, was the only sector to depict positive growth rate (1.0%) in the last quarter of 2010, the eighth consecutive

increase, according to seasonally adjusted IBGE data. The agricultural production declined 0.8% in the fourth quarter of 2010, after falling 1.6% in the previous quarter. The industrial production also declined in the fourth quarter of 2010 (0.3%), against a decline of 0.6% in the previous quarter.

From the viewpoint of aggregate demand, the Gross Fixed Capital Formation (GFCF) increased 21.8% in 2010, after declining 10.3% in 2009. Compared to the immediately previous quarter, and based on seasonally adjusted IBGE data, GFCF registered expansion of 4.0%, 3.9%, 3.1% and 0.7% in the four quarters of 2010, respectively. Despite a low share in aggregate demand, compared to household consumption, the high growth rate of investment has contributed to sustain the level of economy in the post-crisis period. In addition, the perspective of new and large-scale investment projects coordinated by public sector, such as those in the oil (pre-salt layer) and infrastructure sectors, favors the expectations of economic agents and the fast pace of GFCF. Household consumption – the most important component of aggregate demand – increased by 1.8%, 1.1%, 1.8% and 2.5%, in the same periods and the same basis of comparison. Government expenditure grew only in the second quarter of 2010 (1.8%), and exhibited a decline of 0.2%, 0.1% and 0.3% in the first, third and fourth quarters. The external sector contributed negatively to GDP growth in 2010 (-2.8 p.p.) due to the growth of imports (36.2%), while exports rose 11.5% during the year. In sum, domestic demand, driven by the expansion of credit, employment and income, has been the main driving force of activity, and should continue to evolve positively in the coming quarters, although at a slower pace.

In fact, after having grown 9.1% in 2008 and 5.9% in 2009, real retail sales increased 10.9% in 2010, according to the IBGE, notably sales in the segment of "equipment, office supplies, computer and communication" (24.1%) and of "furniture and appliances" (18.3%). The expanded retail sales, which include sectors more sensitive to credit conditions, showed a robust performance in 2010, driven by sales of construction material, which grew by 15.6%, as well as by sales of cars and motorcycles, parts and accessories, which increased by 14.1%.

The labor market has played an important role in the current economic cycle. Unemployment, measured by the rate of unemployment in the six metropolitan areas covered by the monthly survey of IBGE, has been falling in the last years, reaching a historic low of 6% in November 2010, considering the seasonally adjusted series. Afterwards, it increased to

6.3% in January 2011. Based on the non-seasonally adjusted series, the unemployment rate reached 6.1% in January 2011 – the lowest rate for the month of January since the beginning of the unemployment series under the current methodology (March 2002). Relative to the same month of 2010, the unemployment rate declined 1.1 p.p. It is worth noting that this fall took place in all the six areas covered by the survey. Also according to IBGE, the average real earnings usually received by the employed population increased 5.3% in January 2011, with respect to the same month of 2010. The total number of persons working in the six regions reached 22.1 million in January 2011, against 21.6 million in January 2010. Concerning the evolution of formal employment, after falling sharply at the end of 2008 and beginning of 2009, job creation returned to expand quite robustly in 2010. According to figures released by the Ministry of Labor and Employment (MTE), a total of 2.47 million jobs were created between February 2010 and January 2011. Thus real payroll expanded 7.7% compared with the same month of 2010, 9.5%, compared to 2009, 18.1%, compared to 2008, and 26% compared to January 2007.

In addition to the rising payrolls, the availability of credit to households – largely determined by macroeconomic stability and institutional reforms in recent years – was an important driving force of the growth in household consumption. After being adversely affected by the crisis of 2008/2009, credit conditions return to more favorable patterns, thus boosting lending volumes. The stock of credit to households with non-earmarked resources grew 19.1% in January 2011, compared to the same month of the previous year. In the same period, housing loans, whose operations are mainly based on earmarked resources, grew 50.2%. Despite this performance, it is expected some moderation in 2011 with regard to credit for individuals and corporations, in part due to the recently adopted macro prudential measures. In general, delinquency rates have remained at levels consistent with the phase of the cycle. In fact, the share in total outstanding credit with earmarked and non-earmarked funds of loans that is 90 or more days past due moved from 5.5% in January 2010 to 4.6% in January 2011.

The total volume of credit to corporations grew by 18.8% in January 2011, compared to the same month of 2010, considering non-earmarked and earmarked resources, and totaled R$927.5 billion. Credit expansion was boosted by loans and financing with resources from The Brazilian Development Bank (BNDES), which amounted to R$359.4 billion in January 2011, an increase of 24.6% over the same period in 2010. Regarding the capital market, the

volume of primary issues of shares registered in the Securities and Exchange Commission (CVM) reached R$145.2 billion in 2010, including the issue of R$120.2 billion by Petrobras in September 2010, the highest ever recorded in the Brazilian stock exchange. In turn, bond issuance (excluding emissions by leasing companies), totaled R$15.6 billion in 2010, after reaching R$11.1 billion in 2009.

Regarding the external sector, the twelve-month trade balance has been rising since the previous *Report* and reached US$21.7 billion in February 2011. This performance includes exports of US$210.4 billion and imports of US$188.7 billion. These values are 33.9% and 42.0% higher than those recorded in twelve months ending in February 2010, respectively. The recovery of external demand has contributed to the growth of exports. In fact, the quantum of exports increased 9.7% in the twelve months ending in January 2011, against the previous twelve months. In the same period, the average price of exports rose by 21.7%. In turn, the quantum of imports increased 37.5% during this period, in part reflecting the strength of domestic demand. The average price of imports rose by 4.3% in the twelve months up to January 2011.

The twelve-month current account deficit increased from US$47.5 billion in December 2010 to US$49.1 billion in January 2011, equivalent to 2.35% of GDP. Remittances of profits and dividends have been an important component of this deficit, reaching US$31.4 billion in the same period. In turn, foreign direct investment amounted to US$50.8 billion in the twelve months up to January 2011, equivalent to 2.43% of GDP, and surpassing the external financing requirement.

In international financial markets, volatility and risk aversion have risen since the previous *Report*, fueled by very high levels of global liquidity and geopolitical uncertainty in the Middle East and North Africa. Although the perception of systemic risk has fallen significantly in recent months, concerns about the effects of recent high oil prices on economic activity of developed economies have increased recently. There is also uncertainty about the sustainability of debt levels in some European countries, the possibility of a slowdown in China, as well as the effects of the massive earthquake and tsunami in the afternoon of March 11 in Japan.

As far as the pace of global economic activity is concerned, the outlook of a faster than expected recovery has strengthened. The likelihood of a reversal has lowered, but reins the view that will be a marked growth asymmetry across countries. Recovery is consolidating worldwide, and

particularly in the United States, whose domestic demand has been exhibiting some vigor, especially with respect to household consumption, within an environment of declining uncertainties about the labor market. The macroeconomic perspective for the Euro Area remains asymmetric, with Germany expanding quite strongly. Although headline inflation rates of consumer prices have increased in the G3 countries (United States, Euro Area and Japan), the respective core inflation rates in those countries remained at moderate levels – despite the still strong fiscal and monetary stimuli. In emerging markets, inflationary pressures have become widespread. Since the release of the last *Report*, it is worth noting the interest rate hikes promoted by the central banks of Chile, China, Colombia, India, Indonesia, Peru and Russia, as well as the successive increases in reserve requirements in China.

Brent oil prices surpassed again the level of US$110/barrel. Although the hike in the last weeks has been driven by elevated political instability in some countries of the Middle East and, especially, in North Africa, this price acceleration is consistent with the strengthening of global demand. As far as the considerable uncertainty regarding oil price projections is concerned, the main scenario adopted by Copom assumes unchanged domestic gasoline prices in 2011. It should be noted that the influence of international oil prices on domestic inflation is not transmitted exclusively through the local price of gasoline, but also via the production chain of the petrochemical industry, as well as the expectations channel. Among the remaining commodities, there was a sharp rise in international food prices since the release of the latest *Report*. The food price index, calculated by the Food and Agriculture Organization (FAO) of the United Nations, increased by 11.1% in the last three months, and by 34.2% over the twelve-month period up to February 2011. In turn, the commodity price index of the Commodity Research Bureau (CRB), based on twenty two commodities, reached new record on the first week of March. At the cutoff date of March 11, the index increased 11.2% in the three-month period and 29.1% in the twelve-month period. The behavior of commodity and asset prices still embodies great uncertainty, reflecting the volatility in financial and currency markets.

Figure 6.1 – Inflation target path and market expectations for twelve-month ahead inflation

The median of market expectations for the 2011 GDP growth rate declined since the release of the previous *Report*, from 4.50% at December 10, 2010 to 4.10% at March 11, 2011. During this period, the median expectation for inflation in 2011 moved from 5.21% to 5.82%, and in 2012, from 4.50% to 4.80%. The dispersion of inflation expectations for the
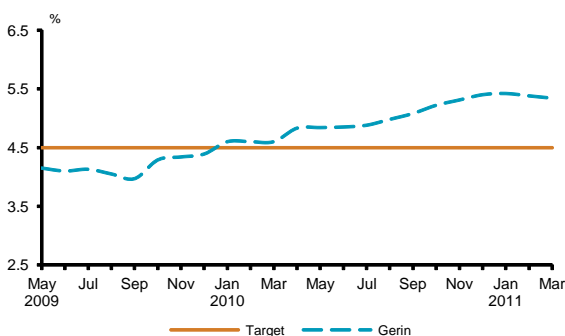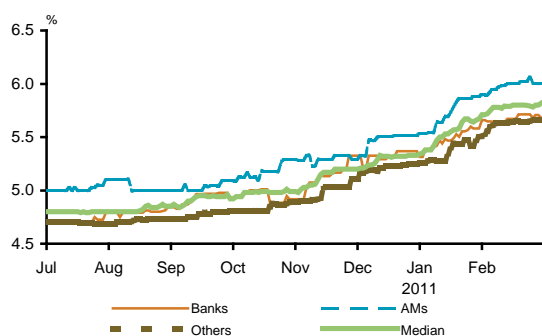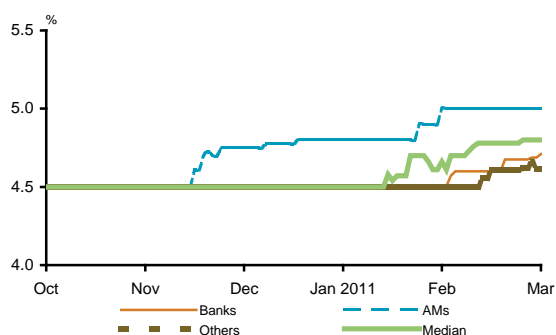
Figure 6.2 – Dispersion of inflation expectations for 2011

Relative frequency
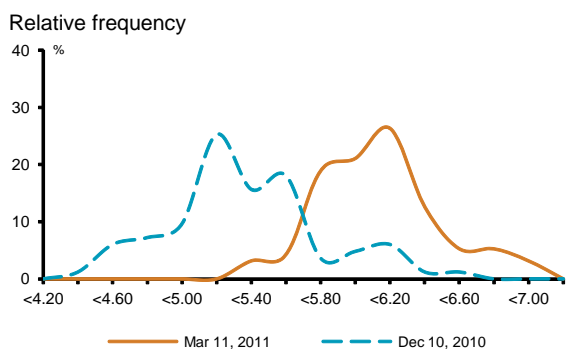
Figure 6.3 – Median market expectations by segment for 2011 IPCA-inflation

Figure 6.4 – Median market expectations by segment for 2012 IPCA-inflation

twelve months ahead decreased slightly, with the standard deviation moving from 0.46% to 0.44%.

Overall, since the release of the previous *Report*, there was a reduction in dispersion around the central tendency measures of inflation expectations for 2011, and an increase for 2012, as illustrated in Figure 6.2. In this sense, according to economic theory, the presence of heterogeneous agents in a survey of expectations, by itself, would lead to the dispersion of beliefs within the sample. One approach to tackle this issue relates the heterogeneous beliefs to underlying economic incentives. Alternatively, the existence of different loss-functions among agents is also used for explaining the dispersion of beliefs.

The international evidence on surveys of expectations, in general, suggests significant degree of information dispersion, both for consumers and professional market analysts. In fact, in the case of Brazil, the breakdown of market participants of the survey carried out by Gerin into three groups – banks, asset managers (AMs) and other institutions (nonfinancial companies, brokers, consulting companies and professional entities), reveals that agents have different views on the inflation outlook. Thus, for each group, time series of median inflation expectations were built, as illustrated in Figures 6.3 and 6.4, which suggest distinct behavior among segments, particularly in the case of the AMs group.

At the cutoff date of March 11, the median inflation expectations for 2011 of banks, AMs and other institutions are 5.68%, 6.00% and 5.67%, respectively. For 2012, these figures are 4.71%, 5.00% and 4.62%, respectively. In order to reduce information asymmetries among market participants, from this *Report* onwards the Central Bank will systematically release inflation expectations of each referred segment, without any loss regarding the release of the median for the whole sample.

6.2 Main scenario: associated risks and monetary policy implementation

The projections used by the Copom are based on a set of assumptions about the behavior of the main macroeconomic variables. This set of assumptions, as well as the risks associated with them, make up the main prospective scenario based on which the Committee makes policy decisions. On the whole, the prospective scenario envisages, on the external

side, the tendency of consolidation of the recovery of the global economy and some dissemination of inflationary pressures, mostly in emerging economies. On the domestic side, the prospective scenario involves moderation in economic activity, and some advances in the balance of risks for inflation, although the inflation projections for 2011 are less favorable that those in the last Inflation *Report*.

On the external front, the main inflationary risk comes from commodity prices behavior. Since the last *Report*, the prospect for international commodity prices, including oil, remains shrouded in uncertainty. For example, it depends on the repercussions of the recent earthquake in Japan; on geopolitical factors in North African and Middle Eastern countries; on the evolution of demand, in the context of asymmetric global recovery; on the possibility of a slowdown in China; and on the volatility in international financial markets. During this period, the chances for new unconventional monetary measures abroad have lowered; and these measures have been seen as supporting elements for the recent surge in international commodity prices.

The recent increase in domestic wholesale prices is closely linked with soaring commodity prices in international markets. In particular, agricultural commodities witnessed a strong acceleration in prices between August 2010 and February 2011, with total change of 24.3%. However, to a significant extent, the commodity price increase has already been incorporated into consumer prices. In fact, the food and beverages group has accumulated 8.15% increase between August 2010 and February 2011. Even so, pressure arising from commodity markets may be persistent and, without compensation from movements in the opposite direction in domestic assets, could result in additional inflationary pressures – which in fact have occurred in recent episodes.

The purchase of external goods tends to diminish domestic inflationary pressures through two channels. First, these products compete with goods that are produced domestically imposing greater discipline to the price setting process. Second, they reduce demand for domestic input markets, contributing to the weakening of cost pressures and, by consequence, of its pass-through to consumer prices.

In relation to the recovery of the global economy, the baseline scenario continues to contemplate the hypothesis of an ongoing recovery of activity, still with marked asymmetry between economic blocs, and with a lower probability of reversion.

On the domestic front, the Committee evaluates the main risk is that the recent increase in inflation – in the context of tight spare capacity in factor markets, most notably the labor market – be transmitted to the prospective scenario. This important risk factor could be worsened by mechanisms favoring inflation persistence. It is worth noting that inflation in the previous months reflected the strong negative influence from food price dynamics, which is in part explained by external and domestic supply shocks; seasonal factors characteristics of the first two months of the year; and unusual readjustments of administered prices in the same period. These price increases have occurred in the context of ongoing imbalance between growth of domestic absorption and supply expansion capacity; but there are signs the imbalance will ease off.

After the pronounced drop in the last quarter of 2008 and the first quarter of 2009, investments have been expanding systematically above the growth rate of GDP, and rates have converged in the last quarter of 2010. As a result, the investment rate – the share of GFCF in GDP – is recovering vigorously, although it remains below the levels observed before the 2008/2009 crisis. The combination of less pronounced growth in aggregate demand with the rebound in investment has led to more stable readings of industrial capacity utilization levels – which had been going through a process of continuous growth during 2009 and the beginning of 2010.

The high GDP growth rate in 2010, 7.5%, reflects in part the statistical carry-over effect that results from the growth rates that were recorded in the second half of 2009. In general, however, the outlook for the evolution of domestic economic activity remains favorable, despite the ongoing moderation, at an uncertain pace, of domestic demand expansion. This assessment is underpinned, among others, by the indications that the expansion of credit supply will persist – although at a more moderate pace after the recent adoption of macroprudential measures – both for individuals and for corporations; by the fact that the confidence levels of consumers and entrepreneurs remain at historically high levels – in spite of moderation at the margin. The strength of labor markets, the remaining effects of the fiscal stimulus and of the policies of public banks and the recovery of the global economy are also noteworthy.

An important source of risk comes from the labor market. The employment level has increased in a vigorous manner and led to the lowest unemployment rate readings since the beginning of the computation of the time series with

the methodology that is currently employed (in March 2002). There are, however, some signs of moderation in employment growth. In this sense, real average earnings, after growing vigorously in 2010, show evidence of moderation, in part, due to higher inflation. A crucial aspect in such situations is the possibility that the level of activity in the labor market leads to nominal wage increases at rates that are not compatible with productivity growth, something which has been occurring. In a strong demand environment, such wage increases tend to be passed on to consumer prices. In this respect, the theory, which is backed by international experience, establishes that wage moderation is a key element for guaranteeing a macroeconomic environment with price stability.

The Committee assesses that there are important mechanisms making the Brazilian inflation downward rigid. In particular, the presence of regular and almost automatic mechanisms of price adjustment, either de jure and/or de facto, has contributed to the persistence of inflationary pressures coming from the past. It is well known that the existence (even informally) of price indexation mechanisms reduces the sensitivity of inflation to demand conditions. Overall, indexation mechanisms tend to prevent the economy from disinflating during downturns and thus increase the "starting point" of the inflation rate during upturns, thus raising the inflation risks for the prospective scenario. In fact, this years' inflation rate will incorporate the high starting point from 2010.

The risks related to indexation mechanisms are particularly important in 2011. Indeed, inflation in the previous year was well above the target path, and particularly so for the last quarter's annualized rate. Moreover, the 12-month inflation rate for the next two quarters tends to remain close to or above the current ones. In part, this is explained by inertia from 2010 and by inflation projections for June to August close to the historical pattern, in contrast to the verified in the same period of the previous year.

The potential effects of recent increases in wholesale market prices on consumer prices should also be monitored. The evidence suggests time lags between price variations in the wholesale market and their pass-through to consumer prices – as highlighted in a box in the March 2010 *Inflation Report*. This implies that, presumably, a share of the effects of the recent spike in producer prices will still be transmitted to consumer prices. As noted in previous *Reports*, the Copom understands that the effects of the development of prices in the wholesale market on consumer inflation will depend,

among others, on current conditions and the outlook for demand, on the exposure of each sector to external and internal competition, and on expectations of price setters regarding the future evolution of inflation.

Another source of concern lies in the evolution of inflation expectations, which have followed unfavorable dynamics during the last months. More specifically, the associated risk lies in the possibility that the recent increase in inflation will influence even further the expectations of price increases, making this dynamics more persistent.

Regarding fiscal policy, the Copom understands that the generation of primary surpluses in line with the assumptions considered for inflation projections, besides contributing to the reduction in the mismatches between supply and demand growth rates, will strengthen the reduction trend in the public debt-to-GPD ratio. The Copom reaffirms that the inflation main scenario considers the materialization of the trajectories regarding fiscal and quasi-fiscal variables. In this sense, significant decisions have been taken and implemented by the government to restrain expenditure, which support the vision that, at the beginning of this year, a fiscal consolidation process has begun.

The dynamics of the credit market also deserves attention, be it for its potential impact on aggregate demand and, as a consequence, on inflation, or for the macroprudential risks that it may represent. The dynamism of the credit market in Brazil has been intense and has meant a persistent growth in the credit-to-GDP ratio. As highlighted in the box "The Potency of Monetary Policy in Brazil", in the June 2010 *Report*, this deepening of credit markets, among other factors, may have contributed to the amplification of the power of monetary policy in Brazil. On the other hand, we should stress that the policy towards international reserve accumulation seeks to purchase the flows in the medium and long run, but, in spite of that, part of the resources have been gone to the credit market. In this sense, the excess of external inflows may weak the credit channel, smooth its contribution to the aggregate demand moderation, as well as cause distortions in the price of domestic assets.

Nevertheless, the Copom understands that the moderation in the expansion of the credit market constitutes an important element to the materialization of its main scenario. In this connection, it considers appropriate the implementation of initiatives aiming to restrain subsidies through credit operations. Compared to the situation that prevailed at the time of the last *Report*, the view that prevails is that there

has been a substantial increase in the probability of the hypothesis of moderation in the expansion of the credit market in general. Incidentally, available information showed significant changes both in prices and quantities transacted in the credit market since the introduction of macroprudential initiatives. The Committee highlights the near equivalence between macroprudential measures and conventional monetary policy measures, in spite of the focus on systemic stability of the former. In this sense, it reaffirms its view that monetary policy strategy cannot be disentangled from macroprudential developments.

Summing up, the Copom recognizes above normal uncertainty in the economic environment and identifies high risks to the achievement of a benign scenario where inflation would timely converge to the target. Since the last *Report*, in the external outlook, stimulus factors and asset price spillovers have lowered the probability of reversion in the recovery process experience by G3 economies. From another point of view, they still reveal the ambiguous influence of the international outlook over domestic inflation behavior. Regarding the domestic outlook, both macroprudential measures – a fast and potent instrument to contain local pressures on demand – and conventional monetary policy measures have been implemented, and in both cases their effects will still be incorporated to price dynamics.

Despite no clear identification of the degree of permanence of recent pressures – due to uncertainties surrounding the global and, to a lesser extent, the domestic scenario –, the Committee assesses that the balance of risks since the last *Report* has shown to be, to some degree, more favorable to the achievement of a benign scenario. Since then, monetary policy measures have been implemented, evidences of the effectiveness of macroprudential measures introduced in December 2010 have emerged, and important decisions have been taken and executed in the fiscal front. In addition, more recently, commodity price dynamics show signs of moderation, despite unfavorable geopolitical developments, such as the crisis in North Africa and the Middle East.

The Copom unanimously decided to increase the target for the Selic rate from 10.75% to 11.25% and 11.75% p.a., without bias, in the January and March meetings, respectively.

In 2010, inflation surpassed the 4.5% midpoint target, an outcome that in part resulted from the first-round effects of negative supply shocks (see the exercise presented in a box in this *Report*), in particular the acceleration of international

commodity prices. As regards the timing, however, the commodity shock was concentrated in the second half of 2010 and in the initial months of 2011. For instance, from July 2010 to February 2011, the Commodities Brazil Index (IC-Br) increased by 41.4%, and in the specific case of agricultural commodities, 60.2%, in the same period. It is estimated that the first-round effects of this extraordinary supply shock would alone increase the IPCA by around 2.5 p.p. Part of this variation already materialized in 2010, but estimates suggest that still approximately one third of the inflationary impact of the commodity shock will affect consumer prices this year.

In circumstances such as the present one, it is natural to discuss how monetary policy should be conducted in the presence of supply shocks. According to economic theory, optimal monetary policy should accommodate first-round effects from negative supply shocks. However, active policy should minimize the possibility of supply related, sector specific price increases to be further propagated into nominal wages, medium- and long-run inflation expectations, and other prices (second-round effects). International experiences support this view, and there is consensus among policymakers that first-round effects of supply shocks represent relative price changes, which, in the presence of wage and price rigidity, leads to aggregate price increases. At the same time, it is consensual that central banks should restrain the propagation of the supply shock, in order to lower the risks of wage and price setting dynamics following suit, that is, to lower the risk of a persistent upward movement in inflation.

The Committee assesses that the costs in terms of economic activity of preventing the first-round effects of the supply shock from moving the 2011 inflation away from the midpoint target of 4.5% would be excessively high. On the other hand, the domestic demand is expanding at a more modest pace, which, though uncertain, should still be impacted by the contractionary policy measures implemented so far. Additionally, the Committee assesses that the flexibility inherent to the inflation targeting regime allows the accommodation of the first-round effects of the supply shock. In other words, under the current circumstances the best practice recommends implementing a more gradual convergence of inflation towards the target, similar to past strategy adopted by the Central Bank.

In this context, therefore, the Committee emphasizes that monetary policy strategy will be implemented in order to restrain second-round effects of the supply shock and assure

inflation convergence towards the midpoint target in 2012. For this purpose, it is worth highlighting that, considering the prospective domestic activity slowdown, the complexity of the international environment, and other factors, monetary policy strategy may be reevaluated, with respect to its intensity, to its temporal distribution, or both.

6.3 Inflation forecasts

According to traditionally adopted procedures, and taking into account the available information up to the cutoff date of March 11, 2011, the baseline scenario assumes the exchange rate remains unchanged over the forecast horizon at R$1.65/US$, and the target for the Selic rate stays at 11.75% p.a. – the level set by the March Copom meeting – against R$1.70/US$ and 10.75% p.a. considered in the December *Inflation Report*. The projection in the baseline scenario for the change, in 2011, of the set of regulated and monitored prices is of 4.0%, the same value considered in the last *Report*. This projection is based on the hypotheses of stable prices for gasoline and bottled gas; increase of 2.8% for electricity rates; and of 2.9% in the fixed telephone rates. Regarding items for which more information is available, price changes were estimated individually, whereas for the others, the projections are based on models of endogenous determination of regulated prices, which consider seasonal components, exchange rate variations, market price inflation and General Price Index (IGP) inflation, among others. According to those models, projection of the regulated and administered prices, in the baseline scenario, is at 4.4% for 2012, the same value considered in the December 2010 *Report*, while for 2013 the projection is 4.3%.

The market scenario, on the other hand, is based on data from the expectations survey carried out by Gerin with a representative group of institutions up to the cutoff date. In this scenario, average exchange rate expectations decreased in comparison to the values released in the December *Inflation Report*. For the last quarter of 2011, these expectations moved from R$1.75/US$ to R$1.70/US$, and for the last quarter of 2012, from R$1.80/US$ to R$1.75/US$. For the first quarter of 2013, survey expectations project an average exchange rate of R$1.76/US$. The expectation about the average Selic rate increased in comparison to the values presented in the last *Report*. For the last quarter of 2011, it moved from 12.25% to 12.50% p.a., while for the last quarter of 2012, it moved from 10.92% to 11.33% p.a. For the first quarter of 2013, the projection for the average Selic rate is 11.13% p.a. This trajectory of the Selic rate is consistent

with a twelve-month pre-DI swap spread, with respect to the current target for the Selic rate (11.75% p.a.), of 116 b.p. and -6 b.p., in the last quarter of 2011 and 2012, respectively. Additionally, the market scenario assumes changes for the group of regulated and administered prices of 4.1% in 2011, and of 4.5% in 2012 and 2013.

With regard to fiscal policy, the projections presented in this *Report* are based on the working hypothesis of accomplishment of the primary surplus target of R$117.9 billion (or roughly 2.9% of GDP) in 2011, without any adjustment (according to the Budget Guidelines Law – LDO 2011). Moreover, the primary surplus in 2012 is assumed to remain at the level of 3.1% of GDP.

In addition, the projections presented in this *Report* incorporated the estimated effects of the reserve requirements measures announced in December 2010.

Based on the above assumptions and using the information set until the cutoff date (March 11, 2011), projections were constructed for the IPCA inflation accumulated over four quarters, consistent with the interest and exchange rate paths of the baseline and market scenarios.

The central projection associated with the baseline scenario shows inflation of 5.6% in 2011, an increase of 0.6 p.p. in comparison to the projection presented in the December *Report*. As can be seen on Figure 6.5, in the baseline scenario, the projection for twelve-month accumulated inflation stays above the central value of 4.5% for the target determined by the National Monetary Council (CMN) until the first quarter of 2012, when it reaches 4.8%, moving to figures close to the central target in the following quarters. According to data shown on Table 6.1, the projection for twelve-month accumulated inflation moves from 6.2% in the first quarter of 2011, reaches 6.6% in the third quarter, but decreases and ends the year at 5.6%. In this scenario, the associated projection for the first quarter of 2012 is of 4.8%, decreases to 4.4% in the second and third quarters and ends the year at 4.6%. The decrease of the inflation projections along the first semester of 2012, in comparison to 2011, partially reflects the effects of the Selic rate increase determined by Copom on its last two meetings, as well as the changes in reserve requirements announced last December. The projection for the first quarter of 2013 is 4.5%.

According to the baseline scenario, the estimated probability that inflation for 2011 will breach the upper tolerance level of the target is 20%. For 2012, this probability is close to 13%.

Figure 6.5 – Projected IPCA-inflation with interest rate constant at 11.75% p.a. (Baseline scenario)

Inflation fan chart
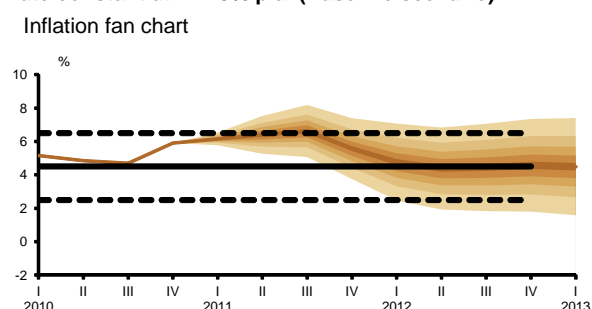
Note: accumulated inflation in 12 months (% p.a.).
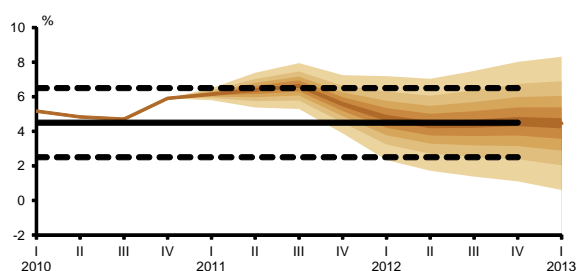
Table 6.1 – Projected IPCA-inflation with interest rate constant at 11.75% p.a.
(Baseline scenario)

Year	Q	Probability Interval						Central projection
					50%			
				30%				
			10%					
2011	1	6.0	6.1	6.1	6.2	6.2	6.3	6.2
2011	2	5.9	6.1	6.3	6.5	6.7	6.9	6.4
2011	3	6.0	6.3	6.5	6.7	7.0	7.3	6.6
2011	4	4.8	5.1	5.4	5.7	6.0	6.3	5.6
2012	1	3.8	4.2	4.6	4.9	5.3	5.7	4.8
2012	2	3.4	3.8	4.2	4.6	5.0	5.4	4.4
2012	3	3.4	3.8	4.2	4.6	5.1	5.5	4.4
2012	4	3.4	3.9	4.4	4.8	5.2	5.7	4.6
2013	1	3.3	3.8	4.3	4.7	5.2	5.7	4.5

Note: accumulated inflation in 12 months (% p.a.).

Figure 6.6 – Projected IPCA-inflation with market interest and exchange rates expectations

Inflation fan chart

Note: accumulated inflation in 12 months (% p.a.).

Table 6.2 – Projected IPCA-inflation with market interest and exchange rates expectations [1/]

Year	Q	Probability Interval						Central projection
				50%				
				30%				
				10%				
2011	1	6.0	6.1	6.1	6.2	6.2	6.3	6.2
2011	2	6.0	6.2	6.3	6.5	6.6	6.8	6.4
2011	3	6.1	6.3	6.5	6.7	6.9	7.2	6.6
2011	4	4.9	5.2	5.4	5.7	6.0	6.3	5.6
2012	1	3.8	4.2	4.6	5.0	5.3	5.8	4.8
2012	2	3.3	3.8	4.2	4.6	5.0	5.5	4.4
2012	3	3.2	3.7	4.2	4.7	5.2	5.7	4.4
2012	4	3.1	3.8	4.3	4.8	5.4	6.0	4.6
2013	1	2.9	3.6	4.2	4.8	5.4	6.0	4.5

Note: accumulated inflation in 12 months (% p.a.).

1/ According to Gerin.

Table 6.3 – December 2010 *Inflation Report* projections

Period	Baseline scenario	Market scenario
2010 IV	5.9	5.9
2011 I	5.7	5.7
2011 II	5.7	5.7
2011 III	5.8	5.8
2011 IV	5.0	4.8
2012 I	4.5	4.4
2012 II	4.3	4.1
2012 III	4.6	4.4
2012 IV	4.8	4.5

In the market scenario, the inflation projection for 2011 is 5.6%, equal to the respective baseline scenario projection, representing an increase of 0.8 p.p. in comparison to the projection presented in the last *Report*. As can be seen on Figure 6.6 and on Table 6.2, projections for inflation accumulated in twelve months, following a similar pattern of the baseline scenario, fluctuate above the central value of the target until the first quarter of 2012. Within this scenario, the projection for the first quarter of 2011 is of 6.2%, moves to 6.6% in the third quarter and ends the year at 5.6%. In the same scenario, the projection for the first quarter of 2012 is of 4.8%, recedes to 4.4% in the second and third quarters and ends the year at 4.6%. The projection for the first quarter of 2013 is 4.5%.

According to the market scenario, the estimated probability that inflation for 2011 will breach the upper tolerance level of the target is 18%. For 2012, this probability is close to 18%.

As it was shown in the last *Report*, the projected dynamics for both scenarios are close to each other along 2011 and 2012, given that the effect of the difference between the interest rate trajectories is offset, to some extent, by the respective exchange rate paths. It is worth noting that, in general, inflation projections increased in comparison to figures presented in the last *Report* but, nevertheless, are close to the central target by the end of the considered horizon.

Comparing the trajectories shown in this *Report* with those released in the previous *Report*, whose projections are shown on Table 6.3, in the baseline scenario, it can be seen that there was an increase of the projections along 2011, partially reflecting higher inflation rates in recent months than the corresponding projections presented in the last *Report*. The trajectory for 2012 reflects, to some extent, higher inflation expectations. In the market scenario, the projection changes also reflect these movements. Regarding the second semester of 2012, it is shown a decrease in the inflation projections in the baseline scenario, and relative stability in the market scenario, in respect to figures presented in the December 2010 *Report*.

Figure 6.7 shows the path of twelve-month accumulated inflation, according to the baseline and market scenarios, up to the first quarter of 2013, as well as the target trajectory. The figures are actual twelve-month inflation until February 2011, and, from March on, projections according to the two scenarios. The projections fluctuate, in both scenarios, above the target along 2011. In both scenarios, the trajectory indicates decrease of the twelve-month accumulated inflation in the fourth quarter of 2011, and tends to near the central

Figure 6.7 – Projections and target path for twelve-month cummulative inflation

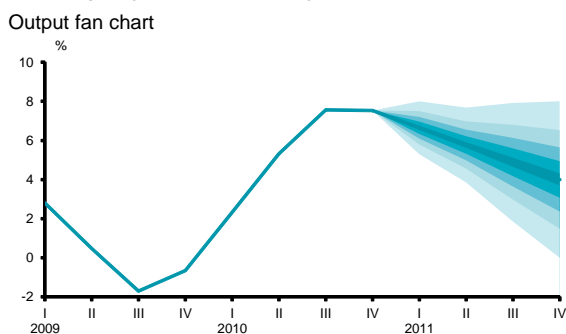| | Target | Market scenario | Baseline scenario |
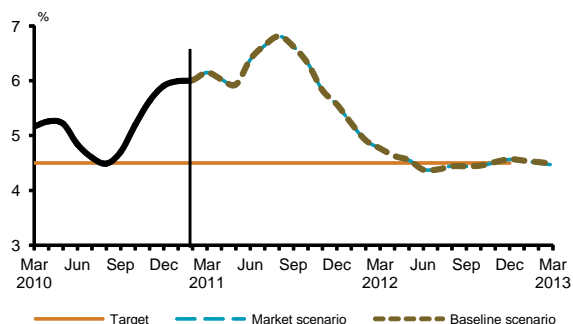
Figure 6.8 – Inflation forecast: VAR models
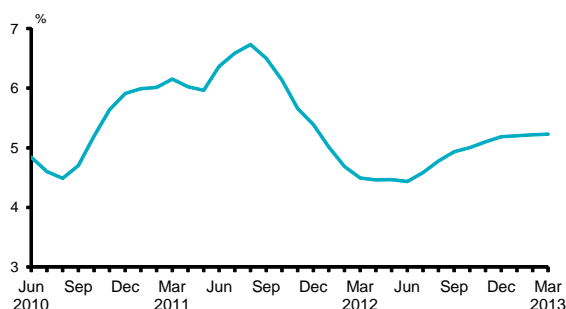
Note: accumulated inflation in 12 month (% p.a.).
Average forecast generated by the VAR models.

Figure 6.9 – Projected GDP growth with interest rate constant at 11.75% p.a. (Baseline scenario)

Output fan chart

target along the first and second quarters of 2012, fluctuating around this value until the end of the projection horizon.

In an alternative scenario, which assumes the exchange rate remains unchanged, over the relevant horizon, at recently observed levels; and the target for the Selic rate based on data from the survey carried out by Gerin, the inflation projection for 2011 is 5.5%, and 4.4% for 2012. For the first quarter of 2013, the projection is 4.3%.

The average forecast generated by the Vector Autoregression models (VAR) for the twelve-month accumulated inflation is presented in Figure 6.8. Up to February 2011, the values are actual twelve-month inflation and, as of March, refer to the average forecast of the VAR models. Compared to the projections presented in the last *Report*, as well as the projections generated in the baseline and market scenarios, the VAR models forecasts for twelve-month accumulated inflation increased along 2011. Regarding 2012, the forecasts, in general, decrease in comparison to those presented in the December 2010 *Report*, but close the year with higher levels. The VAR models forecasts decrease along the first and second quarters of 2012, in comparison to 2011, but increase in the third and fourth quarters and tend to the unconditional average of inflation by the end of the forecast horizon.

Figure 6.9 illustrates the output growth fan chart built under baseline scenario assumptions. Considering that the model which generates GDP growth projections uses two variables that are not directly observable, potential output and the output gap, the forecast errors associated to these projections are considerably higher than the errors related to the inflation projections. According to this scenario, the GDP growth projected for 2011 is 4.0%, a decrease of 0.5 p.p. in comparison to the projection presented in the December 2010 *Inflation Report*.

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

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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

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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/ "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).

is negative – such as an electrical blackout, crop failures or oil price increases – it contracts the supply and pushes inflation up. Theory[4] 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%.

**Figure 1 – CRB and IC-Br Commodity Price indices**

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

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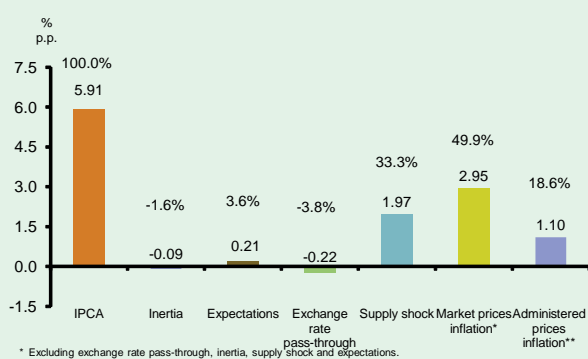
* Excluding exchange rate pass-through, inertia, supply shock and expectations.
** Excluding exchange rate pass-through and inertia.

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
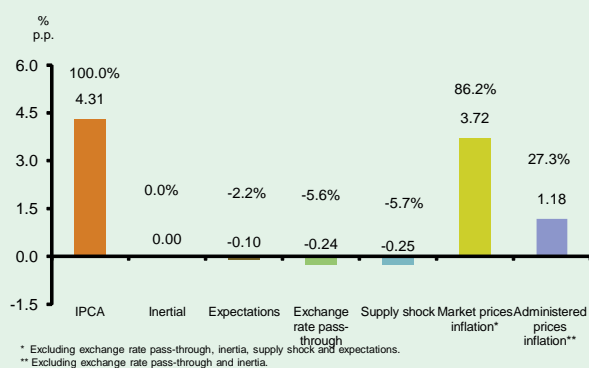

4/ See, for example, the dynamic stochastic general equilibrium models of Aoki (2001) and Bodenstein *et al* (2008).

pass-through, inertia, expectations and supply shock, market prices contributed with 2.95 percentage points (p.p.) of inflation and administered prices with 1.10 p.p.

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

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

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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The Output Gap – Recent Estimations

The output gap, defined as the difference between actual and potential output, is an important variable to indicate inflationary pressures in the economy. Positive values of the output gap indicate that actual output is above potential and suggests the possibility of a future rise in price levels, and vice versa. By functioning as an indicator of economic fluctuations, the output gap, among other variables, gives policymakers the ability to anticipate potential demand pressures on prices.

But since the output gap cannot be directly measured, ie, an unobservable variable, it must be estimated, involving a high degree of uncertainty.[1] There is no consensus regarding the most appropriate method for the estimation of the potential output and, hence, the output gap. Thus, the Banco Central do Brasil, similar to what occurs in most major economies, uses several methods to measure the output gap: i) the extraction of a linear trend (LT); ii) the Hodrick-Prescott filter (HP); iii) the production function approach (PF);[2] iv) the Kalman filter (KF).[3] Methods i) and ii) are univariate, while (ii) and (iv) are multivariate.

The objective of this box is to assess the recent evolution of the different measures of the output gap calculated by the Banco Central, updating the estimates presented in the Inflation Report of March

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1/ In the literature on the methodology for estimating the output gap, there are basically two components. One is based on simpler models, in general univariate, which employs statistical filters to extract potential output, and the output gap as a residual. Another, more complex, makes use of multivariate models that seek greater economic fundamentals for estimating the output gap. The advantage of the first approach is the simplicity of the estimation process, while the multivariate lies on the imposition of economic relations or economic characteristics.

2/ Calculated with data on unemployment rate and data on Installed Capacity Utilization (UCI), using either the UCI prepared by the Confederation of Industry (PF-CNI) as well as the UCI from the Getulio Vargas Foundation (PF-FGV).

3/ The estimation methods based on the extraction of a linear trend and on the HP filter are described in the *Inflation Report* of September 1999. The method was associated with the production function approach is described in the December 2000 and December 2003 *Inflation Reports*, and have been refined in recent years with changes in methodology and variables. The method that uses the Kalman filter with restrictions arising from economic theory was presented in the *Inflation Report* of December 2007.

Figure 1 – Output Gap Dynamics – 2007-II to 2010-IV
Production Function, Linear Trend, HP Filter, Kalman Filter
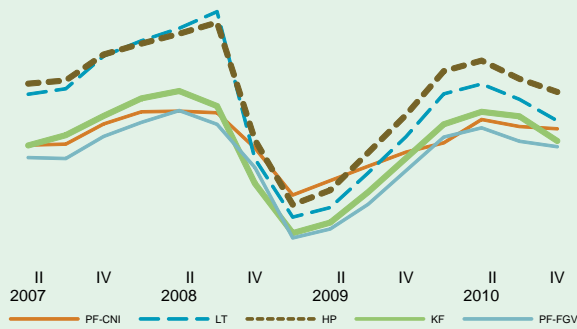

2010. Additionally, we present recent developments in the Gross Fixed Capital Formation (GFCF) of the Brazilian economy.

Using the sample that goes from the second quarter of 2007 to the fourth quarter of 2010, as seen in Figure 1, the various output gap measures are quite correlated, although they differ in level. The different levels mainly reflect the different economic models used at Banco Central for forecasting inflation.[4]

Regarding the recent evolution of the different measures of output gap, the strong fall between the third quarter of 2008 and the first of 2009 is due to the 2008/2009 financial crisis. It's important to point out that this reduction of the output gap was not restricted to the Brazilian economy, but also occurred in other emerging economies, as well as in developed economies.[5] As shown in Figure 1, from the second quarter of 2009 on, all output gap measures gradually increase. This movement goes until the second quarter of 2010 and is compatible with the observed increase in the utilization of production factors in the economy. Finally, in the third and fourth quarters of 2010, all measures of output gap begin to decline.

Figure 2 – Gross Fixed Capital Formation – 2007-II to 2010-IV
Quarterly growth rate
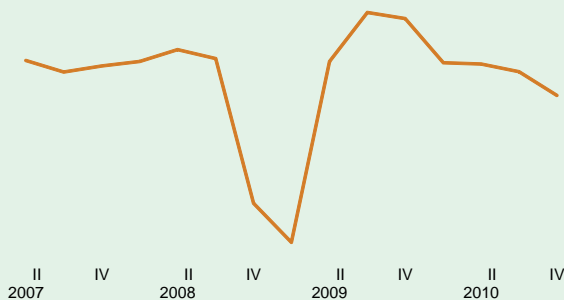
Each measure of the output gap generates a corresponding measure for the potential output of the Brazilian economy. By the way, in the exercises presented here, despite the fact that information on aggregate investment is not directly used in the calculation of the potential output, there is a correlation between the growth rate of potential output and the growth rate of the GFCF. Figure 2 shows the growth rate of the Brazilian GFCF. After achieving growth of around 4.5% in the third quarter of 2008, its rate fell to -10.6% and -14.6% in the next two quarters, reflecting a sharp decline caused by the 2008/2009 financial crisis. The GFCF starts to recover around the second quarter of 2009, posting a 9.3% growth rate in the third quarter of 2009. Since then, as with many other economic indicators, the change in GFCF has cooled down, ranging from 3.1% in the third quarter of 2010 and 0.7% in the

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4/ Considering the different Phillips curves based on the different measures of output gap, the measure calculated by the production function approach does not imply inflation projections that are consistently lower, or higher, than the projections obtained with the other measures.

5/ See, for example, IMF (2010) and Cardenas and Levy-Yeyati (2010).

fourth quarter. It is plausible to conjecture that over the same period, the growth rates of potential output have depicted similar trajectory.

To sum up, good practice in the conduct of monetary policy requires adequate measurements of the output gap. In this regard, it is important to monitor indicators produced by different methodologies, as well as closely monitor the consistency of the data. It is also important to improve constantly the methodologies used, given the inherent difficulties in the estimation process of the output gap. In a sense, when different methodologies for computing the output gap end up producing similar trajectories, this tends to give more confidence to the analysis of economic fluctuations.

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Fiscal Multiplier, Output and Inflation

Due to the international financial crisis of 2008/2009, many countries implemented accommodative monetary policies to offset the sharp drop of output that was then observed. The policy mix involved interest rate cuts, in some cases to values close to the zero lower bound, the use of unconventional instruments such as direct liquidity injection in domestic currency (quantitative easing), and, at times, in foreign currency as well; and even the change of the balance sheets of central banks (qualitative easing).

Given the magnitude and intensity of the impact of the financial crisis on the economic activity, as well as the natural limits of the monetary stimuli, several developed and emerging economies also adopted strongly expansionary fiscal policies, by reducing taxes and/or increasing spending. In the specific case of Latin American economies, the countercyclical policies contributed to a relatively quick economic recovery. Still, in some of these economies, the fiscal stimuli have not yet fully reversed.[1]

This box has two goals. First, it puts the issue into perspective by presenting a brief review of the theory and empirical evidence on the fiscal multiplier. Second, it assesses the expected impact of fiscal policy on inflation in Brazil.

Fiscal Multiplier: Theory and Evidence

The effect on aggregate demand of the change in government spending and/or taxes is proportional to the size of the fiscal stimulus and this coefficient of proportionality is known as the "fiscal multiplier". For the fiscal authority, knowing the size of the

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1/ See, for example, Cárdenas and Levy-Yeyati (2010).

multiplier is important in order to choose the right policy mix (expenditures, taxes and/or transfers), as well as to gauge the magnitude and duration of the stimulus. For the monetary authority, knowing the multiplier is relevant for assessing the impact of the fiscal stimulus on the output gap and, thus, on inflation.

Macroeconomic models, even the simplest, suggest that the size and signal of the fiscal multiplier result from a non-trivial combination of several factors – for example, openness of economy, exchange rate regime, and monetary policy stance, among others. These models suggest that fiscal policy tends to be more potent in closed economies, in situations similar to that of the liquidity trap in which monetary policy remains accommodative and, therefore, does not counterbalance part of the stimulus; and in open economies with fixed exchange rates. In general, traditional Keynesian models generate a fiscal multiplier greater than 1. In extreme cases of a closed economy with marginal propensity to consume between 0.5 and 0.9 (and Auberbach Gorodnichenko, 2010) and relatively flat LM curve, the multiplier could reach values between 2 and 10.

Dynamic stochastic general equilibrium (DSGE) models, even those with Keynesian features, such as sticky prices and wages, generate multipliers less than 1. Two aspects help explain the differences between DSGE models and purely Keynesian models. First, DSGE models combine some rational (or forward-looking) expectations and some dose of Ricardian equivalence. Under this framework, consumers anticipate that a persistent reduction in public spending from today will require lower tax burden in the future, which may induce them to consume more today and generate inflationary pressures.[2] Second, given that fiscal restraint contributes to reducing inflation, the monetary authority can respond by lowering the nominal interest rates, if this is determined by some rule (e.g., the Taylor rule). With prices relatively rigid in the short-run, inflation responds with some lag to economic activity and the real interest rate falls, thus stimulating consumption and investment.

2/ Including non-Ricardian features into DSGE models – for example, agents that consume all their current income (hand-to-mouth households) – tends to weaken the Ricardian equivalence.

This reaction cancels part of the desired effect by the tax authority and, ultimately, fiscal restraint causes only a redistribution of aggregate demand among its various components, not a reduction of its level. However, there is at least one important exception to the rule: when the nominal interest rate remains close to zero at the relevant horizon, the multipliers of DSGE models reach 2 or more (Christiano *et al.* (2009), Hall (2009), Woodford (2010), among others).

Coenen *et al.* (2010) simulate the impact of fiscal stimuli in the United States of America (USA) and in the Euro Zone using seven structural models, including DSGE models.[3] Table 1 illustrates the estimated effects on U.S. inflation and output, caused by an increase in government consumption equivalent to one percentage point (p.p.) of the Gross Domestic Product (GDP). The second and third columns contain the multipliers for each scenario, while the last two columns show the maximum effect on inflation. Note that the longer the fiscal stimulus and the more accommodative the monetary policy, the greater the effects on output and inflation. As, in general, the models are linear, the effect of a reduction in government spending would be symmetrical.

Table 1 – Effect of a Fiscal Stimulus on Inflation and Output
Increase in the USA Government Consumption-to-GDP Ratio by 1p.p.

Monetary Policy Stance	Effect on GDP PIB (%)		Maximum Effect on Inflation (p.p.)	
	1-year stimulus	2-year stimulus	1-year stimulus	2-year stimulus
No accomodation	0.8 a 1.3	0.6 a 1.4	0.2	0.4
1-year accomodation	0.9 a 1.5	0.6 a 1.9	0.4	1.0
2-year accomodation	1.0 a 1.5	0.9 a 2.6	0.6	2.0

Original source: Coenen *et al*. (2010).

Based on semi-structural and DSGE models, Hemming et al. (2002) gather evidence for the U.S. and other economies of the Organization for Economic Cooperation and Development (OECD). Some of the semi-structural models generate short-term multipliers between 0.6 and 1.4 when the fiscal instrument is government consumption, and between 0.3 and 0.8 in the case of taxes.

3/ European Commission (QUEST), International Monetary Fund (GIMF), Federal Reserve (FRB-US and SIGMA), Bank of Canada (BoC-GEM), European Central Bank (NAWM) and Organization for Economic Cooperation and Development (OECD Fiscal).

And what do purely statistical models have to say about fiscal multipliers? Much of the evidence is based on econometric techniques using vector auto-regression (VARs) and focuses on the U.S. economy during the second half of the twentieth century, following the seminal work of Blanchard and Perotti (2002). The range of available estimates is wide, but they tend to point to multipliers of government spending between 0.5 and 1.0.[4] Given that these econometric exercises identify the average behavior of the economy during the sample period – not in specific events like the Great Depression or the 2007/2010 crisis – Auerback and Gorodnichenko (2010) try to overcome this limitation. They use a structural VAR with a regime change (regime-switching SVAR) that is capable of distinguishing the multipliers during recessions and expansions. The results for the U.S. economy support the conjectures of Christiano *et al.* (2009) and others in the context of DSGE models: the estimated multipliers are higher in periods of recessions than in expansions.

To some researchers, the traditional econometric techniques have identification problems, which would reduce the degree of confidence in the estimates. To deal with this problem, Ramey (2009) uses the so-called narrative approach, which would be less subject to problems of identification. By applying this unconventional methodology to the United States, during the period of 1939-2008, the author finds multipliers between 0.6 and 1.1. Therefore, VAR models – using conventional identification techniques or the narrative approach – point to relatively modest magnitudes for the multipliers, which are closer to those suggested by DSGE models with non-accommodative monetary policy than to those suggested by purely Keynesian models.

Regarding emerging economies, the evidence is scarce, because of data limitations, macroeconomic instability and/or difficulty in identifying fiscal shocks, among other factors. The literature suggests that fiscal multipliers are lower in emerging than in mature economies. For example, Ilzetzki and Vegh (2008) estimate a maximum multiplier of 0.6 for a sample of developing countries, compared

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4/ Limitations imposed by the data and identification problems have not ruled out the possibility that the multipliers are greater than 1 (Hall, 2009).

with 0.91 for a sample of developed countries. According to this study, on average, fiscal policy would be pro-cyclical in emerging economies, while it would be counter-cyclical or a-cyclical in industrialized countries. Thus, fiscal policy would tend to amplify rather than mitigate the business cycles in developing countries.[5]

In turn, Ilzetzki *et al.* (2010) use a sample of 44 countries – 20 developed and 24 developing countries, including Brazil – covering the period of 1960-2007 and applying structural VARs (SVARs). Their results suggest that the spending multiplier is greater in closed economies, in open economies with fixed exchange rate regimes, as well as in mature economies. In particular, the authors estimate that in mature economies, the multiplier of government consumption varies from 0.37, on impact, and 0.80 in the long run. On the other hand, in developing economies, the multiplier is negative on impact (-0.21) and 0.18 in the long run.

What does the literature says about Brazil? The estimates of Ilzetzki *et al*. (2010) capture the average multiplier for two groups of countries, but are uninformative on individual economies. Although included in the sample, the study does not provide estimates of the fiscal multiplier for the Brazilian economy. There is also little evidence regarding the impact of fiscal shocks in Brazil using the DSGE methodology.[6] Some features of the Brazilian economy, however, suggest that the fiscal multiplier in Brazil would probably be higher than in other emerging economies with similar level of development. First, the Brazilian economy is relatively closed, which tends to reduce external leaking. Second, the average propensity to save is relatively low. Finally, the relevant part of fiscal stimulus in Brazil refers to current spending, as well as transfers for groups with low savings rate/high propensity to consume.

5/ For Levy-Yeyati (2010) and others, the current round of fiscal expansion in Latin America, which during the international crisis of 2008/2009 played a countercyclical role, would be too prolonged and exacerbate the economic cycle.

6/ However, there is already some evidence available based on DSGE models. For example, Valli and Carvalho (2010) calibrate a large-scale DSGE model for the Brazilian economy and find that an increase of 1 p.p. in the fiscal surplus-to-GDP ratio would lead to a fall in the output gap by 1 p.p. on impact.

In a study carried out by the Department of Investor Relations and Special Studies (Gerin),[7] market participants responded that a fiscal effort for a year, equivalent to 1% of GDP, combined with accommodative monetary policy in the first year, would lead to an average decline of 0.34 p.p. in inflation (maximum of 0.8 p.p.). The wide range of responses by market participants about the expected effects, captured by the survey, indicates that considerable uncertainty surrounds the estimates for the fiscal multiplier in Brazil, as happens with the international empirical evidence.

Simulations for Brazil

The simulations follow the line adopted by Coenen *et al.* (2010); however, it utilizes a semi-structural medium-sized model[8], which has the advantage of being an intermediary tool between DSGE models and purely econometric models such as the VARs. The fiscal stimulus is modeled exogenously, being described by a cut in government spending equivalent to 1% of GDP for four consecutive quarters. Two scenarios for monetary policy were considered: (1) the policy interest rate reacts to the fiscal effort according to the Taylor rule estimated in the model (non-accommodative monetary policy), and (2) the policy interest rate remains constant in the first year of the simulation, reacting according to the Taylor rule from the second year onwards (accommodative monetary policy).

Figure 1 – Effect on Inflation of a Fiscal Effort of 1% of GDP, for one year
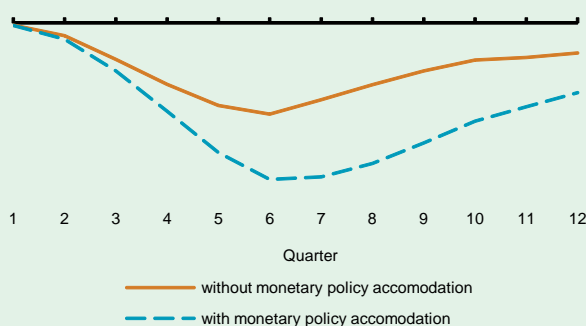
In Figure 1, the solid line shows the effects on inflation of a 1 p.p. reduction in the government spending-to-GDP ratio (for this simulation, the fiscal multiplier is estimated at around 0.9), lasting one year and without monetary accommodation. The exercise suggests that fiscal restraint impacts inflation relatively quickly and the effects are significant and long-lasting. The maximum effect on inflation occurs about six quarters after the beginning of the fiscal effort. The dotted line shows the response of inflation in the case of accommodative monetary policy (constant nominal interest rates), which, coupled

7/ Available at the Central Bank's website on <http://www.bcb.gov.br/Pre/ASIMP/bcimprensa/2774-Pesquisa 20sobre%%% 20Política 20Monetária.pdf>.
8/ See Minella and Souza-Sobrinho (2009). In order to make the simulations more representative, two modifications were made in the original model: (i) inflation expectations are a weighted average of model-consistent expectations and the inflation target and (ii) the Taylor rule also responds to the output gap.

with the fall in expected inflation causes a greater increase in the real interest rate than that suggested by the previous exercise. As a consequence, the effects on inflation are amplified – the maximum effect also occurs around the sixth quarter.

In both exercises, the transmission of fiscal policy to prices materializes primarily via the aggregate demand channel (or, equivalently, by reducing the output gap). In line with the results found by Coenen *et al.* (2010), the second simulation indicates that the effects on the output gap and inflation may be amplified if monetary policy remains temporarily accommodative. This magnifying effect occurs because the fiscal effort, when combined with temporary monetary accommodation, leads to a higher increase in real interest rates, a key variable for consumption and investment decisions.

In summary, despite the uncertainties surrounding the estimates of the fiscal multiplier, the simulations presented in this box indicate that a fiscal contraction may have important effects on inflation dynamics in Brazil, even when the fiscal effort is short-lived. It is reasonable to claim that long-lasting changes in the fiscal regime would have significant implications for the sustainability of the public debt in the medium and long run as well as for aggregate savings. Therefore, persistent changes in the fiscal regime would certainly have even more important effects on the entire price system.

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