INTERNATIONAL MONETARY FUND

IMF Country Report No. 13/313

BRAZIL

2013 ARTICLE IV CONSULTATION

October 2013

Selected Issues

This Selected Issues Paper for Brazil was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on July 11, 2013. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of Brazil or the Executive Board of the IMF.

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International Monetary Fund
Washington, D.C.

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BRAZIL

SELECTED ISSUES

July 11, 2013

Approved By
The Western Hemisphere Department

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CONTENTS

HOW FAST CAN BRAZIL GROW?[1]

Moderating activity and stubbornly elevated inflation since 2010 have led to a re-evaluation of Brazil's long-term potential growth rate. Growth accounting suggests that potential growth is probably lower than was widely assumed in recent years and now stands at about 3½ percent. The demographic dividend of a rapidly expanding labor force is fading and further structural declines in unemployment are likely to be limited. Potential growth will rely more on the pace of capital deepening and productivity growth. Lifting both may require successful implementation of the infrastructure investment program, higher domestic saving, and structural reforms to improve productivity and competitiveness.

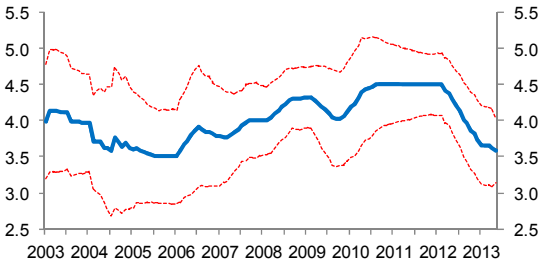
A. Background—Re-Evaluating Potential

1. Potential growth—how quickly the economy can grow without triggering higher inflation and external imbalances—are often critical inputs into the policy-making process. For an inflation targeting central bank, as in Brazil, an assessment of the output gap—the difference between actual and potential output—will likely help determine monetary policy settings. Similarly, fiscal authorities should also take these variables into account when projecting expenditures and revenues, establishing the structural fiscal position, measuring discretionary fiscal impulse, and setting objectives for fiscal policy that ensure public debt sustainability over the long run. Notwithstanding its importance, potential growth is unobservable and for Brazil remains subject to much uncertainty.

2. Market estimates of Brazil's long-term potential growth rate have been revised lower since 2011. The median forecast of real GDP growth four years ahead from the BCB's weekly Focus Survey (assuming that most contributors anticipate a closed output gap at that horizon) is currently trending back towards the low end of the range since 2002 (left panel below). Such revisions should be placed in a broader context, however, since the variation in estimates of Brazil's potential growth is not dissimilar to that of its emerging market peers. The Consensus Economic survey indicates that variation of 1–2 percentage points in these estimates is common for these countries (right panel below).

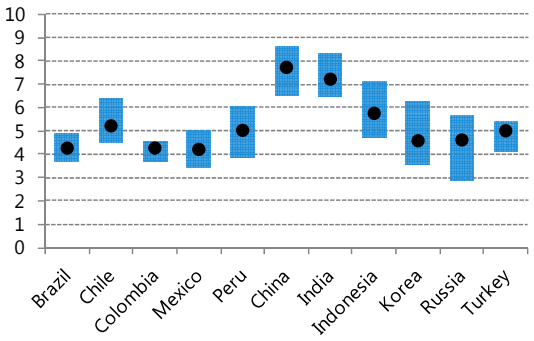
[1] Prepared by Shaun Roache.

Central Bank of Brazil Focus Survey: Estimated Potential Growth
(percent) 1/



Source: Central Bank of Brazil.
1/ Six-month average of the median real GDP growth forecast for 4 calendar years ahead with one standard deviation intervals.

Emerging Market: Potential Growth Estimates, 1994-2012
(percent, max-min range and average)



Source: Consensus Economics, Inc.

3. Growth accounting can shed light on the reasons why potential growth may now be lower and on policies that can lift growth over the long term. There are alternative methods, notably the use of statistical filters. These have their merits but also their drawbacks, including, among others, end-point problems and "black box" characteristics which make it difficult to draw conclusions about how policy might raise potential growth. Growth accounting suffers from its own shortcomings, including the accurate measurement of key inputs such as capital and various aspects of labor supply. This paper will acknowledge these uncertainties and incorporate them into the final range of estimates provided.

B. Methodology

4. This exercise assumes that output is a function of capital, labor, land, and total factor productivity (TFP).[2] The starting point is a standard Cobb-Douglas production function:

$$Y(t) = A(t)[\lambda(t)K(t)]^{\alpha}T(t)^{\beta}[\omega(t)H(t)]^{1-\alpha-\beta} \quad (1)$$

Where Y(t) is gross added value or GDP, A(t) is technology, λ(t) is the capacity utilization rate, K(t) is capital, T(t) is land, ω(t) is the employment rate, and H(t) is quality adjusted labor. Income shares for capital and land are denoted by α and β, respectively. Quality adjusted labor is assumed to be the product of three inputs:

$$H(t) = X(t)L(t)Z(t) \quad (2)$$

X(t) denotes annual hours worked, L(t) is the labor force, and Z(t) is a human capital per worker. As has become standard practice, this is assumed to be positively related to educational attainment, measured as the average years of schooling among the working age population and denoted s and the marginal return from an additional year of schooling denoted by θ.

[2] This exercise follows a well-worn path in the literature, including many applications by the IMF. The particular approach in this paper follows Klenow and Rodriguez-Clare (1997).

$$Z(t) = \exp[\theta s(t)] \tag{3}$$

Two changes in representation will prove useful: expressing output in terms of units per employed worker using (1) and (2); and focusing on the capital-output ratio to better reflect capital deepening unconnected with gains in technology.

$$\frac{Y(t)}{\omega(t)L(t)} = A(t)\left(\frac{\lambda(t)K(t)}{Y(t)}\right)^{\alpha} Y(t)^{\alpha}T(t)^{\beta}[X(t)Z(t)]^{1-\alpha-\beta}[\omega(t)L(t)]^{-\alpha-\beta} \tag{4}$$

Rearranging to bring gross added value to the left hand side, taking logs and differentiating obtains an expression for the growth in the output per worker ratio where g denotes the percent change in each variable.

$$\begin{aligned} g_{Y/\omega L}(t) &= \frac{1}{1-\alpha}g_A(t) + \frac{\alpha}{1-\alpha}g_\lambda(t) + \frac{\alpha}{1-\alpha}g_{K/Y}(t) + \frac{\beta}{1-\alpha}g_T(t) \\ &+ \frac{1-\alpha-\beta}{1-\alpha}g_X(t) + \frac{1-\alpha-\beta}{1-\alpha}\theta\Delta s(t) - \frac{\beta}{1-\alpha}g_\omega(t) - \frac{\beta}{1-\alpha}g_L(t) \end{aligned} \tag{5}$$

Output per capita is the product of output per employed worker, the employment rate, labor force participation, and the proportion of the population that is of working age, and population growth. Again taking logs, totally differentiating this product, and substituting into (5) obtains the final decomposition of output growth that will be used in this paper:

$$\begin{aligned} g_Y(t) &= \frac{1}{1-\alpha}g_A(t) + \frac{\alpha}{1-\alpha}g_\lambda(t) + \frac{\alpha}{1-\alpha}g_{K/Y}(t) + \frac{\beta}{1-\alpha}g_T(t) \\ &+ \frac{1-\alpha-\beta}{1-\alpha}g_X(t) + \frac{1-\alpha-\beta}{1-\alpha}\theta\Delta s(t) + \frac{1-\alpha-\beta}{1-\alpha}g_\omega(t) - \frac{\beta}{1-\alpha}g_L(t) \\ &+ g_{LFP}(t) + g_{AGE}(t) + g_N(t) \end{aligned} \tag{6}$$

Where g_{LFP} is the percent change in labor force participation, g_{AGE} is the percent change in the population of working age, and g_N is the percent change in population.

C. Data and Parameter Assumptions

This section lists the data used in the growth decompositions, provide a brief overview of the evolution of these data since 1970, and set out the assumptions for the 2013–2030 projection period, including for key parameters. More detailed definitions of the data, including estimation methods and sources, are provided in the Appendix.

Demographic Indicators

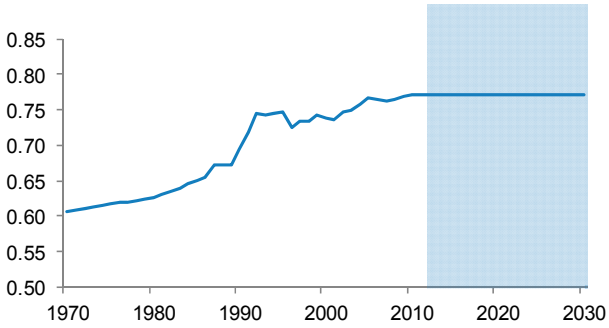
5. The demographic dividend that boosted growth for the four decades through 2000 is coming to an end. Growth in Brazil's working age population (aged between 15 and 65 years) reached just over 3 percent in the 1970s and between 1970–2000 was higher than the emerging markets average. This growth has slowed since then, particularly during the last decade. The working

age population is now expanding at about 1.2 percent and is set to continue slowing, particularly beyond 2020.

Labor market indicators

6. One of Brazil's great successes and an important contributor to growth over recent decades has been fostering inclusion in the formal labor market. In 1970, Brazil's participation rate—the percentage of the working age population considered to be economically active—was about 55 percent. Between 1970 and the early 1990s participation rose steadily to levels well above peer group averages due mainly to the entry of women into the workforce. Since then, participation has stabilized at high levels, implying a reduced contribution to growth. It is assumed that participation rates remain at current levels through the projection period.

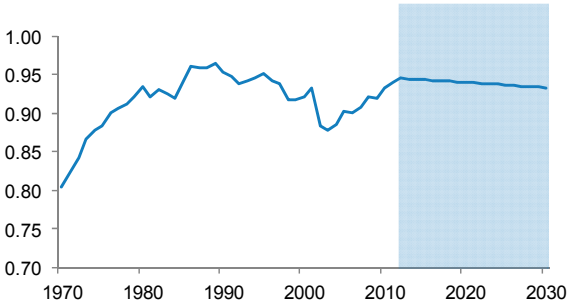
Brazil: Labor Force Participation
(percent)



Source: IBGE, staff estimates and projections.

7. Brazil's employment rate has risen for about 15 years and is now close to historical highs. The NAIRU likely declined during this period as inflation has remained contained, but the future contribution to growth from rising employment may be limited, particularly in the absence of reforms, particularly those that increase labor market flexibility. It is assumed that the employment rate converges gradually to its long-term average over the medium term. Hours worked are tightly regulated in Brazil and, like the employment rate, are not assumed to contribute to long-run growth.

Brazil: Employment Rate 1/
(percent of labor force)



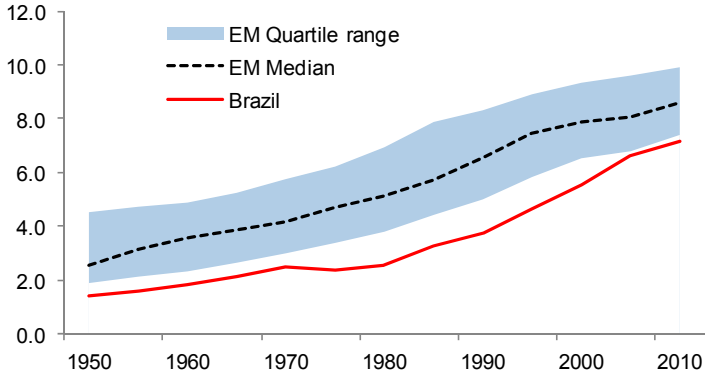
Source: IBGE, staff estimates and projections.
1/ Estimated using Okun's Law between 1970-79. Projections for based on the employment rate returning to its current trend level by 2030.

Human capital

8. Brazil has made large strides in increasing the capacity of its workforce through education and this should continue to be a source of growth. Years of schooling in Brazil stood at about 2½ years in 1970 and grew consistently since then to reach about 7¼ years in 2010. This implies average annualized increases of about 2¾ percent, allowing Brazil to start closing the education gap with its emerging market peers. There remains scope for further gains in education, since the G7 currently averages over 11 years of schooling. During the projection period, it is assumed that the rate of increase in schooling years slows somewhat but remains sufficiently high to reach 10 hours by 2030, close to the current upper quartile for emerging market economies. Based

on the large literature since Mincer (1974), the projections assume a constant return to education at a rate of 7 percent (or θ = 0.07). This assumes that there is no "quality gap" between education in Brazil and other countries (so that returns are the same) and no diminishing returns to education.

Human Capital Stock
(Median years of schooling for population aged 25+) 1/



Source: Barro-Lee database.
1/ Sample of 17 middle-income emerging market economies, excluding Brazil.

Capital

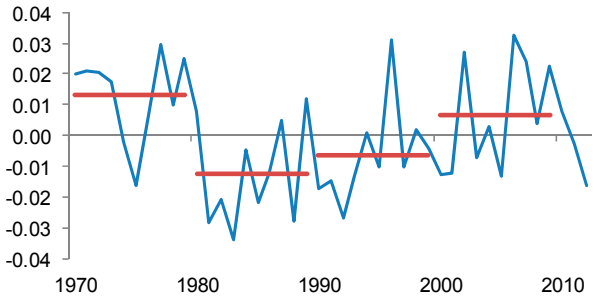
9. Brazil's investment has been constrained by low domestic saving and other structural impediments and these need to be addressed for capital to make a greater contribution to future growth. Economies offering higher returns on capital and experiencing rising investment demand can utilize more foreign saving (reflected in a wider current account deficit), easing the constraint applied by domestic saving. At the same time, there remains a clear and positive empirical relationship between domestic saving and investment across countries. Many explanations have been provided to explain this apparent puzzle, but at least for emerging market economies, constraints on the size of current account deficits, is likely one key reason (see SIP Chapter 2). Not all current account divergences are bad, but they can be a symptom of domestic distortions and building vulnerabilities.

10. Projections for Brazil's capital growth assume an unchanged domestic saving rate and a medium-term current account balance that converges to its "norm". Saving as a percent of GDP is currently close to its average level since 1970 and in the absence of structural reforms that raise incentives to save, it is assumed to remain at about 17 percent of GDP through 2030. The current account deficit is assumed to stabilize at about 2 percent of GDP, close to the level estimated from the IMF's External Balance Assessment (based on a positive estimation of cyclically-adjusted balances across countries). Together with a depreciation rate of about 6 percent (the current level), this generates a capital growth rate of about 3.5 percent, lower than the average rate of 4.6 percent between 1970–2012 but somewhat higher than the average since 2000.

Productivity

11. Productivity gains can support growth over the long run, but this will require closing infrastructure gaps and structural reforms. Historical growth accounting from 1970–2012 suggests that total factor productivity (TFP) growth or, alternatively, the residual from (6), has not contributed to growth. TFP growth appears to have picked up since 2000, but remains moderate at less than 1 percent. The projections use a relatively optimistic TFP growth rate of 1 percent, a rate rarely sustained in recent decades. This assumption is underpinned by expectations that increasing infrastructure investment and some tax reform over the medium run can improve the allocation of capital and raise TFP, even if capital deepening remains at its historical pace.

Brazil: Estimated Total Factor Productivity Growth
(percent)



Source: Staff estimates and projections.

D. Projecting Long-Run Growth

12. Brazil could achieve long-run potential growth of about 3½ percent although this estimate is subject to significant uncertainty and assumes a sustained pick-up in infrastructure investment. This estimate emerges from the assumptions outlined above and an expectation that Brazil can achieve a higher level of productivity growth than in the past. Estimated growth is then determined by a model in which output is given by (1) and capital, the other endogenous variable, is determined by domestic and foreign saving as a percent of GDP (s^d and ca, respectively) and depreciation (δ):

$$K(t) = [s^d(t) - ca(t)]Y(t) - (1-\delta)K(t-1) \qquad (7)$$

13. The potential growth estimate that emerges from this process is about 3½ percent for the period through 2020. The decomposition in the table below shows the declining contribution expected from labor inputs, notably the slower growth and eventual contraction expected in the size of the working age population. Based on the assumptions for saving and the current account, the contribution of capital deepening (growth in capital in excess of productivity growth) will contribute little to growth. These weak contributions underscore the important role that TFP must play to support future growth.

Brazil: Supply-Side Decomposition of Growth, 1995-2030

(annualized percent change)

	Actual			Projected		
	1995-99	2000-04	2005-09	2010-14	2015-19	2020-30
Capital, land and productivity						
Total factor productivity	0.3	-0.1	2.3	0.3	1.7	1.7
Capital deepening 1/	0.3	-0.8	-0.5	0.3	0.2	0.3
Land 2/	0.1	0.0	0.0	0.0	0.0	0.0
Labor						
Education	0.7	0.9	1.0	0.6	0.9	0.9
Labor force participation	-0.3	0.2	0.1	0.0	-0.1	0.0
Working age population	0.8	0.4	0.4	0.3	0.2	-0.2
Cyclical factors						
Capacity utilization	0.1	0.5	-0.5	0.6	0.0	0.0
Employment rate	-0.6	-0.7	0.7	0.5	-0.1	-0.1
Hours worked	-0.9	1.1	-1.1	0.3	0.0	0.0
GDP per capita	0.5	1.6	2.5	2.7	2.7	2.5
Population	1.5	1.3	1.0	0.8	0.7	0.5
GDP	**2.0**	**3.0**	**3.5**	**3.6**	**3.4**	**3.0**

Source: IBGE, IPEA, Central Bank of Brazil, World Bank, United Nations and Staff calculations

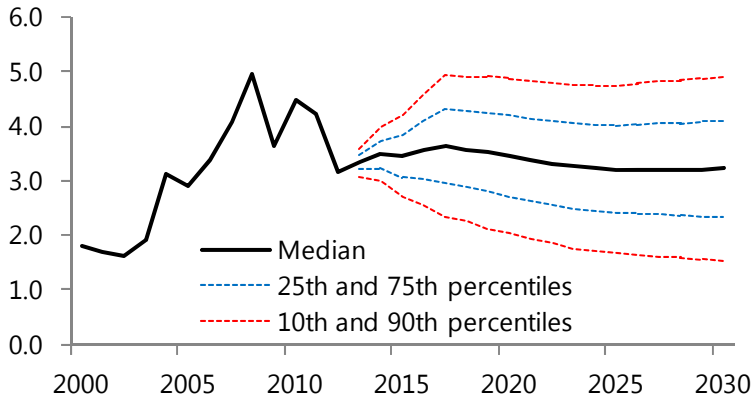
1/ Measured by the change in the capital output ratio to adjust for capital growth associated with technology.

2/ Because land income is a low share of overall national income, the direct contribution to overall economic growth from even significantly increased land use is only marginal.

14. The confidence interval for this estimate is wide, reflecting significant historical variation in saving, the current account and, most importantly, uncertainty about TFP growth. The one standard deviation bounds for potential growth, based on a large number of simulations, range from 2½ to 4 percent.[3] The key uncertainty is whether Brazil can lift TFP growth above its estimated historical range.

[3] To incorporate uncertainty, this exercise was simulated 1,000 times with TFP growth and the "terminal values" of saving and the current account treated as independent random variables. Specifically, the TFP growth assumed each year was drawn from a normal distribution with a mean of 1 percent per year and a standard deviation equal to that for estimated trend productivity growth since 1970, which is about 1 percent (i.e., for each model simulation, the same annual TFP growth was assumed based on a single draw from the distribution. For saving and the current account, the value at the end of the projection period (2030) was drawn from a normal distribution with a mean equal the average level since 1970, 17.9 percent of GDP and -2.7 percent of GDP, respectively. Standard deviations were estimated using trend saving and current accounts as a percent of GDP and were equal to 2 percent and 1.4 percent of GDP, respectively. The paths for saving and the current account were then interpolated from their latest values to this random draw of the terminal value using a cardinal spline.

Potential Growth: Simple Stochastic Simulations
(5-year annualized cumulative growth, percent)



Source: Staff estimates and calculations.

E. Sensitivity Analysis

15. How much would higher saving or a sustainably wider current account deficit lift potential growth? Table 2 provides some illustrative sensitivity analysis based on different assumptions for saving, the current account, and TFP growth. In particular, assuming saving permanently increased to 20 percent of GDP (a rise of about 3 percentage points from 2012 levels), potential growth through 2020 would reach 3¾ percent through 2020 (keeping productivity growth unchanged). Similar results are obtained with changes to the permanent current account. To reach near 4¼ percent, the potential growth widely assumed before the latest slowdown began in 2011, saving would need to rise by nearly 7 percentage points of GDP. The effect on potential growth of higher saving would be amplified by the effect on productivity. Greater capital depth is likely to be associated with higher TFP growth in Brazil as investment needs are concentrated in infrastructure, which has been shown to positively affect economy-wide productivity.[4]

[4] The literature has not come to a consensus on the effects of infrastructure investment on growth, but recent cross-country studies have shown that the impact is significantly positive, particularly when the initial capital stock is low (as is likely the case in Brazil). See Égert, Kozluk and Sutherland (2009).

Potential Growth: Sensitivity Analysis

(annualized cumulative GDP growth through 2020, percent)

	TFP growth 0.5 percent			TFP growth 1 percent			TFP growth 1.5 percent		
	Current account			Current account			Current account		
Domestic saving	-4	-2	0	-4	-2	0	-4	-2	0
15	2.6	2.3	2.0	3.2	2.9	2.6	3.8	3.5	3.1
20	3.4	3.1	2.8	4.0	3.7	3.4	4.6	4.3	4.0
25	4.1	3.8	3.5	4.7	4.4	4.2	5.4	5.1	4.8

Source: Staff calculations.

Appendix. Data Description and Sources

Indicator	*Sources*	*Comments*
Capital stock	1970–2011: Instituto de Pesquisa Econômica Aplicada (IPEA)	The methodology of this estimation is provided in Morandi and Reis (2004).
Capacity utilization	1970–2012: Fundação Getulio Vargas (FGV) Conjuntura Econômica 1991-2012: Confederação Nacional da Indústria (CNI)	The FGV series was used for the whole sample period.CNI data were compared with the FGV and found to be comparable in terms of changes, albeit with some persistent differences in levels.
Land	1970–2012: World Bank World Development Indicators (WDI) database.	Agricultural land under cultivation in millions of square meters.
Hours worked	1975–1991: Federação das Indústrias do Estado de São Paulo (FIESP) 1976–2007: International Labor Organisation (ILO) ILOStat database 1992–2011: CNI	Both FIESP and CNI data are for the industrial sector but ILO data indicate that the correlation between changes in hours worked in the broader economy and the industrial sector are very high. The series is rebased to the average annual hours worked in 2007 as reported by the ILO. Backcasted between 1970-74 using a regression in which hours are the endogenous variable and a constant, GDP per worker, and the unemployment rate are exogenous variables.
Employment rate	1980–2012: IBGE	Backcasted using Okun's law between 1970–79.
Labor force participation	1970–2011: World Bank WDI database. 2012: IBGE	
Working age population	1970–2011: Comisión Económica para América Latina y el Caribe (CEPAL) 2012: IBGE	
Education	1970–2011: IPEA and Barro-Lee database.	Average years of schooling for the population aged over 25 years.
Capacity Utilization	1970–2011: IPEA/ FGV.	

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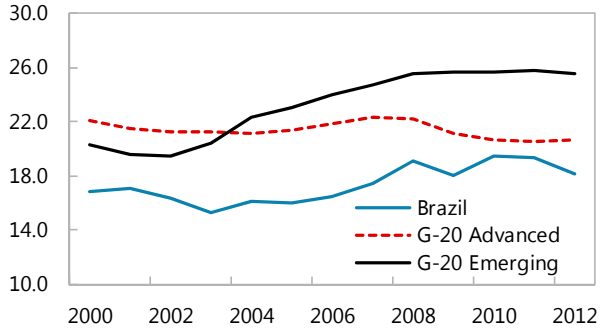
FINANCING INVESTMENT-LED GROWTH IN BRAZIL[1]

Brazil will need to scale up investment to achieve strong and sustained growth over the medium term. Foreign saving can finance part of the needed increment in investment, but to forestall external vulnerabilities, domestic saving will have to rise. In turn, this will require policy efforts to address the structural factors that inhibit household and public saving, including further reforms of the pension system and reducing fiscal rigidities.

A. Background

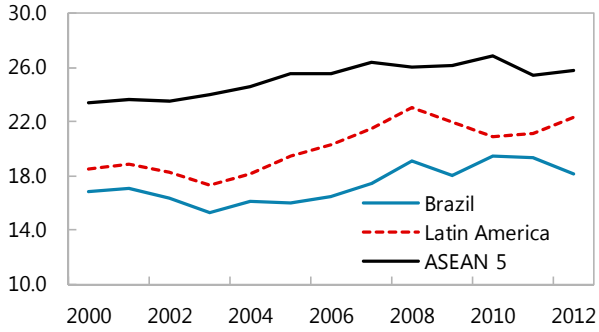
1. Brazil will need to scale up investment to boost potential growth over the medium term. As the impulse from beneficial labor market dynamics fade over the medium term, capital accumulation and productivity gains (in part associated with investment) will need to drive growth.[2] This will require a material scaling up of investment sufficient to push Brazil's investment ratio much closer to the average of its international peer group.

G-20: Gross Fixed Capital Formation
(percent of GDP)



Source: IMF WEO.

Emerging markets: Gross Fixed Capital Formation
(percent of GDP)



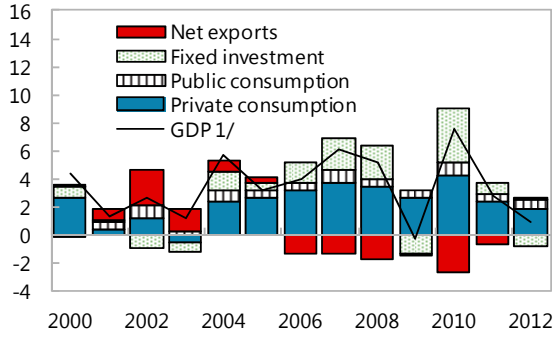
Source: IMF WEO.

2. Investment-led growth will also help to address demand imbalances that have emerged over the last decade. The expansion of the middle class has been one of Brazil's success stories over the last decade. This is a testament to macroeconomic stability and growth (in part due to substantial terms of trade windfalls) but also policies facilitating redistribution. At the same time, this welcome advance has been accompanied by rising demand imbalances and lower saving. Consumption has become the dominant demand-side driver of growth while investment and net exports have weakened. Since 2004, consumption—both public and private—has accounted for almost all the growth in Brazil, which contrasts sharply with G-20 Emerging Market peers.

[1] Prepared by Shaun Roache and Anna Ter-Martirosyan.

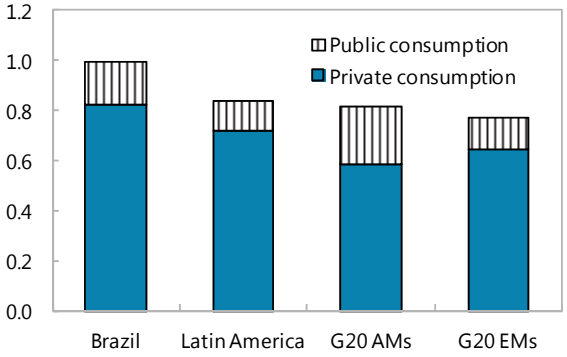
[2] See Selected Issues, Chapter 1.

Brazil: Contributions to Growth, 2000-12
(percent)



Sources: IMF WEO.
1/ Includes the contribution of inventories.

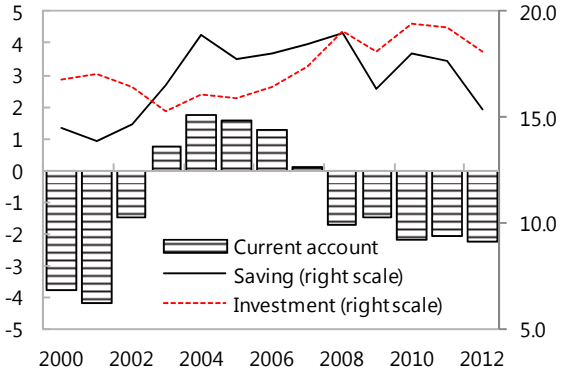
Contribution of Consumption to Growth, 2004-12
(proportion of cumulative GDP growth explained)



Sources: IMF WEO.

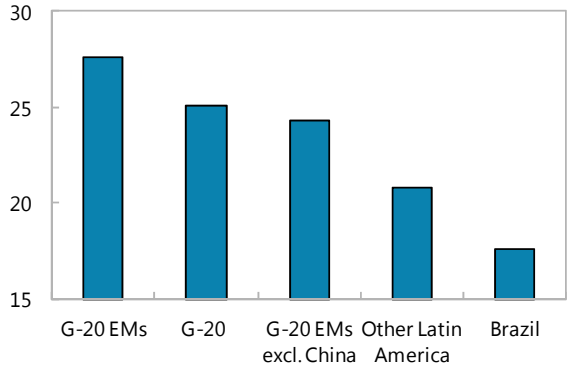
3. Brazil's external balances have also deteriorated, despite weak investment and terms of trade gains, due to lower saving. The terms of trade have contributed to some improvement in the current account since 2002, but this has not prevented a steadily widening external deficit. In the run-up to the crisis, saving failed to keep pace with rising investment. During the post-crisis period, the deterioration is largely explained by the fall in saving that has accompanied rapid consumption growth. This decline has left saving in Brazil as a percent of GDP well below many of its G-20 peers.

Brazil: Current Account, Saving and Investment
(percent of GDP)



Sources: IMF WEO.

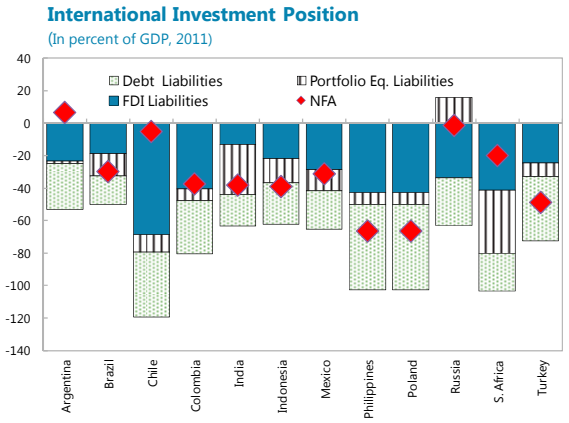
G-20 Saving, 2005-12
(average as a percent of GDP)

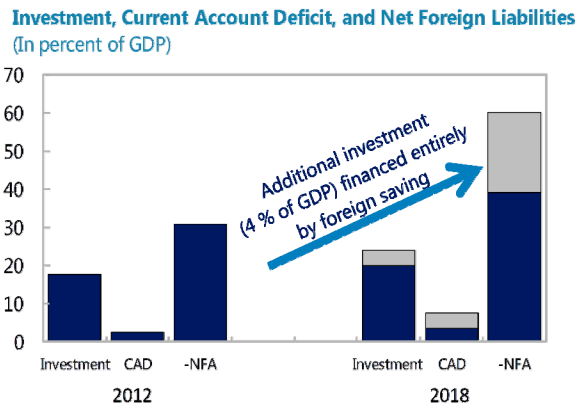


Sources: IMF WEO

B. Can Foreign Saving Finance Higher Investment?

4. Brazil could overcome low domestic financing by relying more on foreign saving but this approach would face constraints. In the past the current account has been largely financed by foreign direct investment (FDI), suggesting that there is some scope for greater recourse to foreign saving particularly if it financed productive investments. Brazil's foreign asset position has improved in recent years and compares favorably with other emerging markets in terms of gross and net levels and the composition of liabilities (with a greater share of FDI). On the other hand, the current account deficit has already reached 3¼ percent of GDP and greater recourse to foreign saving would result in further deterioration.



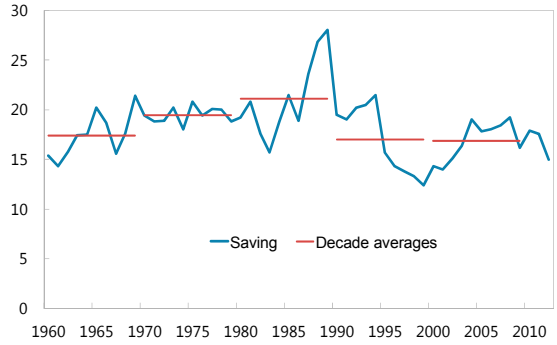


5. There are limits to such financing given the scale of Brazil's investment needs. If the increase in Brazil's investment to peer levels (about 4 percent of GDP) were to come entirely from foreign saving, it would result in further widening of the current account deficit and significant deterioration of foreign asset position. The chart above illustrates the impact of higher investment-to-GDP ratios on current account deficit and the medium-term net foreign asset (NFA) position as a percent of GDP. If investment increased to average G-20 levels, Brazil's current account deficit would exceed 6 percent of GDP and its net foreign position would deteriorate sharply to the point where external vulnerabilities could emerge. A much wider current account deficit would also likely imply significant appreciation of the real exchange rate and higher real interest rates, both of which could adversely affect incentives for investment. This suggests that financing for scaled-up investment will have to rely importantly on domestic saving.

C. Boosting Domestic Saving

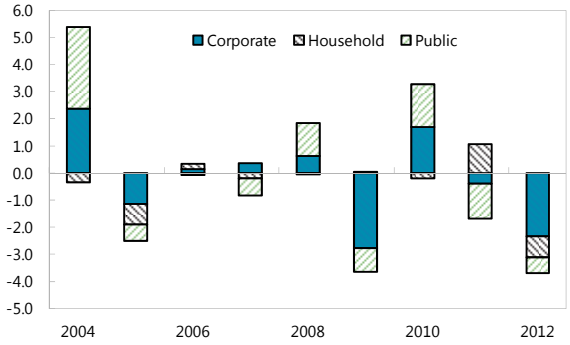
6. Domestic saving has varied with the cycle over the last 10 years but remains low. Brazil's saving rates surged by almost 7 percentage points between 1999–2004 in a context of emerging macroeconomic stability and the start of the commodity price boom. After stabilizing at long-term average levels, saving declined in the aftermath of the global financial crisis and dipped to 15 percent in 2012 with all three sectors reducing saving. Public and corporate sector saving are typically cyclical, in part reflecting the sensitivity of revenues and income to economic growth. Household saving is less cyclical and at times partially offsets changes in saving behavior in other sectors. But the most notable feature of saving behavior is that it fluctuates around a low level, particularly in the public and household sectors.

Brazil: Gross National Saving Rate
(saving as percent of GNI, percent)



Sources: IBGE and staff calculations.

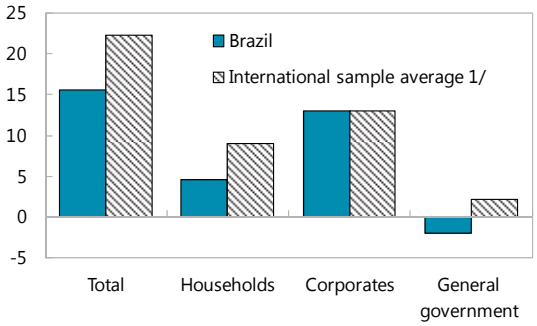
Brazil: Changes in Saving by Sector
(change of savings as percent of GNI, percentage points)



Sources: United Nations, IBGE, and staff estimates.

7. The public and household sectors explain the low level of saving. The gap between saving in Brazil and an international peer group during 2005–09 was about 7 percentage points of GDP (based on a sample selected on the basis of United Nations data availability), largely due to lower public and household saving.

Saving , Average 2005-09
(percent of GDP)



Sources: United Nations.
1/ Includes Chile, China, Colombia, France, Germany, Italy, Japan, Korea, Mexico, South Africa, United Kingdom, and the United States.

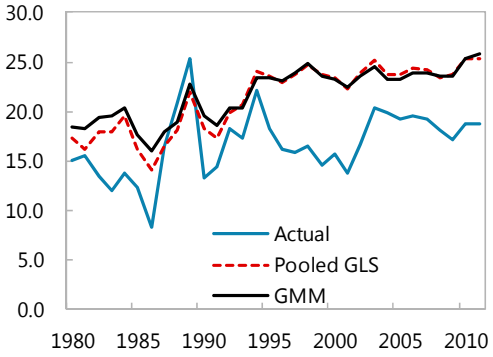
8. A cross-country comparison can shed light on whether Brazil could save more.[3] Some of the more important structural determinants of private saving include demographics, income levels, and financial depth. Among the more cyclical factors are public saving and the terms of trade. Key policy variables, including those related to broadly defined social safety nets, are not included due to lack of cross country availability. The table below presents the results of a regression in which private saving is the endogenous variable and these and other possible determinants are explanatory variables (see Appendix for details). Based on an unbalanced panel of 49 advanced and

[3] This analysis focuses on private saving. For most countries, household and corporate saving data with a sufficiently long history are not available.

emerging economies and an annual sample period of 1960–2011, pooled regressions largely confirm the results of earlier work.[4] Many of the coefficients on the factors listed above have signs in accord with theoretical priors and are statistically significant.

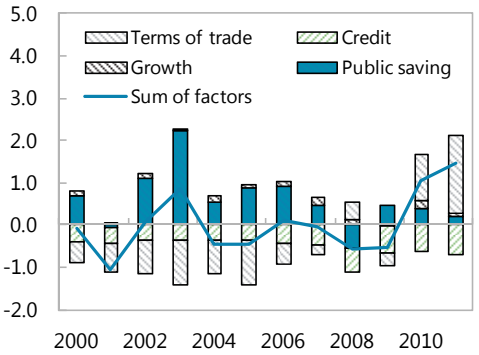
9. This analysis suggests that Brazil does not save enough. The fitted values for Brazil from these regressions are shown below. In the early 2000s, actual private saving was about 3 percentage points of GDP lower than the fitted values and this gap widened over the subsequent decade to 7 percentage points of GDP. In contrast, the regressions predict that private saving should have increased by 3 percentage points during this same period due to three key drivers: a reduction in public saving (which is predicted to have been partially offset by the private sector); a large rise in the terms of trade at the end of the period (reflecting a tendency to save windfalls); and brisk economic growth. One important factor that could explain some of the decline in saving is rapid financial deepening, with increased access to credit reducing household incentives to save, particularly for liquidity constrained households.

Brazil: Private Saving
(percent of GDP)



Source: Staff calculations.

Changes in Estimated Private Saving
(contribution, percentage points of GDP) 1/



Source: Staff calculations.
1/ Calculated from regression specification (4).

[4] See Loayza, Schmidt-Hebbel, and Servén (2000).

Table. Private Saving Regression Coefficients, Advanced and Emerging Economies 1/

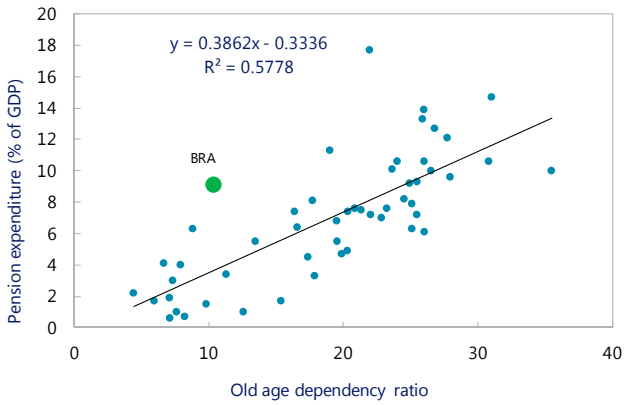
	1 OLS levels pooled	2 OLS levels fixed effects	3 GLS levels and AR(1)	4 GMM with AR(1)	5 GMM Differences
Public saving	-0.578 ***	-0.649 ***	-0.740 ***	-0.592 ***	-0.627 ***
	(0.02)	(0.03)	(0.04)	(0.02)	(0.19)
GDP growth	0.311 ***	0.114 ***	0.089 ***	0.029	0.045
	(0.05)	(0.04)	(0.02)	(0.02)	(0.07)
Relative GDP per capita	0.022 ***	0.064 ***	0.027	0.048 ***	-0.088
	(0.00)	(0.01)	(0.02)	(0.01)	(0.10)
Private credit to GDP	0.016 ***	-0.008	-0.012	-0.013 ***	0.040
	(0.00)	(0.01)	(0.01)	(0.00)	(0.05)
Old dependency ratio	-0.635 ***	-0.458 ***	-0.605 ***	-0.684 ***	-0.341
	(0.04)	(0.09)	(0.16)	(0.05)	(0.39)
Young dependency ratio	-0.267 ***	-0.231 ***	-0.274 ***	-0.260 ***	-0.355 **
	(0.02)	(0.03)	(0.09)	(0.03)	(0.18)
Inflation	0.002 ***	0.003 ***	0.001	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Real interest rate	0.000	0.000	0.000	0.000 ***	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Terms of trade	0.007	0.038 **	0.053 *	0.088 ***	0.058
	(0.01)	(0.02)	(0.03)	(0.01)	(0.04)
J-statistic (p-value)	...	...	...	0.447	0.109

Source: Fund staff calculations.
1/ All data are in levels. Public saving and real interest rates are assumed to be endogenous in the two-stage regressions, specifications (4) and (5). Instruments include lagged values of the endogenous variables. Specifications (3) and (5) included an AR term to account for serial correlation of error terms. Specification (3) is a GLS estimation using cross-section SUR.

10. How can policies boost private saving? Among the missing variables that may explain Brazil's large residual in the cross-country regression are those related to pension provision. Public pensions remain particularly generous, in terms of retirement age and benefits. Staff analysis indicates that adjusting benefits would strengthen incentives for households to save and increase national saving as a percent of GDP, although this would occur only over the long run.[5]

11. The public sector must also play a key role in increasing national saving. Low public saving does not reflect insufficient revenue but rather very high consumption which, as a percent of GDP, is among the highest across emerging markets and double the level of peers in Latin American. Easing budget rigidities, including fiscal earmarking and spending mandates that fix current spending at a very high level, should remain a priority for fiscal reform efforts.[6]

Old Age Dependency Ratio and Pension Expenditure, 2010



Source: United Nations, Eurostat, OECD, ILO, EC, Country authorities, IMF Staff calculations

[5] See Macroeconomic Implications of Pension Reform in Brazil, Chapter I in Brazil: Selected Issues Papers, 2012.

[6] See Real Exchange Rate Appreciation: Can Fiscal Policy Help? Chapter II in Brazil: Selected Issues Papers, 2012.

Appendix

Data for the Saving Regressions, 1960-2011

Variable	Description	Source
Private Saving	Saving of the household and corporate sectors	World Economic Outlook database (WEO)
Public Saving	Saving of the non-financial publi sector	WEO
GDP growth	Real GDP growth	WEO
Relative GDP per capita	PPP GDP per capita relative to the United States	WEO
Private credit	Private credit by deposit money banks and other financial institutions as a percent of GDP	World Bank World Development Indicators database (WDI)
Old dependency ratio	Percent of the population aged 65 and older as a percent of the working age population	WDI
Young dependency ratio	Percent of the population aged 15 and younger as a percent of the working age population	WDI
inflation	Annual percent change in the consumer price inflation index	WEO
Real interest rate	Deposit interest rate deflated by the consumer price index	WDI and WEO
Terms of trade	Percent difference between current terms of trade and sample average multiplied by trade openness (imports	WEO

Reference

Loayza, Norman, Klaus Schmidt-Hebbel, and Luis Servén, 2000, "What Drives Private Saving across the World?" Review of Economics and Statistics, Vol. 82, No. 2 (May, 2000), pp. 165–181.

INFLATION IN BRAZIL—STILL PERSISTENT?[1]

Brazil's track record under the inflation targeting framework has been impressive. Since 1999, price stability has been achieved and policy credibility has accumulated. This has contributed to lower "inflation persistence," implying that price shocks now fade more rapidly. Policy space has increased as a result. Evidence is emerging, however, that this beneficial trend of falling persistence has recently stalled and may be reversing at the same time that medium-term inflation expectations have drifted above the central bank's target. Restoring lower persistence, including by securely anchoring expectations, would help rebuild Brazil's policy space.

A. Background

1. Inflation persistence can be defined as the tendency for price shocks to push inflation rate away from its steady state for a prolonged period. In the case of an inflation targeting country, the steady state should be the inflation target. This is a reduced form interpretation of persistence and does not provide a structural explanation. Persistence may change due to a number of reasons, including: inertia in the underlying "forcing process," such as the output gap; the policymaker's reaction function to price or output shocks; and inertia intrinsic to the inflation process itself, such as indexation. Recent studies suggest that intrinsic factors may be the most important explanation for large changes in persistence.[2]

2. Reduced form inflation persistence can be measured using measures of the "half-life" impact from shocks. A half-life is the time taken for ½ of an inflation shock to dissipate: the lower the half-life, the lower is persistence. The starting point is an AR(1) regression[3]:

$$\pi_t = k + a\pi_{t-1} + \varepsilon_t \qquad (1)$$

3. In (1), the measure of persistence is the parameter *a*, where π is quarterly inflation, *k* is a constant, and *ε* is an iid shock to inflation (see Appendix for a detailed description of the data). The moving average interpretation of (1) shows that *a* can be regarded as the persistence of all previous inflation shocks *ε* and manipulation of (2) provides an estimation of half-life.

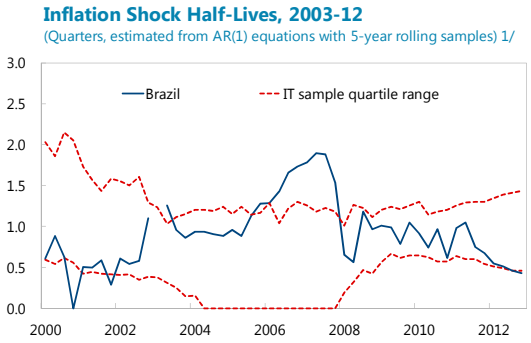
$$\pi_t = \sum_{i=1}^{\infty} a^i \varepsilon_{t-i} \qquad (2)$$

[1] Prepared by Shaun Roache.

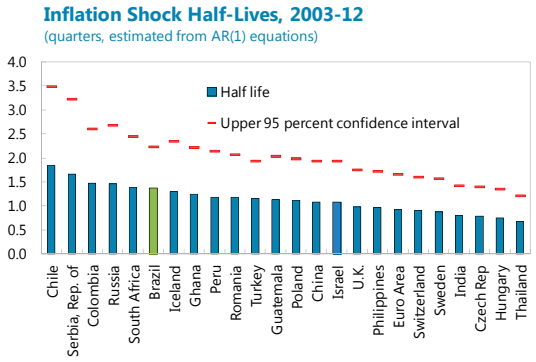
[2] See Fuhrer (2009) for a full taxonomy of inflation persistence.

[3] Tests for Brazil and other inflation targeting countries indicate that the time series properties of inflation are best represented by AR(1) rather than higher order processes.

4. One of Brazil's most important macroeconomic achievements since the 1990s has been a significant reduction in inflation persistence measured by indicators of "half-life". In the early part of the decade, Brazil's transition to the inflation targeting (IT) regime induced a structural break in inflation that explains the observed decline in persistence (using 5 year rolling samples of quarterly data). A further reduction in persistence started after Brazil began to build a track record of success in achieving price stability. Taking the period 2003–12 (which excludes episodes of high inflation volatility), Brazil's persistence is well within the range observed for IT countries.[4]



Sources: Fund staff calculations
1/ 5 year rolling samples of quarterly data. Outliers from 2003 not shown.



Sources: Fund staff calculations.

5. Backward-looking measures of persistence such as "half-lives" may do a poor job of detecting changes at the margin. By construction, most measures of inflation persistence use historical data in which observations from the past can offset the influence of a smaller number of recent data points. Reducing sample size is one option but it can mean that results are dominated by outliers and are subject to wide confidence intervals. The next section will discuss an alternative "forward looking" measure of persistence.

B. "Forward Looking" Inflation Persistence

6. Inflation expectations can provide an indication of forward looking persistence. Specifically, assessing the effect of changes in actual inflation now (say at time *t)* on the inflation expected at some future period *t+m* (where *m* could be 12 or 18 months ahead, for example) may suggest how persistence will change in the future. Whether this approach is meaningful will depend largely on the extent to which inflation expectations are accurate predictors of future inflation.

[4] The sample of countries was guided by Roger (2010) and included the 26 countries that target inflation plus China, the euro area, India, Japan, Russia, Switzerland, and the United States. The adoption date of IT by these 26 countries varies widely, with the first adoption in 1991 (New Zealand) and the latest in 2007 (Ghana). The sample includes a mix of 12 advanced countries and 21 emerging and low income countries. Five Latin American economies are included in the sample, with the date of IT adoption in parentheses: Brazil (1999), Chile (1999), Colombia (1999), Mexico (2001), and Peru (2002).

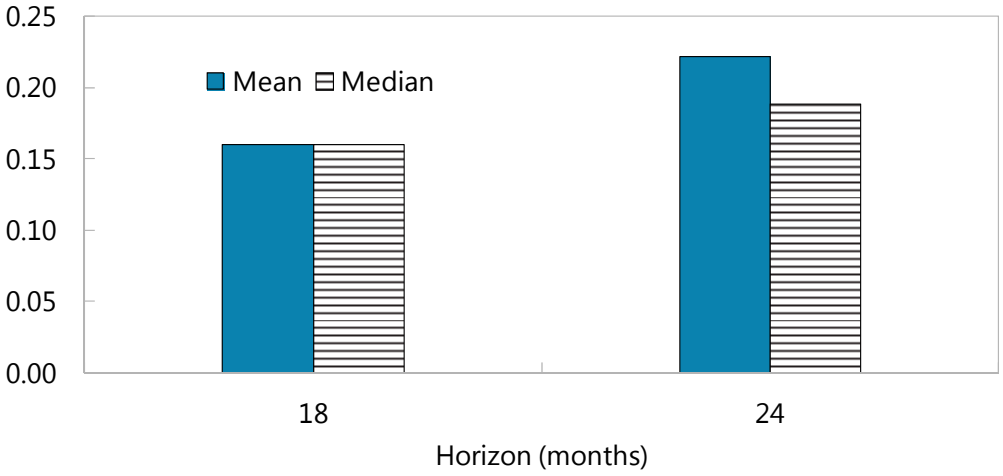
7. Inflation expectations in Brazil have good forecasting properties for future inflation. In-sample tests were based on a regression in which the actual change in annual inflation *(π12)* over a specified horizon m was the endogenous variable and the difference between expected annual inflation and actual inflation was the explanatory variable:

$$\pi 12_{t+m} - \pi 12_t = \alpha + \beta[E_t\{\pi 12_{t+m}\} - \pi 12_t] + \varepsilon_t \quad (3)$$

8. Expectations are unbiased if *α = 0 and β = 1* and, based on a regression estimated using monthly data from January 2003 through March 2013, it was not possible to reject this null hypothesis.[5] This is a strict notion of rationality and indicates that surveyed expectations avoid persistent errors and are "correct" on average.

Focus Survey: In-Sample Inflation Forecast Bias Tests

(p-value of the null hypothesis that survey forecast is unbiased in sample) 1/

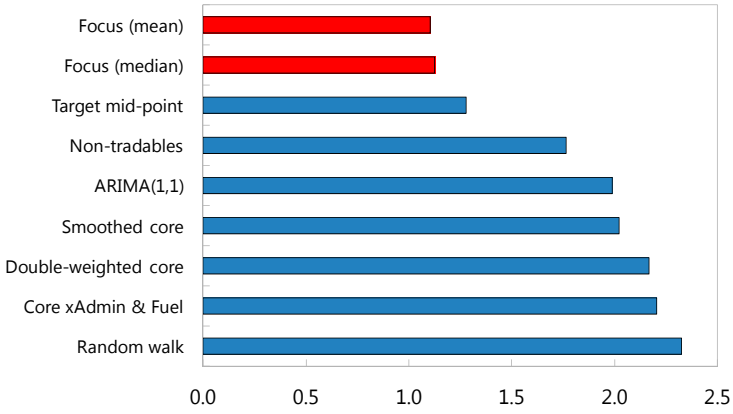


Sources: Central Bank of Brazil, Fund staff calculations.
1/ Sample period from Jan-2003 to Mar-2013. Wald tests using Newey-West long-run covariance matrix to account for overlapping monthly observations.
π(t+k) - π(t) = α + β (E(t)π(t+k) – π(t)) + ε(t), with null H0: α = 0, β = 1

9. Inflation expectations outperform alternative measures in out-of-sample forecasting. In a "horse race" exercise with seven other naïve approaches, including measures of core, a simple time series model, and a random walk, the root mean squared error was lowest for surveyed expectations.

[5] Given the use of overlapping observations (i.e., the frequency of observations is shorter than the forecast horizon), residual correlation is controlled for by using Newey-West HAC standard errors with a bandwidth equal to the forecast horizon minus one.

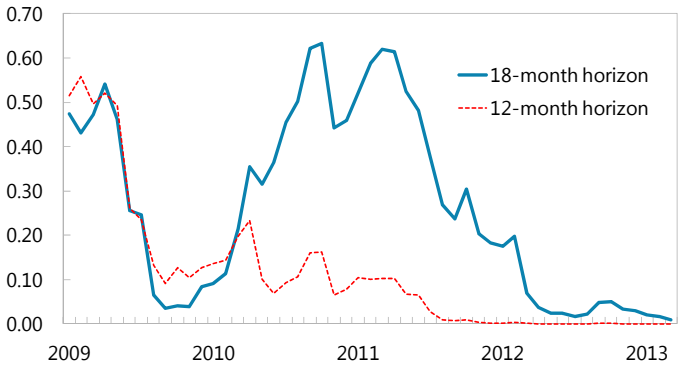
Focus Survey: 18m Inflation Forecast RMSEs, 2003-13
(Root mean squared errors in percentage points)



Sources: Fund staff calculations.

10. In a sign that persistence has started to rise, changes in actual inflation have begun to affect expectations at longer horizons. Granger causality tests now indicate that lagged changes in the actual annual inflation rate affect changes in the expected annual inflation rate at the 12 month and 18 month horizons (prior to 2011, this had not been the case). For example, an upside surprise in inflation now leads to upward revisions in inflation expectations at these horizons in the following months. Market participants now perceive that inflation surprises will persist and continue to affect inflation some time after they occurred.

Past Changes in Inflation and Inflation Expectations
(p-values of null of no Granger causation, rolling 5-year sample) 1/



Sources: Fund staff calculations.
1/ Granger causality tests with 4 lags of the change in inflation in previous periods and the effect on the change in inflation expectations.

11. The rise in inflation persistence has been asymmetric with the effects of upside surprises much more important than downside surprises. To evaluate possible asymmetry, a regression was estimated in which the endogenous variable was the month-on-month change in the expected annual inflation rate at the 18 month horizon (m=18). The explanatory variable was the month-on-month change in the actual annual inflation rate during the preceding month. This was

multiplied by a dummy variable with its value determined by the sign of the change in actual inflation:

$$E_t\{\pi 12_{t+m}\} - E_{t-1}\{\pi 12_{t-1+m}\} = \alpha + \gamma_1 d_1 \Delta\pi 12_{t-1} + \gamma_2 d_2 \Delta\pi 12_{t-1} + \varepsilon_t$$

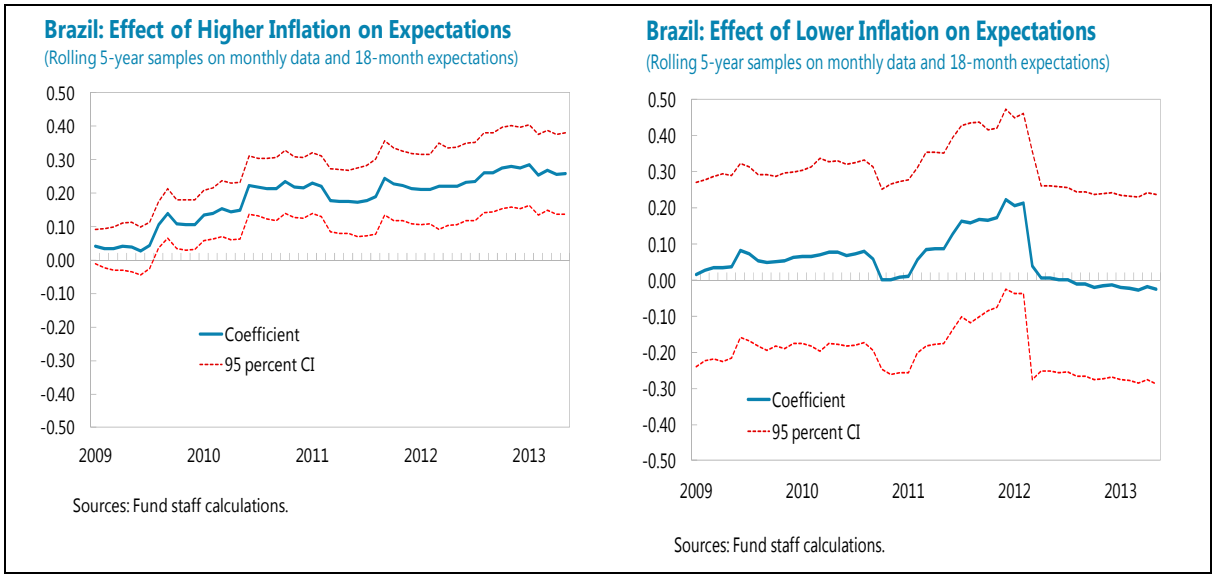
where

(4)

$$d_1 = 1 \text{ if } \Delta\pi 12_{t-1} > 0 \text{ and } d_1 = 0 \text{ otherwise}$$
$$d_2 = 1 \text{ if } \Delta\pi 12_{t-1} < 0 \text{ and } d_2 = 0 \text{ otherwise}$$

12. The coefficients *γ_1 and γ_2* measure the sensitivity of inflation expectations one month following a rise and a fall in the actual inflation rate, respectively. The figure below shows estimates for these coefficients based on rolling 5 year samples. The coefficient γ_1 is statistically significant, has been increasing since 2009, and suggests that about ¼ of a rise in actual inflation feeds through to 18 month inflation expectations. If these expectations are good predictors of future inflation (which the analysis above suggests they are), then this is signaling an rise in "actual" persistence of inflation increases.

13. In contrast, the coefficient γ_2 is not significant, indicating that a decline in inflation has no effect, on average, on inflation expectations. If the rise in persistence is indeed "intrinsic" and perhaps due to a partial re-emergence of indexation, then this process appears to work in only one direction and present upside risks to inflation.



C. Conclusions

14. Inflation persistence in Brazil appears to be rising but history shows that this process can be reversed. Forward looking evidence is pointing to rising persistence and this may be reducing the space monetary policy has available to absorb transitory shocks, including those from global and domestic food commodity markets. But Brazil's history suggests that anchoring monetary policy in the existing IT framework and providing clear guidance regarding the primacy of achieving the inflation target over the relevant horizon could prove remarkably effective in reversing this process and rebuilding the policy space that has contributed to macroeconomic stability over the last decade.

Appendix. Sample Choice and Description of the Data

The inclusion of all IT countries is motivated by the common assumption that inflation expectations are well anchored in a credible IT regime (see Gürkaynak, Levin, and Swanson, 2006, for an example using a standard New Keynesian DSGE). In turn, this argues for less inflation persistence, all else equal, and previous empirical studies have suggested inflation targeters do experience lower persistence (Mishkin and Schmidt-Hebbel, 2007). Given that all of the Latin American countries under consideration are inflation targeters, it is reasonable to compare them to this peer group.

Inflation is measured as the 400 times the quarterly log change in the seasonally adjusted quarterly average headline consumer price index for each country. This provides an approximate annualized rate of inflation in percent. The seasonal adjustment is carried out uniformly on non-seasonally adjusted price indices published by the IMF's *International Financial Statistics* using the U.S. Census Bureau's X12 procedure. The sample period starts in Q1 1990 but in many cases the analysis is performed for a sample that begins in Q1 2000. Only in the 1999–2002 period did the adoption of IT start to gain momentum; during these four years, nine of the 21 emerging economies, including all of the Latin American countries, adopted IT. Focusing on the results since 2000 helps avoid large structural regime breaks. At the same time, changing target levels and the gradual build-up of credibility may still impart long-lasting effects on inflation behavior.

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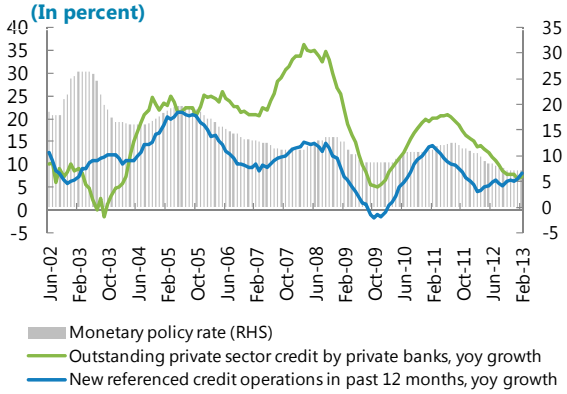
MONETARY TRANSMISSION IN BRAZIL—HAS THE CREDIT CHANNEL CHANGED?[1]

This chapter investigates the transmission of monetary policy by private banks in the recent easing cycle. The analysis presented uses a panel dataset with information on lending by private banks and concludes that monetary transmission through lending volumes was not impaired. Instead, the observed diminished lending appears to be related to supply and demand factors, as well as to the rapid expansion of public banks' lending.

A. Introduction

1. During the past two years, private banks' credit seems to have been less responsive to monetary policy changes than in previous loosening cycles. In August 2011, the Brazil central bank started an easing cycle. Since then and till the start of the tightening cycle in April 2013, the policy rate was cut by 525 bps to 7.25 percent, a decades low. Despite the substantial monetary stimulus in place, credit growth by private banks continued to decline, partly reflecting that new lending operations were recovering only very gradually.

Brazil. Credit Growth and Monetary Policy
(In percent)



Sources: Central Bank of Brazil; and Fund staff calculations.

2. Several factors could help explain the apparently diminished monetary transmission. The surge in NPLs that private banks experienced since late-2011 could explain the more cautious and limited supply of credit. On the demand side, weak consumer and business confidence, coupled with elevated household indebtedness and relatively high debt service ratios could have also been holding back demand for credit by corporates and individuals. Another factor that could have played a role in explaining the dynamics of private banks' credit is the expansion of credit by public banks, which in recent years have been growing at sizable rates and may be competing with private credit.

3. This chapter explores why monetary transmission to lending volumes has been lower than in the past. The chapter examines if the diminished monetary transmission has been due to a weakening of the credit channel or if, shifts in underlying supply and/or demand factors could help

[1] Prepared by Mercedes Garcia-Escribano (WHD). This chapter has benefitted from comments from the Central Bank of Brazil.

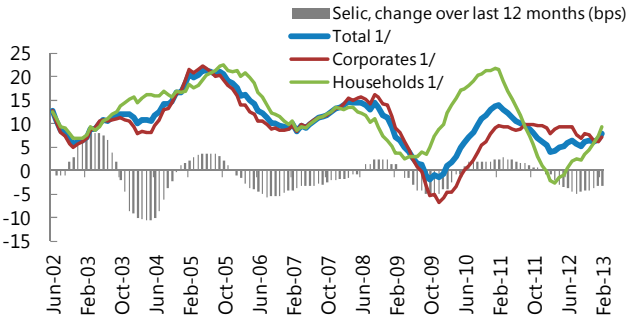
explain the delay in transmission. The chapter also analyzes if during the recent monetary easing cycle, there were differences in the monetary transmission across banks depending on their ownership (private domestic or foreign banks). The impact of the expansion of public bank lending on lending by private banks is also analyzed; in particular, we test if competition between private and public banks has changed.

B. Stylized Facts

4. Has monetary transmission via the lending channel changed recently? Figure 1 shows the negative co-movements of cumulative changes in monetary policy and new credit growth. The negative correlation between Selic changes and credit growth seems to have weakened in the recent monetary easing cycle, particularly for bank lending to corporates.

5. The delayed monetary transmission to credit does not appear to have affected lending rates as the pass-through of the policy rate to loan rates has been complete. In contrast with the previous easing cycle, the interest rate pass-though during the last cycle was initially delayed, but eventually, private banks fully passed the policy cuts to lending rates for firms and individuals, with even a tightening of the spreads for some loan segments.

Brazil: By Borrower, Changes in Selic and Lending Growth



1/ New interest rate referenced credit over last 12 months, growth yoy, in percent.

Sources: Central Bank of Brazil; and Fund staff calculations.

Brazil: Monetary Transmission Through Lending Rates

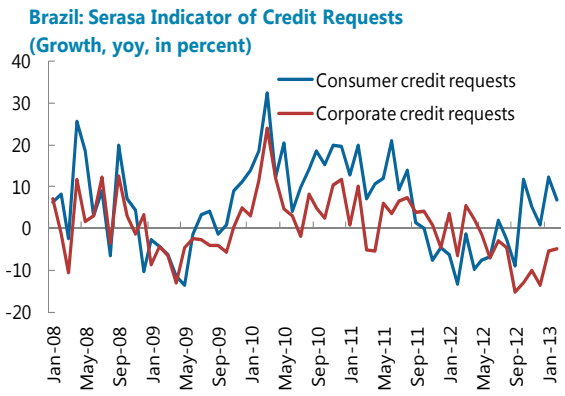
	Interest Rate Changes (bps) since December 2008						Interest Rate Changes (bps) since August 2011					
	Policy Rate	Discount	Working Capital	Payroll Loans	Personal Credit	Vehicles Loans	Policy Rate	Discount	Working Capital	Payroll Loans	Personal Credit	Vehicles Loans
t+1	-1.00	-1.4	-0.8	0.0	-3.9	-1.9	-0.50	-0.9	0.7	0.2	0.1	-1.1
t+5	-3.50	-2.1	-4.9	-2.2	-13.8	-7.4	-2.00	-0.8	-0.8	-0.3	0.3	-1.9
t+10	-5.00	-3.7	-6.9	-3.6	-14.7	-11.0	-4.00	-5.2	-5.4	-3.2	-6.3	-7.1
t+14	-5.00	-6.5	-8.0	-3.5	-16.6	-12.4	-5.25	-9.2	-6.6	-4.1	-6.8	-6.9

Sources: Central Bank of Brazil; and Fund staff calculations.

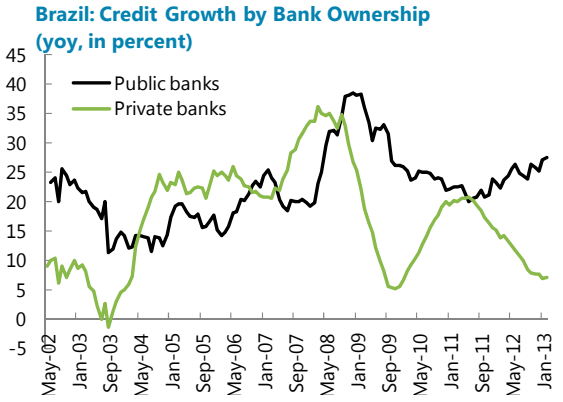
6. Other factors affecting credit supply or demand may help understand credit dynamics. Elevated household indebtedness and the surge in NPLs may have prompted banks to be more cautious and selective in their lending practices during the past year. Uncertain global and domestic economic conditions—reflected in weakened consumer and business confidence—as well as elevated household indebtedness may have lowered demand for credit by consumers and corporates. The indicator of credit requests by Serasa shows that demand for credit by consumers have been relatively weak during 2012 and picked up in early 2013. In contrast, corporates' demand for credit that had also weakened since end-2011 has not rebounded yet.

7. Increased lending by public banks may have also played a role. Public banks' credit expanded at an annual rate of nearly 25 percent during 2011–12, resulting in an increase in their share of total credit to 48 percent (compared to 42 percent by end-2010). Heightened competition

from public banks may also help explain the lower sensitivity of private banks' credit growth to Selic changes.



Sources: Serasa Experian Brazil; and Fund staff calculations.



Sources: Central Bank of Brazil; and Fund staff calculations.

C. Methodology and Data Description

8. A panel dataset with quarterly data comprising 37 private banks (19 domestic and 18 foreign) is used to explain the credit channel of the monetary transmission mechanism. During the sample period that extends from the first quarter of 2005 to the fourth quarter of 2012, monetary conditions were eased and tightened in several occasions. The observed volume of new loans by private banks reflects the equilibrium between credit supply and credit demand. The empirical specification presented in this chapter explains the growth in new lending as a function of supply and demand factors, including changes in the Selic rate, bank characteristics, proxies for corporate and individual demand for credit, and new lending extended by public banks.

The empirical specification is as follows:

$$\Delta lnx_{ijt} = \beta_0 + \beta_1 \Delta Selic_t + \beta_2 \Delta lnpublic_{it} + \beta_2 k_{it} + \beta_3 A_{ijt} + \beta_4 Z_{jt} + \upsilon_{ij} + \varepsilon_{ijt}$$

where x_{ijt} stands for new loans to sector i, either a corporate or an individual, by private bank j at time t; *Selic* is the policy rate of the Brazil Central Bank; $public_{it}$ represents new loans extended by public banks to sector i; k_{it} is a variable representing the demand for credit by sector i (proxied by confidence index, expectations index, or the Serasa credit request indicator); A_{ijt} includes factors that could affect private banks' perception for credit risk (some factors may be bank and sector specific, such as the non-performing loan ratio, while other factors are common to all banks, such as VIX, EMBI, the Bovespa stockprice index or the level of household debt service); Z_{jt} are factors that limit bank's lending capacity (some could be bank specific like bank capitalization or liquidity, or common to all banks, like reserve requirements); υ_{ij} is the bank specific fixed effect when lending to sector i; and ε_{ijt} is the error term.

A dummy variable δ_t that takes the value of 1 during 2012Q1–2012Q4 will allow identifying if the growth of private banks' new credit was lower during the last monetary easing cycle than during the rest of the sample period. The interaction of δ_t with a few of the other explanatory variables—such as the change in the Selic—will allow examining if the sensitivity of credit growth to any of these variables changed recently.

Table A.1 presents the definition of the variables and the descriptive statistics. Figure A.1 shows the time evolution of these variables.

D. Results

9. This section summarizes the main results. Table A.2 explores the presence of changes in monetary transmission during the recent easing cycle. Table A.3 tests the role of the Selic as well as demand and supply factors in explaining changes in lending growth during the sample period. Table A.4 focuses on understanding the lower lending growth during the recent cycle, in particular, if the sensitivity of lending growth to either of the explanatory variables has changed recently. Table A.5 assesses if public bank lending has any impact on private banks' credit.

10. Table A.2 confirms that lending growth was weaker since end-2011. Changes on the Selic have a negative and statistically significant impact on credit growth. Lending growth during the past cycle has been significantly lower than during the rest of the sample period, as shown by the negative coefficient on the dummy variable δ_t in Column (I). The coefficient for the interaction between Selic changes and δ_t in Column (II) is positive and statistically significant indicating that monetary transmission has been weaker during the recent cycle. However, the coefficient sign reverts and is statistically significant when the dummy δ_t is included in the regression (Column (III)), implying that when controlling for other factors contributing to the lower credit growth in the past cycle, the reductions in the Selic did have a positive impact on loan disbursements; thus, it is not possible to conclude that the lower lending growth observed last year was due to limited or impaired monetary transmission mechanism. Similar results are obtained when the sample includes only lending to individuals (Columns V-VI) or to corporate (Columns VII-VIII). Column (IV) explores if lending from foreign banks differs from domestic private banks during the past cycle; the coefficient on the interaction term is not statistically significant and thus, suggests this is not the case.

11. Demand and supply factors are main determinants of lending growth. Table A.3. shows the estimates for a range of demand and supply factors using the total sample. Three different of variables—confidence index, expectations index and Serasa credit requests—are tested as proxies for demand for credit. The three of them have a positive and significant impact on credit growth. Perception of changes in credit risk matters for credit supply. Heightened market risk (proxied with either increases in the EMBI or VIX, or declines in the Bovespa stockprice index) has a negative impact on credit growth. Similarly, a deterioration in the credit portfolio (captured in an increase in the NPL or decrease in the ROA) leads to lower supply of credit by banks. Table A.2. also displays the impact of bank's balance sheet variables related to the bank's lending capacity on credit growth. Increases in reserve requirements should limit bank's funding, but the coefficient sign is instead positive indicating the presence of endogeneity (i.e. the central bank increases reserve requirements

in response to excesses in credit growth). Bank capitalization and liquidity have the expected sign and are statistically significant.

12. The lending channel was not weakened during the last monetary easing cycle. Column I in Table A.3.c. displays the regression results when including the full set of explanatory variables. Column II adds the dummy variable δ_t in the set of regressors; the coefficient is negative and statistically significant, confirming that the behavior of credit growth during the past year was different than during the rest of the sample period. Column (IV) displays the results when interacting the change in the Selic with the dummy δ_t. The negative sign on the Selic indicates not only that the lending channel was not impaired, but that after controlling for the rest of the factors that weakened lending growth, the lending channel was more effective than during the rest of the sample. The results are similar when the sample is limited to lending to individuals (Column VII) or lending to corporates (Column X) in the sense that the interaction term is not statistically significant, suggesting that the monetary transmission mechanism during the recent cycle was working similarly as during the rest of the sample period.

13. Recently, banks have become more cautious in their lending practices. Banks became more sensitive in their lending to changes in monetary policy during the past easing cycle (as shown by the negative and significant coefficient on the interaction of the dummy δ_t and the Selic change in Table A.4.), and also to macroeconomic or global environments, captured by the EMBI (Column (III)). The coefficient on the interaction of the EMBI and δ_t is negative and statistically significant; further, when the interaction term is added in the regression, the coefficient on the dummy δ_t reverts its sign, indicating that the weaker monetary transmission during the past year is explained by the heightened sensitivity of banks to the Selic changes and to the EMBI. Other coefficients on the interaction terms with δ_t are not statistically significant (as the one for non-performing loans), but the signs are as expected, providing further evidence of the increased caution of banks in their lending practices.

14. Public banks compete with private banks in some credit segments, but the competition did not intensify recently. Coefficient results on the variable lending growth by public banks, *dlnpublic*, displayed in Columns I-IV in Table A.5. indicate that when lending to individuals, public banks' lending moves in tandem with private banks' lending, suggesting differences regarding lending products or type of borrower. However, there seems to be competition between private and public banks when lending to corporates (Columns V-VIII). The interaction of *dlnpublic* with δ_t is negative but not statistically significant, thus, providing no strong evidence of increased competition in the recent period in the sense of targeting more similar customers or offering more similar products than during the rest of the sample. Columns IX-XIII display similar results when the sample is limited by lending product.

E. Conclusions

15. The transmission of monetary policy has worked efficiently during the last monetary easing cycle. This chapter has provided evidence that though private bank lending has been weaker since end-2011 despite the substantial monetary policy cuts, the monetary transmission neither through lending rates or volumes was impaired, but rather than the sensitivity of lending to Selic changes seems to have increased.

16. The observed diminished lending appears to be related to supply and demand factors. Shifts in the demand for credit have led to a weaker lending growth. In addition, loan supply was impacted by tighter banks' profitability and level of capitalization. Banks have also exhibited an increased caution in their lending practices given their recent experience with the surge in non-performing loans and heightened market risk.

17. Public banks lending seems to have also contributed to the weaker lending by private banks. While public banks' lending have traditionally moved in tandem with private banks' lending when extending loans to individuals, there seems to be competition/substitution effect in other lending areas. Though this chapter does not find evidence that the competition has increased, to the extent that public banks' credit has expanded rapidly, public banks may have contributed to the diminished impact of monetary policy on private banks' lending.

Appendix. Tables and Figure

Table A.1.a. Descriptive Statistics

	All Sample				Sample 2012Q1-2012Q4			
	Mean	Standard Deviation	Min.	Max.	Mean	Standard Deviation	Min.	Max.
dlnx	0.03	0.41	-1.89	1.84	0.00	0.45	-1.83	1.81
Selic	10.60	1.72	7.25	13.75	8.43	1.15	7.25	10.25
Δ Selic	-0.26	0.94	-2.33	1.33	-1.02	0.42	-1.58	-0.42
confidence	85.9	28.6	47.4	126.4	88.6	32.6	55.1	126.4
Δ confidence	0.3	4.0	-13.2	8.8	0.5	3.4	-5.1	7.1
expectations	85.2	23.7	53.1	116.7	86.4	25.9	59.4	116.7
Δ expectations	0.0	3.9	-13.6	9.3	0.8	3.5	-3.2	8.3
Serasa	104.9	10.6	87.0	129.7	109.6	11.9	88.7	125.7
Δ Serasa	0.7	7.0	-15.1	18.1	-0.7	6.9	-15.1	8.3
Reserve requirements	29.3	5.6	20.2	37.1	31.8	2.5	28.6	35.4
Δ reserve requirements	0.0	2.7	-9.2	6.3	-2.1	0.4	-2.7	-1.7
Capital to RWA	16.4	3.6	12.0	29.8	15.9	3.2	12.4	29.8
Δ Capital to RWA	-0.1	1.8	-9.4	15.7	-0.1	1.1	-3.5	5.8
Liquidity to assets	21.0	8.5	6.0	44.7	21.5	8.4	6.0	44.7
Δ Liquidity to assets	0.0	3.6	-15.8	15.7	0.3	3.0	-6.9	13.5
Liquidity to SR liabilities	84.4	50.1	26.4	264.0	88.5	49.8	27.3	248.6
Δ Liquidity to SR liabilities	1.9	26.0	-97.1	141.1	-1.1	23.7	-75.8	86.1
embi	229.4	72.7	151.0	455.3	184.7	23.6	151.0	213.3
Δ embi	-3.8	55.1	-107.3	189.7	-18.5	19.4	-36.7	14.3
vix	24.7	8.6	14.5	51.7	18.0	0.8	17.4	19.4
Δ vix	-0.1	8.2	-14.5	24.1	-2.3	4.1	-9.3	1.6
bovespa	59,070	8,334	37,203	69,849	59,571	2,678	57,628	64,265
Δ bovespa	765	6,707	-18,068	10,056	472	4,949	-6,138	7,874
hhserv	19.8	1.7	17.7	22.7	22.5	0.4	21.8	22.7
Δ hhserv	0.2	0.5	-0.9	1.5	-0.2	0.4	-0.9	0.1
npl	3.9	3.5	0.0	15.0	4.2	3.4	0.0	12.9
Δ npl	0.0	1.2	-8.2	9.5	0.1	1.3	-7.0	9.0
roa	2.2	2.8	-12.8	13.2	1.0	2.6	-9.0	6.5
Δ roa	-0.1	1.0	-11.0	10.1	-0.2	0.6	-2.9	1.4
dlnpublic	0.06	0.25	-0.62	0.64	0.14	0.22	-0.12	0.50
δ_t	0.2	0.4	0.0	1.0	1.0	0.0	1.0	1.0

	Sample of Lending to Individuals				Sample of Lending to Corporates			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
dlnx	0.03	0.46	-1.89	1.84	0.03	0.37	-1.47	1.57
confidence	114.6	7.4	96.2	126.4	58.8	5.0	47.4	67.8
Δ confidence	0.6	4.5	-13.2	7.6	0.0	3.5	-5.6	8.8
expectations	109.0	5.2	94.1	116.7	62.7	4.3	53.1	71.1
Δ expectations	0.1	4.6	-13.6	9.3	-0.1	3.1	-8.2	6.0
Serasa	109.7	12.4	87.0	129.7	100.2	5.7	88.7	112.2
Δ Serasa	1.8	7.1	-11.7	18.1	-0.3	6.6	-15.1	8.9
npl	5.9	3.7	0.0	15.0	2.0	1.7	0.0	10.2
Δ npl	0.0	1.6	-8.2	9.5	0.0	0.8	-7.8	3.5
dlnpublic	0.08	0.17	-0.27	0.42	0.05	0.31	-0.62	0.64

Sources: Fund staff calculations

Table A.1.b. Definition of Variables	
$dlnx_{ijt}$	First-difference of the log of real new credit concessions. New credit concessions are deflated by CPI.
$Selic_t$	Brazil Central Bank monetary policy rate (average for period t)
$confidence_{it}$	Consumer or business confidence index
$expectations_{it}$	Consumer or business expectations index
$Serasa_{it}$	Serasa index for credit demand (2008 = 100)
Reserve requirements$_t$	Total reserve requirements of deposit financial institutions to total deposits of financial institutions
Capital to RWA$_{jt}$	Regulatory capital to risk-weighted assets
Liquidity to assets$_{jt}$	Total liquidity to total assets
Liquidity to SR liabilities$_{jt}$	Total liquidity to short-term liabilities
$embi_t$	EMBI Brazil
vix_t	VIX
$bovespa_t$	Bovespa Stockprice index (average)
$hhserv_t$	Household debt as percentage of disposable income
npl_{ijt}	Non-performing loans to total loans
roa_{jt}	Return on assets
$dlnpublic_{it}$	First difference of the log of real new credit concessions by public banks. New credit concessions by public banks are deflated by CPI.
δ_t	Dummy taking the value of 1 during 2012Q1–2012Q4
Source: The Brazil Central Bank provided a dataset containing time series information on new credit concessions, non-performing loans, loans, total regulatory capital, risk-weighted assets, total assets, liquid assets, short-term liabilities, and ROA for each of the private banks included in the sample. The dataset also included information on new credit concessions by public banks. The rest of the sources are Haver and Serasa Experian Brazil.	

Figure. Description of the Variables

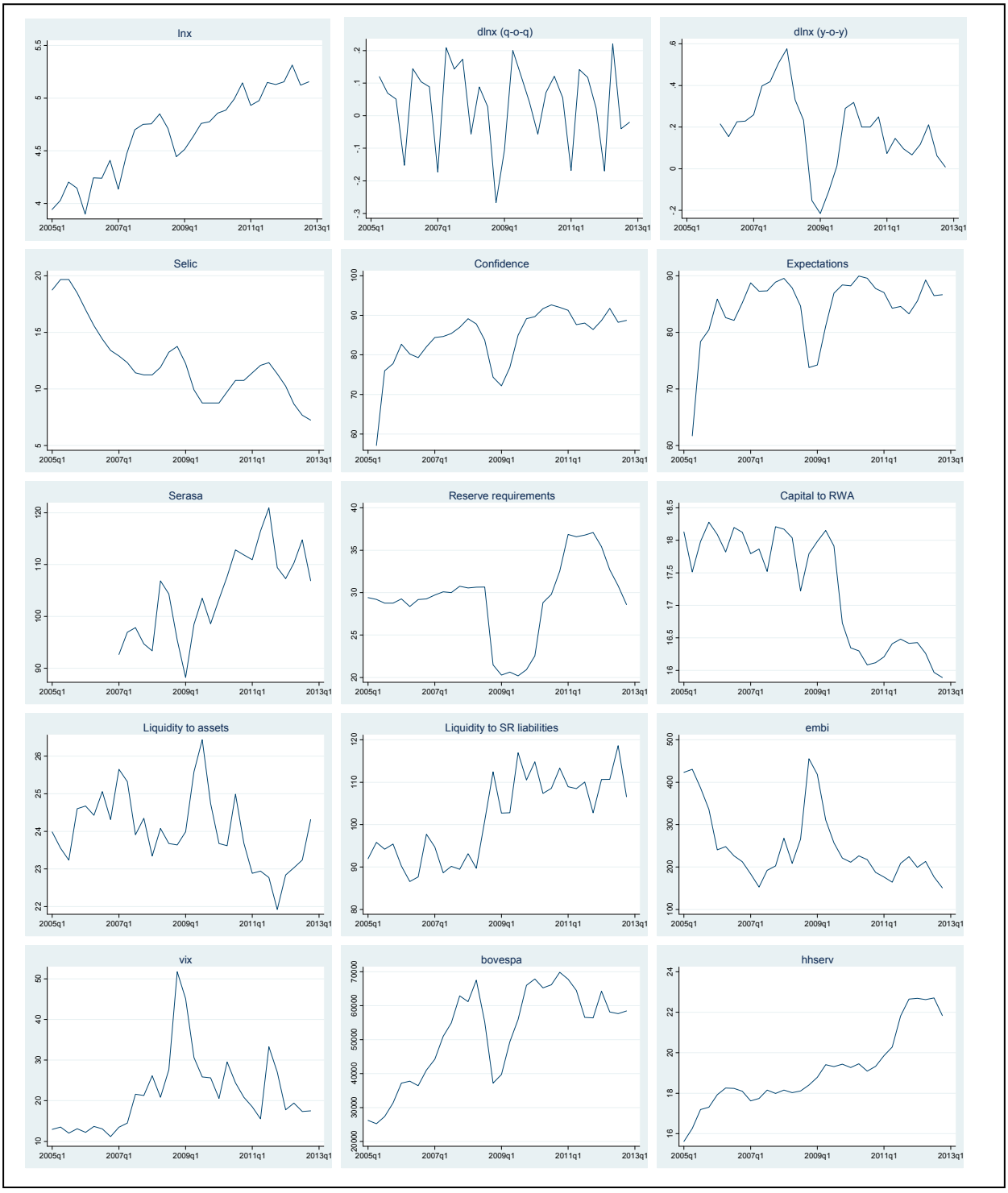
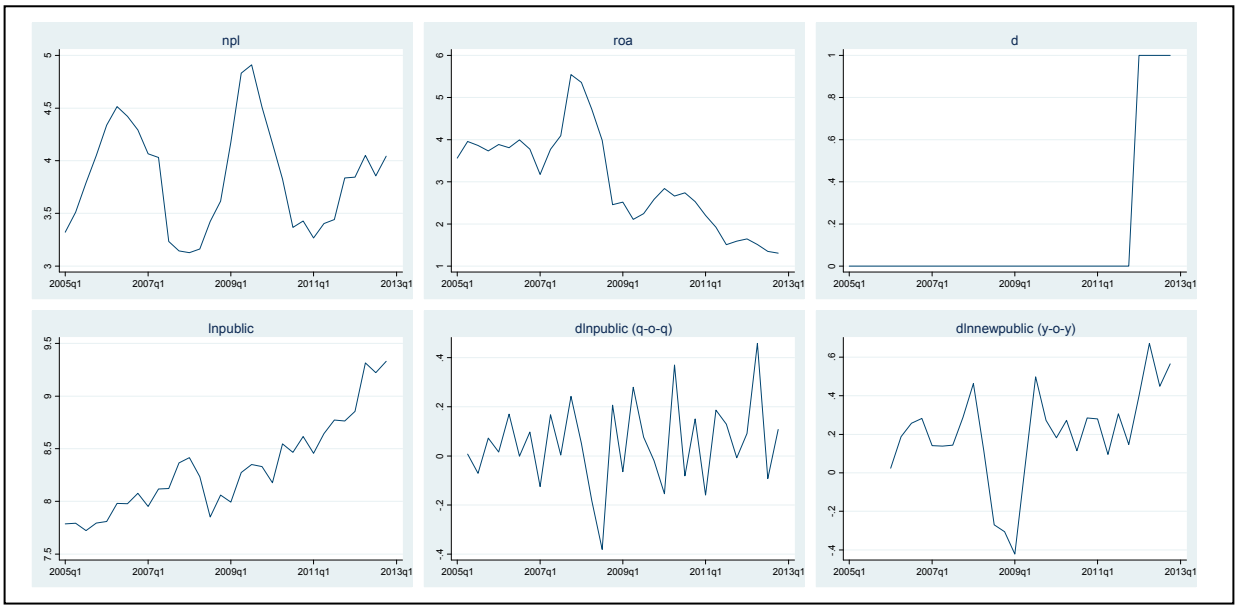


Figure. Description of the Variables (continued)



Sources: Fund staff calculations.

Table A.2. Monetary Transmission and Changes During the 2012 Easing Cycle (Dependent Variable: *dlnx*)

Sample	All				Individuals		Corporates	
	(I)	*(II)*	*(III)*	*(IV)*	*(V)*	*(VI)*	*(VII)*	*(VIII)*
$dlnx_{t-1}$	-0.18	-0.18	-0.18	-0.18	-0.13	-0.13	-0.24	-0.24
	(8.16)***	(8.15)***	(8.07)***	(8.17)***	(4.23)***	(4.17)***	(7.60)***	(7.57)***
ΔSelic	-0.02	-0.02	-0.02	-0.02	-0.05	-0.04	-0.00	0.00
	(2.20)**	(1.96)*	(1.82)*	(2.19)**	(2.79)***	(2.64)***	(0.20)	(0.21)
δ_t	-0.09		-0.22	-0.12	-0.05	-0.12	-0.13	-0.35
	(3.00)***		(3.11)***	(2.98)***	(1.19)	(1.11)	(3.21)***	(3.50)***
$\delta_t \cdot \Delta Selic$		0.05	-0.13			-0.06		-0.21
		(1.86)*	(2.04)**			(0.68)		(2.36)**
δ_t *· Foreign bank dummy*				0.06				
				(1.10)				
Constant	0.05	0.05	0.05	0.05	0.04	0.04	0.06	0.07
	(4.49)***	(4.15)***	(4.59)***	(4.48)***	(2.33)**	(2.35)**	(4.14)***	(4.27)***
R^2	0.04	0.04	0.04	0.04	0.03	0.03	0.07	0.07
Observations	1,985	1,985	1,985	1,985	1,008	1,008	977	977

* p<0.1; ** p<0.05; *** p<0.01

Sources: Fund staff estimates.

Table A.3. Impact of Selected Factors on Lending Growth (Dependent Variable: *dlnx*)

a. All Sample: Controls for Demand for Credit

	(I)	(II)	(III)
$dlnx_{t-1}$	-0.20	-0.19	-0.18
	(8.80)***	(8.59)***	(7.38)***
ΔSelic	0.01	0.01	-0.02
	(0.49)	(0.62)	(1.78)*
Δconfidence	0.01		
	(5.44)***		
Δexpectations		0.01	
		(4.42)***	
ΔSerasa			0.01
			(6.80)***
Constant	0.04	0.05	0.04
	(4.07)***	(4.31)***	(3.12)***
R2	0.05	0.05	0.07
Observations	1,953	1,953	1,535

Source: Fund staff estimates

.

Table A.3. Impact of Selected Factors on Lending Growth (Dependent Variable: dlnx) (continued)

	b. All Sample: Controls for Bank's Lending Capacity and Perception for Credit Risk									
	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)	(XIII)
$dlnx_{t-1}$	-0.19	-0.19	-0.18	-0.13	-0.20	-0.19	-0.18	-0.18	-0.17	-0.20
	(8.37)***	(8.46)***	(8.12)***	(4.22)***	(8.22)***	(8.56)***	(8.27)***	(7.83)***	(6.90)***	(7.93)***
ΔSelic	-0.02	-0.01	-0.03	-0.04	-0.02	-0.02	-0.03	-0.02	-0.02	-0.01
	(2.06)**	(0.48)	(2.59)***	(2.56)**	(2.26)**	(1.40)	(2.74)***	(1.79)*	(1.72)*	(0.90)
embi	-0.00									
	(5.14)***									
vix		-0.01								
		(5.17)***								
bovespa			0.00							
			(2.80)***							
Δhhserv				0.00						
				(0.12)						
Δnpl					-0.05					
					(5.87)***					
Δroa						0.03				
						(3.84)***				
ΔReserve requirements							0.02			
							(5.99)***			
Capital to RWA_{t-1}								0.01		
								(2.51)**		
Liquidity to $assets_{t-1}$									0.01	
									(2.74)***	
Liquidity to $SRliabilities_{t-1}$										-0.00
										(0.56)
Constant	0.20	0.17	-0.10	0.03	0.04	0.05	0.04	-0.11	-0.08	0.06
	(6.12)***	(6.28)***	(1.95)*	(1.93)*	(3.77)***	(4.39)***	(3.35)***	(1.81)*	(1.77)*	(1.94)*
R2	0.05	0.05	0.04	0.03	0.06	0.05	0.05	0.04	0.03	0.04
N	1,985	1,985	1,985	1,008	1,655	1,952	1,985	1,779	1,698	1,504

Sources: Fund staff estimates.

Table A.3. Impact of Selected Factors on Lending Growth (Dependent Variable: *dlnx*) (concluded)

c. All Controls for Demand and Supply for Credit										
Sample	All				Individuals			Corporates		
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
$dlnx_{t-1}$	-0.24	-0.25	-0.25	-0.24	-0.21	-0.22	-0.21	-0.30	-0.30	-0.30
	(8.31)***	(8.42)***	(8.41)***	(8.35)***	(5.16)***	(5.23)***	(5.13)***	(7.20)***	(7.28)***	(7.26)***
$\Delta Selic$	-0.04	-0.06	-0.05	-0.06	-0.06	-0.09	-0.08	-0.01	-0.03	-0.03
	(2.78)***	(4.17)***	(3.64)***	(3.85)***	(2.99)***	(3.90)***	(3.59)***	(0.72)	(1.86)*	(1.68)*
ΔSerasa	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00
	(3.11)***	(2.38)**	(3.02)***	(1.81)*	(2.42)**	(2.12)**	(1.85)*	(1.61)	(0.86)	(0.34)
embi	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(5.25)***	(6.32)***	(5.78)***	(6.51)***	(4.19)***	(4.91)***	(5.06)***	(2.89)***	(3.76)***	(3.90)***
Δnpl	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.06	-0.06	-0.06
	(3.57)***	(3.51)***	(3.57)***	(3.45)***	(2.28)**	(2.29)**	(2.27)**	(3.04)***	(2.95)***	(2.85)***
Δroa	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
	(1.92)*	(1.56)	(1.66)*	(1.61)	(0.95)	(0.61)	(0.64)	(1.72)*	(1.52)	(1.56)
Capital to RWA_{t-1}	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
	(2.68)***	(2.26)**	(2.41)**	(2.27)**	(2.10)**	(1.80)*	(1.79)*	(1.85)*	(1.56)	(1.58)
Liquidity to $assets_{t-1}$	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	0.00
	(0.71)	(0.48)	(0.55)	(0.51)	(0.03)	(0.13)	(0.10)	(0.86)	(0.69)	(0.70)
δ_t		-0.14		-0.26		-0.16	-0.32		-0.13	-0.24
		(3.64)***		(3.14)***		(2.66)***	(2.53)**		(2.64)***	(2.15)**
$\delta_t \cdot \Delta Selic$			0.08	-0.12			-0.16			-0.11
			(2.49)**	(1.68)*			(1.46)			(1.13)
Constant	0.01	0.14	0.08	0.15	0.04	0.18	0.20	-0.04	0.08	0.09
	(0.07)	(1.36)	(0.80)	(1.48)	(0.22)	(1.10)	(1.20)	(0.36)	(0.63)	(0.70)
R^2	0.13	0.14	0.13	0.14	0.14	0.15	0.15	0.14	0.15	0.15
N	1,052	1,052	1,052	1,052	510	510	510	542	542	542

* p<0.1; ** p<0.05; *** p<0.01

Source: Fund staff estimates.

Table A.4. Testing for Changes in the Sensitivity of Lending Growth to Factors

	Dependent variable: *dlnx*							
All sample	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
$dlnx_{t-1}$	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24
	(8.35)***	(8.26)***	(8.36)***	(8.34)***	(8.36)***	(8.35)***	(8.35)***	(8.23)***
ΔSelic	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
	(3.85)***	(3.84)***	(3.85)***	(3.89)***	(3.86)***	(3.85)***	(3.86)***	(3.88)***
ΔSerasa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(1.81)*	(1.96)*	(1.59)	(1.85)*	(1.82)*	(1.81)*	(1.80)*	(2.01)**
embi	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(6.51)***	(6.37)***	(6.54)***	(6.41)***	(6.53)***	(6.51)***	(6.54)***	(6.24)***
Δnpl	-0.03	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04	-0.04
	(3.45)***	(3.47)***	(3.47)***	(3.53)***	(3.42)***	(3.46)***	(3.48)***	(3.61)***
Δroa	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	(1.61)	(1.58)	(1.63)	(1.60)	(1.45)	(1.62)	(1.59)	(1.36)
Capital to RWA_{t-1}	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(2.27)**	(2.25)**	(2.32)**	(2.28)**	(2.28)**	(2.24)**	(2.29)**	(2.31)**
Liquidity to $assets_{t-1}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.51)	(0.53)	(0.42)	(0.44)	(0.49)	(0.51)	(0.29)	(0.18)
δ_t	-0.26	-0.30	0.68	-0.26	-0.26	-0.23	-0.32	0.89
	(3.14)***	(3.13)***	(1.20)	(3.06)***	(3.11)***	(1.36)	(2.70)***	(1.43)
$\delta_t \cdot$ *ΔSelic*	-0.12	-0.15	-0.53	-0.12	-0.13	-0.12	-0.13	-0.70
	(1.68)*	(1.83)*	(2.10)**	(1.57)	(1.71)*	(1.69)*	(1.72)*	(2.46)**
$\delta_t \cdot$ *ΔSerasa*		-0.00						-0.01
		(0.74)						(1.39)
$\delta_t \cdot$ embi			-0.01					-0.01
			(1.68)*					(2.02)**
$\delta_t \cdot$ *Δnpl*				0.02				0.03
				(1.02)				(1.12)
$\delta_t \cdot$ *Δroa*					0.03			0.04
					(0.61)			(0.69)
$\delta_t \cdot$ *Capital to* RWA_{t-1}						-0.00		-0.00
						(0.20)		(0.21)
$\delta_t \cdot$ *Liquidity to* $assets_{t-1}$							0.00	0.00
							(0.67)	(0.42)
Constant	0.15	0.14	0.15	0.15	0.15	0.15	0.16	0.15
	(1.48)	(1.43)	(1.50)	(1.47)	(1.49)	(1.41)	(1.57)	(1.39)
R^2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15
N	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052

* p<0.1; ** p<0.05; *** p<0.01

Source: Fund staff estimates.

Table A.5. Impact of Public Banks' Lending

a. Dependent variable: *dlnx*

Sample	Individuals				Corporates			
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
$dlnx_{t-1}$	-0.24	-0.25	-0.24	-0.24	-0.30	-0.30	-0.30	-0.29
	(5.68)***	(5.80)***	(5.70)***	(5.68)***	(7.20)***	(7.19)***	(7.18)***	(7.00)***
ΔSelic	-0.03	-0.06	-0.06	-0.05	-0.02	-0.04	-0.04	-0.04
	(1.22)	(2.21)**	(2.11)**	(2.09)**	(0.92)	(2.05)**	(1.89)*	(1.88)*
ΔSerasa	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(1.99)**	(1.56)	(1.58)	(1.49)	(1.83)*	(1.08)	(0.57)	(1.27)
embi	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(4.05)***	(4.80)***	(4.82)***	(4.83)***	(3.29)***	(4.12)***	(4.23)***	(3.99)***
Δnpl	-0.03	-0.03	-0.03	-0.03	-0.06	-0.05	-0.05	-0.05
	(2.19)**	(2.19)**	(2.20)**	(2.23)**	(2.81)***	(2.71)***	(2.63)***	(2.68)***
Δroa	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	(0.89)	(0.49)	(0.48)	(0.47)	(1.84)*	(1.63)	(1.67)*	(1.61)
Capital to RWA_{t-1}	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(2.02)**	(1.67)*	(1.65)*	(1.65)*	(1.93)*	(1.62)	(1.64)	(1.73)*
Liquidity to $assets_{t-1}$	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.20)	(0.18)	(0.21)	(0.91)	(0.74)	(0.75)	(0.62)
$dlnpublic_{t-1}$	0.36	0.40	0.40	0.41	-0.13	-0.12	-0.12	-0.14
	(2.71)***	(2.62)***	(2.60)***	(2.63)***	(2.57)**	(2.42)**	(2.40)**	(2.63)***
$\delta_t \cdot dlnpublic_{t-1}$		-0.02	-0.12	-0.28		-0.03	-0.01	-0.29
		(0.08)	(0.42)	(0.59)		(0.17)	(0.07)	(1.56)
δ_t		-0.17	-0.25	0.36		-0.13	-0.23	2.23
		(2.52)**	(1.88)*	(0.25)		(2.47)**	(1.98)**	(2.47)**
$\delta_t \cdot \Delta Selic$			-0.09	-0.41			-0.10	-1.07
			(0.69)	(0.54)			(0.99)	(2.91)***
$\delta_t \cdot$ embi				-0.00				-0.02
				(0.42)				(2.75)***
Constant	0.03	0.19	0.19	0.19	-0.02	0.09	0.10	0.09
	(0.17)	(1.14)	(1.15)	(1.17)	(0.22)	(0.77)	(0.84)	(0.73)
R^2	0.15	0.17	0.17	0.17	0.15	0.16	0.16	0.17
N	510	510	510	510	542	542	542	542

* p<0.1; ** p<0.05; *** p<0.01

Source: Fund staff estimates.

Table A.5. Impact of Public Banks' Lending (continued)

a. Dependent variable: *dlnx*

Sample	Individual consumption	Individual personal loan	Working capital	Goods
	(IX)	(X)	(XI)	(XII)
$dlnx_{t-1}$	-0.21	-0.01	-0.28	-0.27
	(4.37)***	(0.25)	(6.41)***	(6.50)***
ΔSelic	-0.05	-0.09	-0.04	-0.01
	(1.27)	(3.24)***	(1.69)*	(0.26)
ΔSerasa	0.00	0.00	0.00	0.02
	(0.58)	(1.25)	(0.84)	(4.13)***
embi	-0.00	-0.00	-0.00	-0.00
	(1.28)	(2.27)**	(2.50)**	(3.38)***
Δnpl	-0.00	-0.01	-0.03	-0.03
	(0.08)	(0.68)	(1.17)	(1.17)
Δroa	0.03	0.01	0.00	-0.00
	(0.60)	(0.48)	(0.22)	(0.01)
Capital to RWA_{t-1}	0.01	0.01	-0.00	0.02
	(1.48)	(1.76)*	(0.12)	(2.52)**
Liquidity to $assets_{t-1}$	-0.01	0.00	0.00	0.01
	(0.97)	(1.12)	(0.63)	(1.38)
$dlnpublic_{t-1}$	0.52	-0.09	-0.15	-0.11
	(2.46)**	(0.54)	(2.38)**	(1.59)
$\delta_t \cdot dlnpublic_{t-1}$	-0.54	-0.22	-0.21	-0.37
	(0.83)	(0.44)	(0.96)	(1.50)
δ_t	1.34	-1.36	3.26	2.65
	(0.67)	(0.90)	(3.05)***	(2.21)**
$\delta_t \cdot$ *ΔSelic*	-0.73	0.33	-1.30	-1.04
	(0.70)	(0.42)	(2.99)***	(2.12)**
$\delta_t \cdot$ embi	-0.01	0.01	-0.02	-0.02
	(0.74)	(0.75)	(3.14)***	(2.20)**
Constant	0.05	-0.13	0.18	-0.17
	(0.23)	(0.75)	(1.21)	(0.98)
R^2	0.10	0.09	0.12	0.16
N	398	376	534	522

* p<0.1; ** p<0.05; *** p<0.01

Source: Fund staff estimates.

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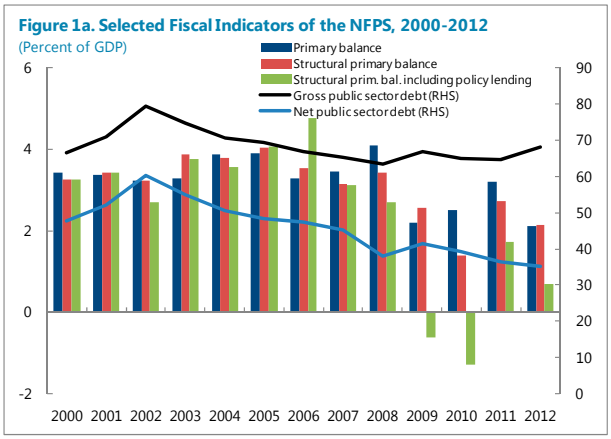
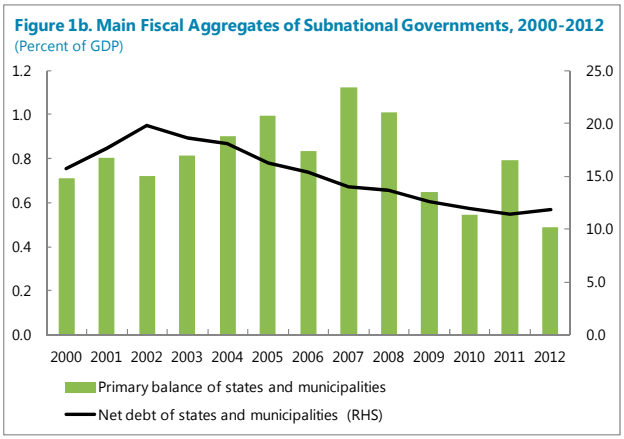
PUBLIC DEBT DYNAMICS UNDER BRAZIL'S FISCAL FRAMEWORK[1]

Brazil has successfully reduced its gross public debt ratio over the last decade under the framework in the Fiscal Responsibility Law, but this process has been interrupted in recent years. Going forward, placing public debt firmly back on a downward path would entail, given Brazil's key macroeconomic variables, returning to a fiscal primary surplus similar to those achieved in the past. In this context, removing budget rigidities will be key to increase savings and reduce the burden of adjustment on investment.

A. Brazil Public Finances Since 2000

1. Brazil's fiscal framework has been instrumental to place public debt on a downward path. The debt renegotiation contracts signed between the Federal and sub-national governments in 1997–1999 and the adoption of the Fiscal Responsibility Law (FRL) in 2000 were critical to reverse the increase in government debt witnessed through the 1980s and 1990s. Before the global crisis, Brazil's gross government debt had fallen from its peak of 79½ percent of GDP in 2002 to 63½ percent, still relatively elevated compared to other emerging market countries.





Source: Central Bank of Brazil, Ministry of Finance and Fund staff estimates.

2. The reduction in government debt was due significantly to a consistently high primary fiscal surpluses since 2000, which have fallen in recent years reversing the declining path in public debt. The primary balance of the non financial public sector (NFPS) remained above 3 percent of GDP since 1999, with an average of 3.5 percent, to which sub-national governments

[1] Prepared by Joana Pereira (FAD).

contributed with surpluses close to 1 percent of GDP through 2000–2008.[2] Since 2008, the NFPS primary surplus has fallen and, together with a substantial expansion of credit to public financial institutions, has contributed to a halt in the decline of gross debt.[3] In this period interest rates on gross debt declined but not enough to compensate for the reduction in GDP growth.

3. Budget rigidities have contributed to reduce public savings and to make public investment procyclical. Budget rigidities are relatively large in Brazil, with extensive earmarking of revenues stipulated by the 1988 Constitution and subsequent agreements, and large mandatory spending.[4] The average earmarking share of federal revenues is estimated to be between 75 and 80 percent (Alier and Costa (2005), OECD (2011)), while mandatory primary spending at the federal level (a large proportion of which is covered by earmarked revenues) stands at about 75 percent of the total[5] (IMF (2012)). Some of the mandatory spending financed by earmarked revenues is larger than the latter (including social security benefits relative to contributions). Together, budget rigidities affect close to 90 percent of total spending, contributing to low public savings (given that the increase in earmarked expenditures during cyclical upswings are often difficult to reduce during downturns) and to public investment taking the burden of adjustment through the cycle.

Figure 2a. Primary Revenue and Expenditure of the NFPS, 2000-2012
(Percent of GDP)

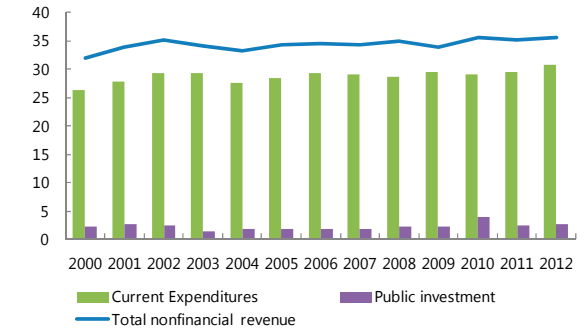
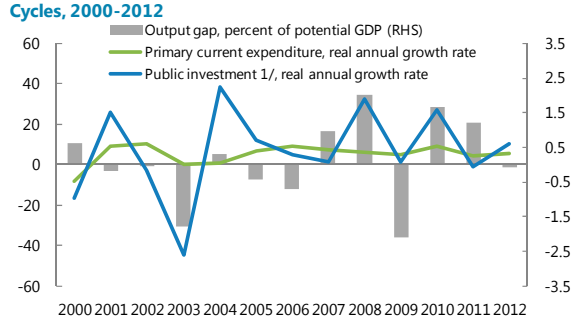


Figure 2b. Sensitivity of Real Expenditure Growth to Economic Cycles, 2000-2012



1/ Includes capitalization of Petrobras in 2010 and inclusion of the *Minha Casa Minha Vida* home subsidy program in 2012.

Source: Central Bank of Brazil, Ministry of Finance and Fund staff estimates.

[2] Public enterprises had small but positive surpluses in all but last year. Petrobras and Eletrobras are excluded from NFPS accounts.

[3] See Box 7 in the Staff Report for the 2013 Article IV Consultation.

[4] Constitutionally mandated spending includes social security benefits, public wages, public debt services and, at the central government level, revenue-sharing with sub-national governments. In addition, selected expenditure programs are designated as mandatory under the Budget Guidance Law, protecting them from financial programming decrees.

[5] Mandatory primary spending is likely larger at the sub-national level, as transfers from the federal government were designed to match constitutionally devolved expenditure mandates, given insufficient own resources.

B. The Primary Surplus Target and Debt Dynamics

4. How do different primary surplus targets affect the likelihood that gross public debt will continue on a downward trend? The FRL requires the adoption of yearly fiscal targets for all levels of government. A primary surplus for the NFPS of 3.1 percent of GDP has been targeted in recent years, with the use of adjustors (pre-authorized discretionary allowances to reduce the target) to protect priority investment and, starting in 2013, tax stimuli. The maintenance of primary surpluses above 3 percent of GDP has been instrumental to place the debt ratio on a downward path. A debate has emerged recently on the appropriate primary surplus objective going forward, particularly as interest rates are considered to have fallen on a permanent basis. In this paper, we consider the implications for gross public debt dynamics of different fiscal primary targets.[6] In this context, consideration is given to the impact of quasi fiscal operations such as policy lending, which contribute to the accumulation of gross debt.

5. What are the implications of different targets for spending composition over the cycle? In tandem with the debt dynamics analysis, we study the implications of different primary surplus targets for public savings and the space to pursue public investment priorities. In particular, we focus on the correlation of the discretionary spending, especially investment, with the business cycle, comparing it with the different targets.

Methodology

6. To answer these questions, we use a methodology traditionally applied to stochastic debt sustainability analysis. As in Celasun, Debrun and Ostry (2006), we use historical data for Brazil to estimate a joint probability distribution for the macroeconomic variables that are relevant for the analysis. These include both domestic and foreign variables, specifically: the output gap, real interest rates (domestic and foreign), the real effective exchange rate and commodity prices. Using the estimated joint distribution and the latest available data, we generate a series of possible macroeconomic scenarios and associated paths for government revenue, expenditures, public savings and debt.[7] Details on the methodological approach, including a discussion of its advantages and shortcomings, are provided in the Appendix. Other assumptions include:

[6] The focus on gross debt is IMF standard practice and allows for better comparability with other countries. The GFSM2001 concept of gross debt of the NFPS is used. It includes treasury bills held by the central bank, which are excluded in the authorities' definition of gross debt.

[7] Steady state assumptions include a constant share of foreign currency denominated debt (at 5 percent of total), potential growth at 3½ percent and inflation at the mid-point target of 4.5 percent. The tax revenue elasticity to the output gap is set at 1.2, in line with estimates in Medas and Lemgruber (2008). We abstract from the effect of commodity price cycles on revenue, as the direct windfall from commodities is less than ½ percent of GDP.

- *Budget rigidities are assumed to remain in place through the forecast horizon.* The implication of the budget rigidities discussed above is that the growth of current spending is largely predetermined (and has little sensitivity to the output gap), with a large share of current primary spending, notably social security and public wages, unaffected by cyclical fluctuations. For simulation purposes, we adopt the simplifying assumption that that the current expenditure ratio to potential GDP remains constant over time.[8] Although in practice budget rigidities would (and have in the past) implied a medium run increase of this ratio, our symmetric assumption is that the tax burden is also fixed in steady state.[9] From a debt dynamics perspective, these assumptions are equivalent to letting the long term revenue ratio adjust to the budget pressure implied by budget rigidities (as observed in the past).

- *Our analysis also abstracts from the effect that different types of expenditure have on economic activity and from exogenous determinants of fiscal policy.* Although the adjustment variable to meet the primary surplus target (current spending, public investment or different kinds of taxes) matters for growth in subsequent periods, the present analysis does not endogenize this effect. It also doesn't consider possible shocks to fiscal policy which are unrelated to the macro variables considered above (for example, one-off changes to spending and taxes).

Results

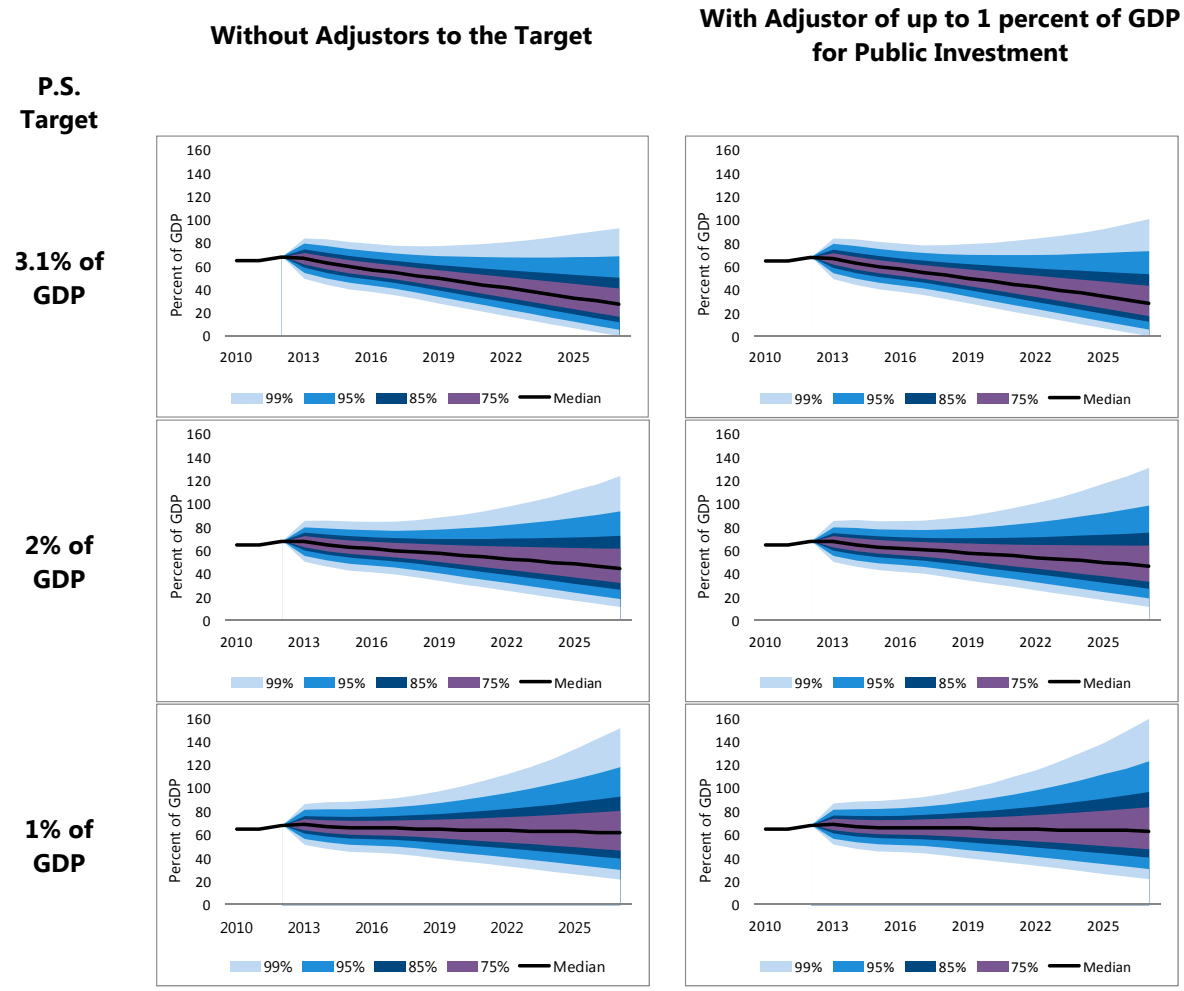
7. Stochastic simulations suggest that the primary surplus target of 3.1 percent of GDP is appropriate to reduce public debt with a high level of certainty. Figure 3 shows the probability distribution for the debt path under different primary surplus targets. Under a primary surplus target of 3.1 percent of GDP, public debt either remains constant or declines through the forecast horizon in over 90 percent of the simulated macroeconomic scenarios, with the expected value of gross debt at the end of the period projected at 31 percent of GDP (in line with the average for G-20 emerging market economies in 2012).[10] Lower primary balances would reduce the probability of a debt decline. The expected debt ratio at the end of the forecast horizon would be 50 percent of GDP for a target of 2 percent of GDP (with debt declining in 75 percent of the cases) and 66 percent of GDP for a target of 1 percent of GDP (with debt declining in 50 percent of the cases).

[8] About 60 percent of discretionary spendings relate to priority programs for the government, such as the home subsidy program *Minha Casa Minha Vida*. The remaining share is considered to be 'adjustable' for our analytical purposes and basically corresponds to the capital spending ratio.

[9] The NFPS revenue ratio is about 34 percent of GDP, a relatively high value among emerging markets.

[10] The average is calculated by attaching equal probability to each macro scenario simulated.

Figure 3. Public Debt Dynamics Under Different Primary Surplus Targets

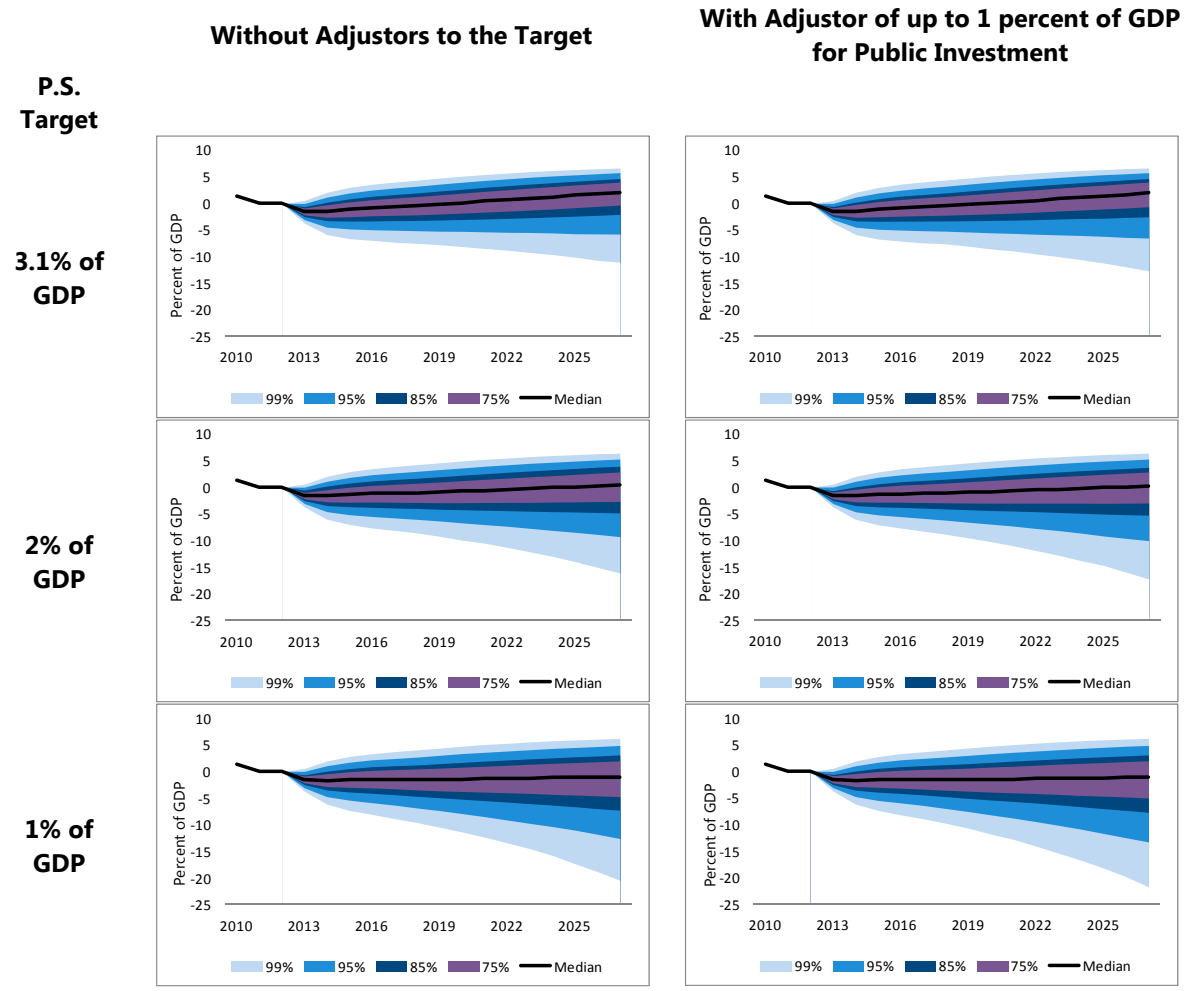


Source: Fund staff estimates.

8. Public savings would also be likely to increase under the 3.1 percent of GDP target.[11] By the end of the forecast horizon, public savings would be expected to increase to 1¼ percent of GDP under the 3.1 percent target (Figure 4). Alternatively, under a 2 percent primary target, public savings would be projected to fall to -0.5 percent of GDP at the end of forecast horizon. In parallel, the overall balance would be more likely to approach zero under the 3.1 percent primary surplus target, with a probability of about 50 percent (Figure 5).

[11] In principle, public savings for a given primary balance is set by the determinants of interest payments and the public investment share. Because our assumptions hold that the latter fully adjusts to meet the target in each macro scenario, differences in public investment do not affect the distribution of public savings in our simulations. Instead, the differences in Figure 4 are closely tied to the drivers of debt dynamics.

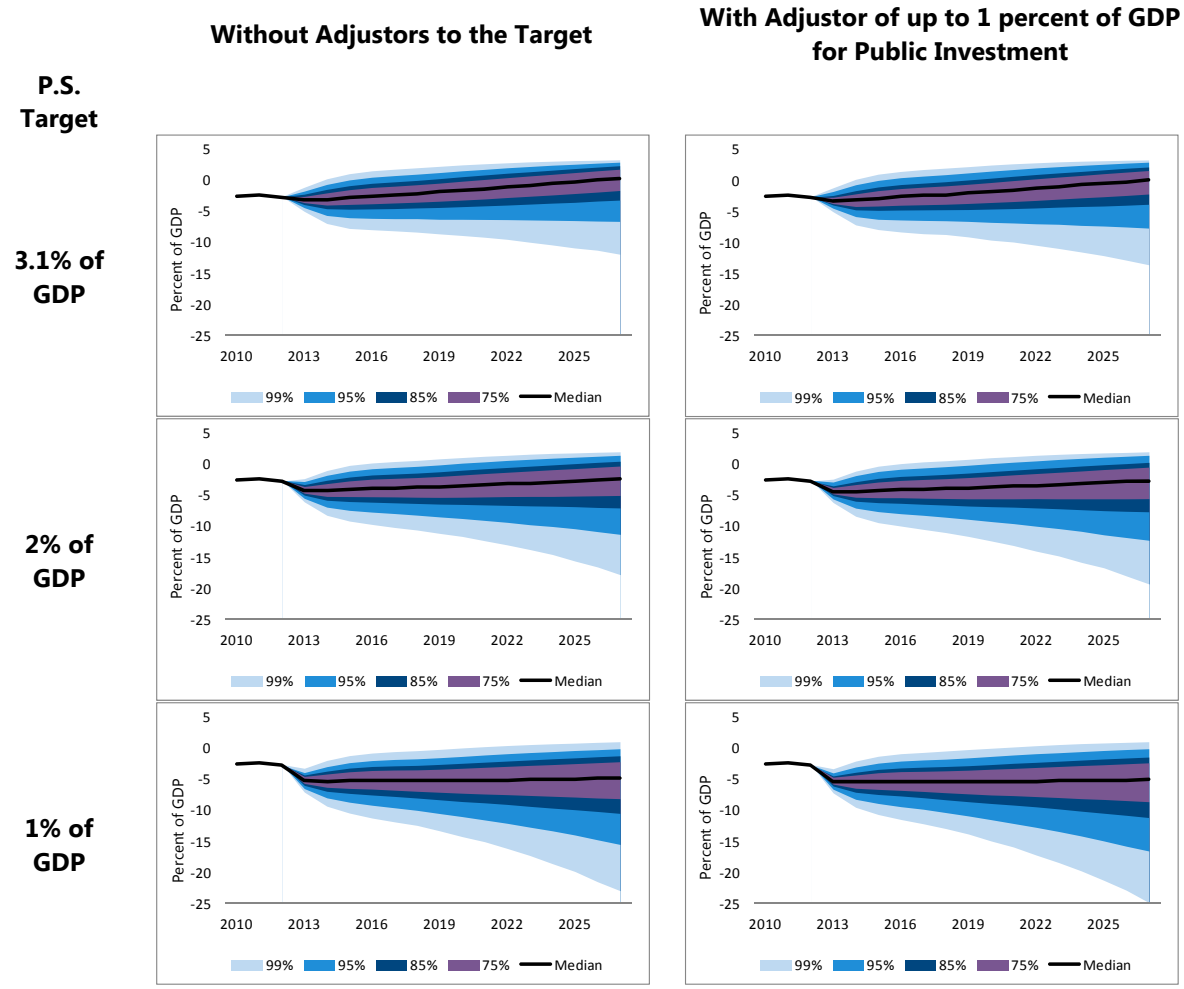
Figure 4. Public Savings Distribution Under Different Primary Surplus Targets[1]



Source: Fund staff estimates.

1/ Public savings is defined as overall balance minus investment.

Figure 5. Overall Balance Distribution Under Different Primary Surplus Targets



Source: Fund staff estimates.

9. Amid high budget rigidities, a lower primary target during cyclical downturns would not prevent that public investment remains highly procyclical. The very high correlation between capital spending and the cycle (see text table) is linked to budget rigidities and not significantly affected by the primary surplus target in our exercise. However, the use of investment adjustors (of up to 1 percent of GDP in our simulations) helps mitigate this effect somewhat, with a cost of a higher expected debt ratio of about 2 percent of GDP.

Statistical Properties of Public Investment

	Variance	Covariance with the Output Gap
PS Targets without adjustors		
3.1 percent of GDP	0.43	0.90
2 percent of GDP	0.45	0.92
1 percent of GDP	0.45	0.92
PS Targets with adjustor of 1 percent of GDP for Investment		
3.1 percent of GDP	0.30	0.74
2 percent of GDP	0.30	0.74
1 percent of GDP	0.30	0.74

Source: Fund staff estimates.

10. Sustained policy lending would require a higher primary surplus target to keep debt on a downward path.[12] As a debt creating flow, policy lending has a similar impact on gross debt dynamics as the primary balance. For example, if the 3.1 percent of GDP primary surplus target is maintained but net policy lending remains at the post crisis average of 2.1 percent of GDP, debt dynamics would be very similar to that of the last row in Figure 3 (primary target of 1 percent of GDP). Thus, a primary surplus target including policy lending remains the relevant assessment variable for debt dynamics.

C. Enhancing the Fiscal Framework

11. Reducing budget rigidities would improve expenditure management and reduce investment procyclicality. Minimizing budget rigidities would reduce significantly the correlation of capital spending with the business cycle. If current spending equivalent to one percent of GDP could be freely adjusted to meet the primary surplus target of 3.1 percent of GDP (without the use of adjustors), the covariance of public investment with the output gap would fall to 0.5 from 0.9, without a significant effect on public savings. Options to achieve such flexibility include addressing pension entitlements, revisiting the minimum wage rule, curbing increases in public wages, and limiting both earmarking and the inclusion of priority programs under the Budget Guidance Law (Bornhorst and Medas (2010), IMF (2012)).

Impact of Reducing Expenditure Rigidities by 1 percent of GDP on Selected Fiscal Variables

	Variance of Public Investment	Covariance of P. Investment with the Output Gap	Expected Debt Ratio, End of Forecast	Expected Public Savings Ratio, End of Forecast
Target = 3.1 percent of GDP (no adjustor)	0.43	0.90	30.8	1.3
Target = 3.1 percent of GDP (no adjustor), 1 percent lower budget rigidities	0.09	0.33	32.9	1.5

Source: Fund staff estimates.

D. Concluding Remarks

12. The expansionary fiscal policy in recent years interrupted the decade-long decline in gross public debt. Revisions to the primary surplus target and/or associated adjustors, recurrent use of exceptional financing, and large off-budget fiscal operations in recent years have increased gross public debt and contributed to weaken the credibility of the fiscal framework.

[12] For simplification, the analysis ignores the positive impact that policy lending has on the implicit interest rate, and therefore on the debt service dynamics. Like for other spending, the multiplier effect of on-lending is also not taken into account, but it is arguably small when there is crowding out of private bank credit.

13. Sustaining a primary surplus target similar to those in the past would be key to ensure a declining debt ratio over the medium term with a high level of certainty. Brazil's relatively high gross public debt ratio increases the potential vulnerability to shocks, encumbers the budget, and contributes to a high tax burden. Maintaining the primary surplus target at 3.1 percent of GDP, in the absence of policy lending, increases significantly the likelihood that public debt would be on a downward path; sustaining high policy lending would reduce this probability.

14. Reducing budget rigidities would be key to successfully increase public savings and investment. A medium term orientation for the budget would help strengthen the current framework, protecting public investment and other policy priorities by ensuring continuity. A key obstacle to such reform is the presence of earmarking and other spending rigidities, which render the majority of budget mandatory. Addressing those rigidities would help bolster public savings and investment in the medium term.

Appendix. Methodology

In this appendix we briefly describe the empirical method employed in Section B of the paper.

To derive the stochastic paths for fiscal variables of interest, we follow two distinct steps. First, an unrestricted VAR model is estimated using quarterly data from 1999 to 2012 on the output gap (from the WEO database), real interest rates (based on the SELIC and IPCA), real effective exchange rate (from the INS database), the U.S. Fed-funds rate, and commodity prices (CRB index). The last two variables are entered as exogenous in the system, and the VAR includes 2 lags. The order of the endogenous variables in the VAR is immaterial to the purpose of our study, as the only information we extract from this regression is the associated variance-covariance matrix of disturbances. In particular, this matrix characterizes the joint statistical properties of the contemporaneous macroeconomic shocks which ultimately affect fiscal balances. As a second step, we consider the rules imposed by each specific fiscal framework. Using the variance-covariance matrix estimated in step one we generate a large set of possible macro scenarios, and, making use of the steady state assumptions and framework rules, calculate the associated frequency distributions of budgetary aggregates.

By deriving the joint distribution of macroeconomic shocks based on historical relationships, this method assesses public debt dynamics in a more realistic fashion than a simple consideration of a baseline scenario and/or stylized departures from such baseline. A caveat, however, is that it assumes that the historical relationships stay broadly constant over the forecast horizon. Furthermore, it does not allow for any feedback from changes in fiscal policy (as imposed by the fiscal rules) to the endogenous variables in the VAR.

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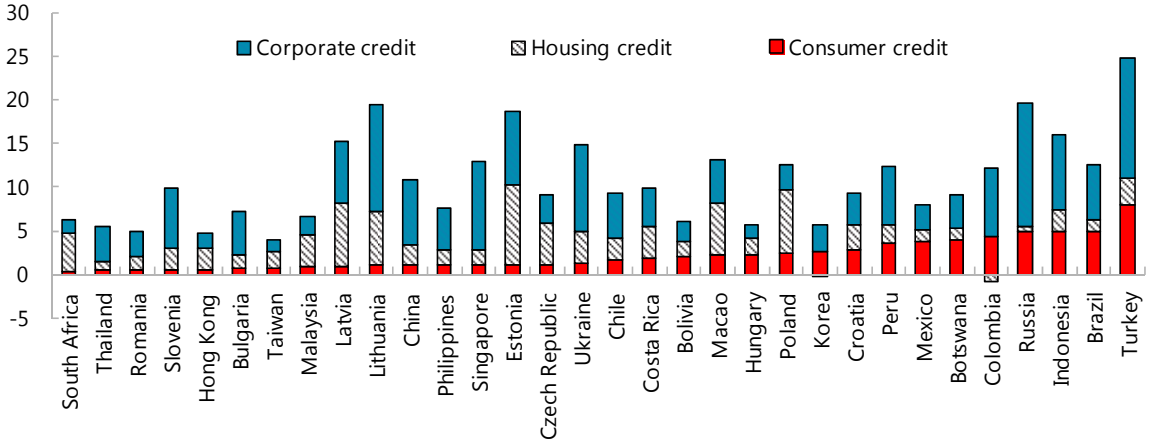
CREDIT IN BRAZIL: CONTRIBUTION TO GROWTH IN RECENT YEARS[1]

This chapter explores the contribution of credit growth and the composition of credit portfolio (corporate, consumer, and housing credit) to economic growth in Brazil and other emerging market economies (EMEs). Using cross-country panel regressions and a Brazil-specific time series model, we find significant impact of credit growth on GDP growth, with corporate credit having the largest impact through investment.

A. Introduction

1. Credit in Brazil and other EMEs has been growing rapidly in recent years. Macroeconomic stability, financial deepening as well as growth help explain credit dynamics in emerging markets during the past decade. Brazil stands out as one of the countries in Latin America with the largest credit growth over the last decade, but in line with a broader group of EMEs.

EMEs: Contributions of Types of Credit to Total Credit Growth
(Percent; 2003–12 annual average, real terms)



Sources: Haver Analytics; dXtime database; and Fund staff calculations.

2. Countries differ in the composition of their credit portfolio, with Brazil among the countries with the largest growth in consumer credit. The composition of the credit portfolio and in particular the contribution of each type of loan—corporate, consumer and housing—to the expansion of the stock of credit has been different across emerging markets. In the case of Brazil, the expansion of consumer and corporate credit have contributed broadly equally to credit growth, while in other countries, corporate loans explain the bulk of the increase in credit.

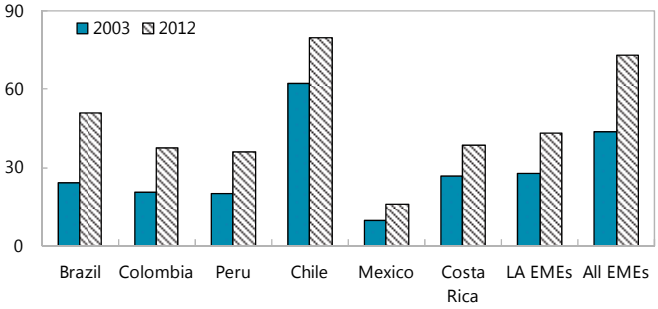
[1] Prepared by Mercedes Garcia-Escribano and Fei Han (WHD). This chapter has benefitted from comments from the Central Bank of Brazil.

3. This chapter explores the impact of bank lending and its composition on GDP growth in Brazil and other EMEs. The main questions are: What has been the impact of credit growth on GDP growth? Has the composition of credit (i.e. corporate, consumer, and housing credit) mattered for GDP growth? A different impact of consumer, corporate and housing credit on growth would help explain why financial deepening may have had a different effect on growth across countries. This chapter complements the existing literature as the analysis of the impact of the change in credit composition on output is novel, particularly a cross-country panel analysis.

B. Stylized Facts and Literature Review

4. Credit in Brazil has expanded rapidly during the past decade. Macroeconomic stability and financial inclusion on the back of real income gains and robust employment have been the key drivers of increased demand for consumer credit in Brazil. Institutional improvements and new instruments also favored the supply of credit to households, for example, fiduciary assignments on housing and auto loans and payroll deducted personal loans. As a result of a decade of strong credit growth, credit in Brazil now accounts for about 50 percent of GDP (up from 24 percent in 2002), above the average in Latin America but still below the average in other emerging markets.

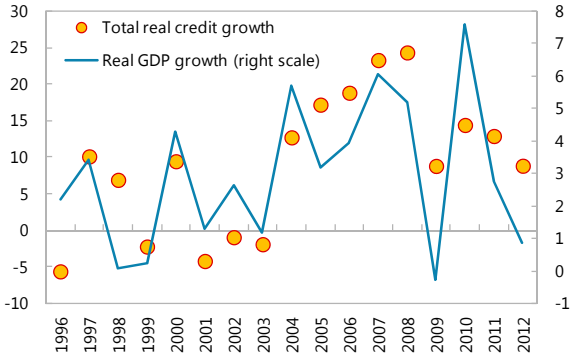
A Decade of Banking Sector Deepending: Credit-to-GDP Ratio
(Percent)



Sources: Haver Analytics; dXtime database; and Fund staff calculations.

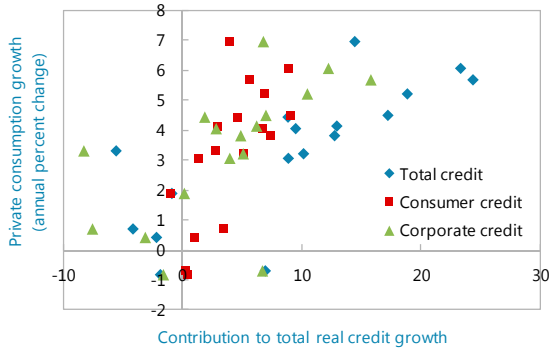
5. During periods of strong credit expansion in Brazil, output also grew rapidly. Real GDP growth averaged nearly 2 percent during the period 1996–2003, while credit expanded at an average of 1.5 percent in real terms. During 2004–08, average GDP growth rose to 4.8 percent and credit accelerated to average annual real rates of 19 percent. Since 2010, real GDP growth and credit moderated to 3¾ percent and 12 percent, respectively. Data for all emerging markets also shows a close relationship between credit and GDP growth.

Brazil: Real GDP and Credit Growth
(Annual percent change)



Sources: Central Bank of Brazil; Haver Analytics; and Fund staff calculations.

Brazil: Credit and Private Consumption Growth
(1996-2012)



Sources: Central Bank of Brazil; Haver Analytics; and Fund staff calculations.

6. Research on the impact of credit composition on output growth has been limited. Most literature focuses on the effects of credit supply shocks on GDP growth by using different instruments to solve the endogeneity problem between credit growth and GDP growth, and finds significantly positive impact.[2] Little research has been done on the effects of credit composition on growth. Beck et al (2012) found that corporate credit (but not household credit) has significantly positive impact on GDP per capita growth. However, the cross-section regression they used with data averaged over the sample period is unlikely to capture the dynamics of credit growth.

C. Data and Econometric Methodology

7. Our sample is an unbalanced quarterly panel comprising 31 EMEs including (9 Asian and 22 non-Asian economies) for the period 2002–12.[3] In our analysis, we make a distinction between Asian and non-Asian EMEs because credit growth in Asian EMEs exhibited a different behavior from that observed in the other EMEs after the global financial crisis, as found in most literature.[4]

8. Cross-country panel two-stage least squares (2SLS) regressions are used to assess the effects of corporate, consumer, and housing credit on real GDP growth.[5] In particular, the dependent variable we choose is either consumption contribution or investment contribution to GDP growth in order to capture the channels through which credit impacts GDP. The specification we use is:

$$C_{it} = \alpha_0 + \alpha_1 Credit_{it}^{Corporate} + \alpha_2 Credit_{it}^{Consumer} + \alpha_3 Credit_{it}^{Housing} + \alpha_4 X_{it} + \alpha_5 Z_t + \varepsilon_{it}$$

where i and t refer to country and time, respectively. C_{it} is the contribution of private consumption or private investment to GDP growth.[6] X_{it} is domestic control variables including short-term interest rate, real effective exchange rate, corporate issuances of bonds, equities and loans (in percent of GDP) as a proxy for nonbanking sources of financing, and government consumption growth. Zt denotes global controls including OECD real GDP growth, LIBOR, and VIX. $Credit_{it}$ is the

[2] See, for instance, Rondorf (2012), Bassett *et al* (2010), Driscoll (2004), and Peek *et al* (2003).

[3] The time dimension varies depending on countries. For a detailed description of the variables and a list of countries, see Appendix I. For Brazil, credit includes both earmarked and non-earmarked loans.

[4] For instance, Guo and Stepanyan (2011) found that credit growth in most Asian EMEs, unlike in other EMEs, did not decline after the crisis, and even accelerated in some countries.

[5] All the national account and credit variables considered in this chapter are expressed in real terms.

[6] The contribution of private consumption to GDP growth (in the following denoted as consumption contribution to GDP growth) is calculated as *(private consumption$_t$ – private consumption$_{t-1}$)/GDP$_{t-1}$*, all in real terms. The contribution of private investment to GDP growth (denoted as investment contribution to GDP growth) is calculated in a similar way.

contribution of different types of credit to total credit growth.[7] The coefficients of interest are α_1, α_2, and α_3.To deal with the endogeneity of credit variables, we use two-stage least squares, where lagged values of the credit variables and global variables are used as instruments.

9. A Brazil-specific VAR model with exogenous variables (VARX) is also constructed to better focus on the effects of credit composition on GDP growth in Brazil.[8]

$$Y_t^{Brazil} = A(L)Y_t^{Brazil} + B_1 X_t^{Brazil} + B_2 Z_t + \epsilon_t^{Brazil}$$

where Y denotes endogenous variables including corporate, consumer and housing contributions to credit growth, and growth of consumption, investment, and GDP. X and Z are the domestic and global controls as in the cross-country panel regressions.[9] Cholesky decomposition is used to identify six structural shocks, namely, shocks to corporate, consumer, and housing credit, and other shocks to consumption, investment, and GDP growth. The order of credit variables does not affect our results.

D. Results

10. Cross-country panel 2SLS regressions suggest that the composition of credit does matter for GDP growth in non-Asian EMEs. There is evidence that consumer credit has a significantly positive effect on the consumption but not investment contribution to GDP growth, and corporate credit has a significantly positive effect on the investment but not consumption contribution to GDP growth. The main results are summarized in the table below. Detailed results are shown in Tables A1–A2 in Appendix II. The fact that credit growth in most Asian EMEs behaved countercyclically after the crisis might be one of the reasons why the results are different for Asian EMEs (see footnote 4).

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[7] Total credit growth can be decomposed as: $\frac{Credit_t^{Total} - Credit_{t-1}^{Total}}{Credit_{t-1}^{Total}}$

$= \frac{Credit_t^{Corporate} - Credit_{t-1}^{Corporate}}{Credit_{t-1}^{Total}} + \frac{Credit_t^{Consumer} - Credit_{t-1}^{Consumer}}{Credit_{t-1}^{Total}} + \frac{Credit_t^{Housing} - Credit_{t-1}^{Housing}}{Credit_{t-1}^{Total}}$,

where the three terms on the right-hand side refer to corporate contribution to credit growth, consumer contribution to credit growth, and housing contribution to credit growth, respectively. We favor the use of contributions of different types of credit to total credit growth rather than different types of credit growth because housing credit has been growing rapidly in some EMEs, yet the shares of housing credit in total credit in these countries are still small, particularly in Brazil.

[8] A system of equations in the VAR could also help us identify the channels through which credit shocks take effect.

[9] We also include the international commodity price as a global variable which is not included in the cross-country panel regressions because there are both commodity exporters and importers in the panel sample. These domestic and global control variables are assumed to be exogenous in the VAR.

Table. Cross-Country Panel 2SLS Regressions: Summary of Results

	All Sample			Non-Asian Sample		
Dependent Variable	Corporate credit	Consumer credit	Housing credit	Corporate credit	Consumer credit	Housing credit
Consumption contribution to GDP		√			√	
Investment contribution to GDP				√		

Note: √ indicates statistical significance at the 5% level.

11. Corporate credit has a larger impact on growth than consumer credit in non-Asian EMEs. Another implication of the panel estimates (Tables A1–A2) is that, for the average non-Asian EME, a one standard-deviation shock to corporate credit results in an increase of 0.4 percentage points in GDP growth, while a one standard-deviation shock to consumer credit only lifts growth by 0.25 percentage points.

12. The Brazil-specific VARX model suggests that both consumer and corporate credit could boost GDP growth significantly, and confirms a larger impact from the latter. The responses of Brazil's consumption, investment, and GDP growth to the three types of credit impulses are presented in Figure A1. First, consumer credit has a significant impact on consumption and GDP growth, while corporate credit has a significant impact on investment and GDP growth. Secondly, the peak impact of a consumer credit shock on consumption growth happens in the same quarter as the shock, while the peak impact of a corporate credit shock on investment growth materializes one quarter after. Last, a one standard-deviation shock to corporate credit has a larger peak impact on GDP growth than a one standard-deviation shock to consumer credit. Based on the VARX estimates, we could quantitatively assess the cumulative impact of consumer and corporate credit impulses on growth. If Brazil's corporate credit expands by one standard deviation (13 percentage points), then investment and GDP growth will increase by about 4 and 0.9 percentage points, respectively. If consumer credit expands by one standard deviation (12 percentage points), then consumption and GDP growth will increase by about 1 and 0.6 percentage points, respectively.[10]

13. Corporate credit has played a more important role for GDP growth than consumer credit. Historical decomposition of the VARX model allows us to decompose GDP growth into contributions from different sources. The main results are presented in Figure A2. Corporate and consumer credit have been playing non-negligible roles in terms of driving GDP growth, with a larger role from the former.[11] Despite a non-negligible role of corporate credit, investment has been

[10] All these numbers are annualized peak impact.

[11] The analysis also confirms that Brazil is highly subject to external shocks including commodity price shocks, global risk aversion shocks, and global demand shocks (captured by international commodity prices, VIX, and OECD real GDP growth, respectively).

mainly driven by external factors, partly reflecting low domestic savings and dependence on external financing. Consumer credit has driven consumption dynamics to some extent, including a larger contribution from housing credit since 2011.

E. Conclusions

14. Credit growth and its composition (namely, corporate, consumer, and housing credit) had significant impact on economic growth in Brazil and its emerging market peers. Our cross-country study for a panel of 22 non-Asian EMEs and time-series study for Brazil both suggest that different types of credit have different impact on GDP growth and through different channels.

15. Corporate credit appears to have a stronger effect on GDP growth through its impact on investment. Cross-country comparison of the composition of credit across EMEs suggests that credit growth in Brazil has been driven equally by the expansion of consumer and corporate credit, while in most EMEs, corporate credit has been the main driver of credit growth. The composition of credit growth has important implications for output dynamics. In particular, our cross-country and time-series analyses find a more important role of corporate credit in driving investment and GDP growth than consumer credit.

Appendix I. Data

The sample includes 31 emerging market economies (EMEs) for the period Q1 2002–Q4 2012, namely, Brazil, Bolivia, Botswana, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Estonia, Hong Kong, Hungary, Indonesia, Latvia, Lithuania, Macao, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Singapore, Slovenia, South Africa, South Korea, Taiwan, Thailand, Turkey, and Ukraine. Time span varies depending on the countries with shorter data available for bank lending to the private sector, particularly the composition of bank lending.

Variables are defined as follows:

Short-term interest rate is the policy rate in most countries as long as it is available. For countries where no policy rate is available, we use deposit rates. The data come from Haver analytics.

Real effective exchange rate is based on consumer price index and taken from the Information Notification System (INS) of the IMF.

Corporate issuances of bonds, equities and loans are defined in percent of GDP, and are taken from the Dealogic database.

Government consumption is taken from Haver analytics.

OECD real GDP (a measure of global demand), international commodity prices, and LIBOR (a measure of global liquidity) are obtained from the IMF's International Financial Statistics (IFS) database.

The Chicago Board Options Exchange Market Volatility Index (VIX), a measure of global risk aversion, is taken from Bloomberg database.

Credit variables comprise different types of bank lending to the private sector obtained from countries' central banks, Haver analytics, and dXtime database.

Appendix II. Tables and Figures

Table A1. Cross-Country Panel 2SLS Regression: Consumption Contribution to GDP Growth

Variable	(1) All Sample	(2) Non-Asian Sample
$Constant$	-0.06	0.13
	(-0.50)	(0.75)
$Corporate\ credit$	0.01	0.04*
	(0.71)	(2.06)
$Consumer\ credit$	0.05	0.03
	(1.59)	(0.96)
$Housing\ credit$	0.01	-0.03
	(0.42)	(-1.07)
$Interest\ rate$	0.33*	0.53*
	(2.32)	(2.43)
$REER$	-0.04	-0.13*
	(-1.83)	(-2.21)
$Government\ consumption$	0.02	-0.00
	(1.27)	(-0.19)
$Issuances\ of\ bonds, equities, and\ loans$	0.00	0.00
	(1.59)	(0.97)
$OECD\ GDP\ growth$	0.15**	0.20**
	(7.22)	(7.19)
$Libor$	-0.32**	-0.52**
	(-3.36)	(-2.80)
VIX	-0.01	-0.02*
	(-1.76)	(-2.47)

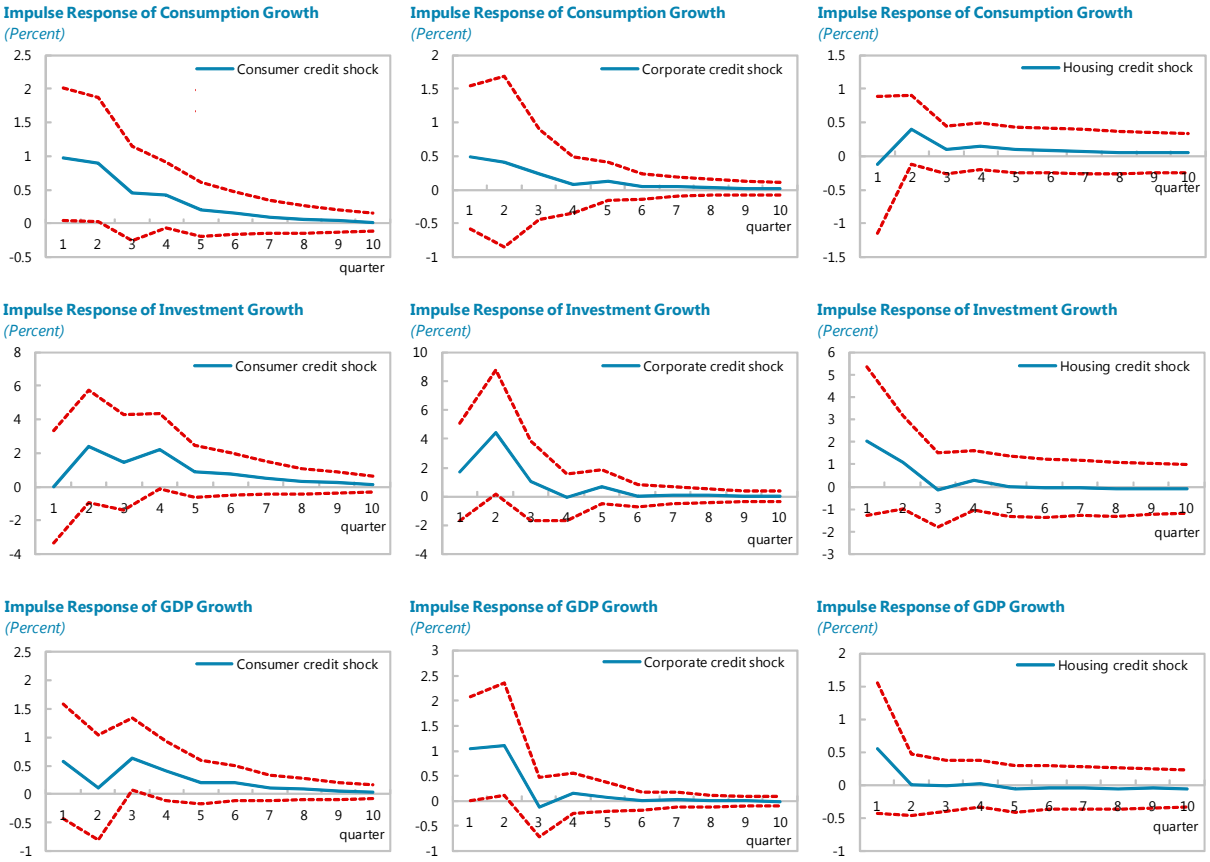
Note: The dependent variable is the *investment contribution to GDP growth*. *Corporate/ consumer/housing credit* is the corresponding contribution to total credit growth. *Government consumption* is annualized quarter-on-quarter percent change. *Issuances of bonds, equities, and loans* are in percent of GDP. *Interest rate* and *Libor* are the first-order differences of short-term interest rate and the LIBOR respectively. *REER* is the log of real effective exchange rate. Lagged values of the three credit variables and the global variables are used as instruments.
Asterisks *, ** indicate statistical significance at the 5% and 1% levels, respectively.

Table A2. Cross-Country Panel 2SLS Regression: Investment Contribution to GDP Growth

Variable	(1) All Sample	(2) Non-Asian Sample
$Constant$	-0.06	0.13
	(-0.50)	(0.75)
$Corporate\ credit$	0.01	0.04*
	(0.71)	(2.06)
$Consumer\ credit$	0.05	0.03
	(1.59)	(0.96)
$Housing\ credit$	0.01	-0.03
	(0.42)	(-1.07)
$Interest\ rate$	0.33*	0.53*
	(2.32)	(2.43)
$REER$	-0.04	-0.13*
	(-1.83)	(-2.21)
$Government\ consumption$	0.02	-0.00
	(1.27)	(-0.19)
$Issuances\ of\ bonds, equities, and\ loans$	0.00	0.00
	(1.59)	(0.97)
$OECD\ GDP\ growth$	0.15**	0.20**
	(7.22)	(7.19)
$Libor$	-0.32**	-0.52**
	(-3.36)	(-2.80)
VIX	-0.01	-0.02*
	(-1.76)	(-2.47)

Note: The dependent variable is the *investment contribution to GDP growth*. *Corporate/ consumer/housing credit* is the corresponding contribution to total credit growth. *Government consumption* is annualized quarter-on-quarter percent change. *Issuances of bonds, equities, and loans* are in percent of GDP. *Interest rate* and *Libor* are the first-order differences of short-term interest rate and the LIBOR respectively. *REER* is the log of real effective exchange rate. Lagged values of the three credit variables and the global variables are used as instruments. Asterisks *, ** indicate statistical significance at the 5% and 1% levels, respectively.

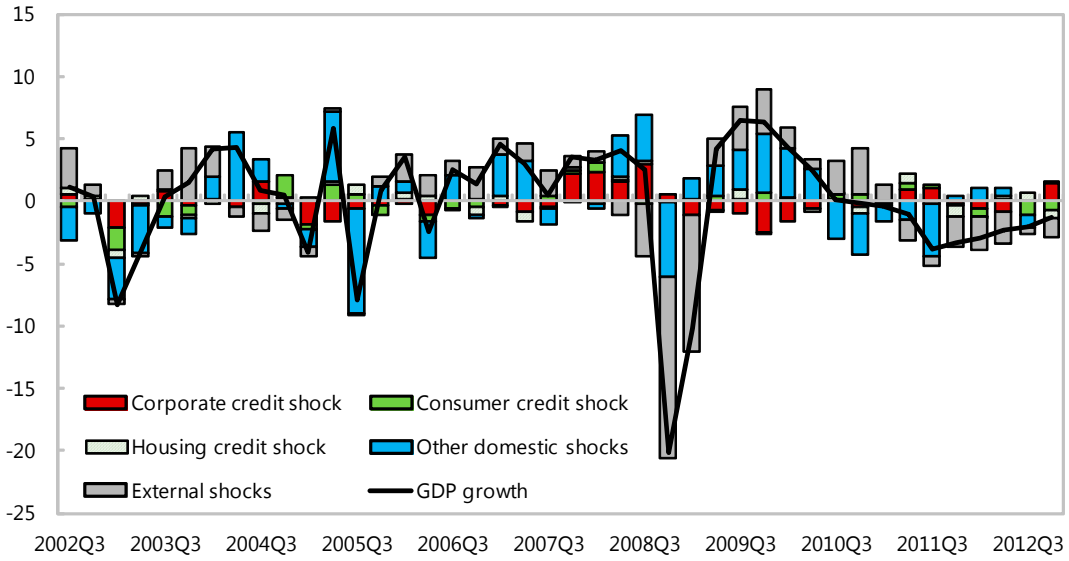
Figure A1. Brazil-Specific VARX: Impulse Responses to One Standard-Deviation Shocks



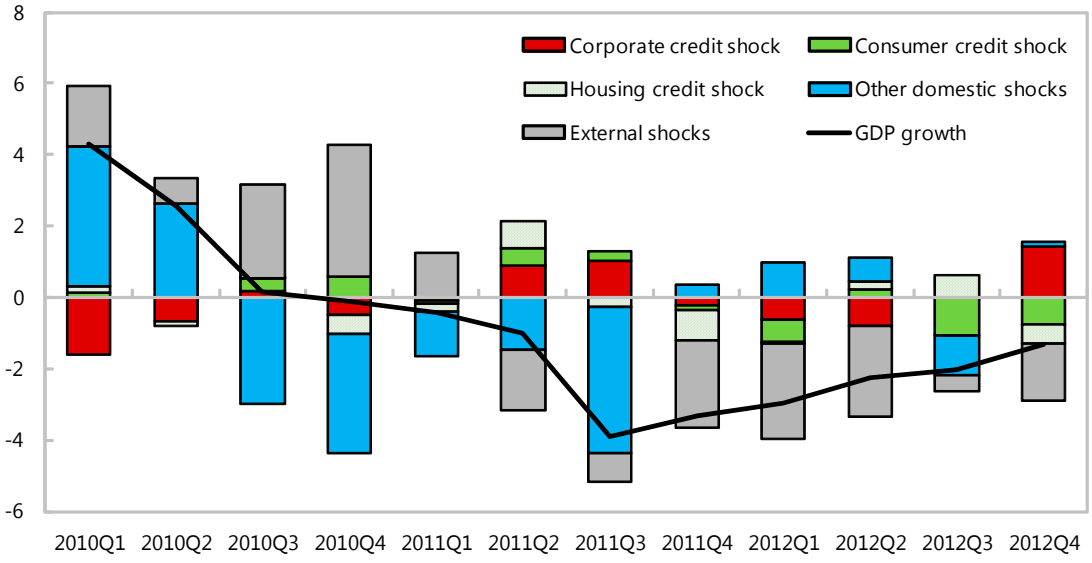
Sources: Haver Analytics; dXtime databse; Dealogic database; Bloomberg database; INS and IFS databases of the IMF; and Fund staff estimations.

Figure A2. Brazil-Specific VARX: Historical Decomposition

Historical Decomposition of Brazil's Real GDP Growth (2002–12)
(Deviation from mean; annualized quarter-on-quarter percent change)



Historical Decomposition of Brazil's Real GDP Growth (2010–12)
(Deviation from mean; annualized quarter-on-quarter percent change)



Sources: Haver Analytics; dXtime databse; Dealogic database; Bloomberg database; INS and IFS databases of the IMF; and Fund staff estimations.

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UNDERSTANDING HOUSING MARKETS IN BRAZIL: MARK II[1,2]

Since the global financial crisis, feedback loops appear to have strengthened between real estate loans and house prices in Brazil. There are significant risk mitigants, but a correction in house prices, although not systemic, could have adverse effects for some banks and households. The authorities should continue to closely monitor both housing and real estate loan market developments. In addition, policy measures, such as explicit limits on LTV and DTI ratios, and a change in the saving deposits allocation rule, will help to contain potential systemic risk preemptively.

A. Motivation and Questions

1. Since the global financial crisis, Brazil has been experiencing a rapid expansion of real estate loans and housing prices. During 2009–12, real estate loans have increased substantially at 35–55 percent per annum, and real estate loan-to-GDP ratio tripled from 2.3 to 6.9 percent. Housing prices,[3] though recently moderating, increased about 20 percent over the twelve months in 2012, and prices in Sao Paulo and Rio de Janeiro have been growing by 25 percent per annum during 2009–12.[4]

[1] Prepared by Heedon Kang (MCM).

[2] As a part of the 2011 Brazil Article IV consultation, a selected issue paper described the institutional framework governing housing loans, discussed developments of housing credit and prices, and pointed out data shortcomings and some policy implications. This paper focuses on the feedback loop between housing loans and prices, factors behind the relationship, and policy recommendations to promote a healthy development of housing markets in Brazil. For the institutional framework, see the previous selected issue paper (IMF, 2011a, "Taking Stock of Housing Finance in Brazil" (Washington: International Monetary Fund)).

[3] There are currently two house price indices available in Brazil: one is an index published by the Fundação Instituto de Pesquisas Econômicas of the University of Sao Paulo (FIPE–Zap Index), which is constructed with sales announcements data received by the Zap portal, a website dedicated to host advertisements of property sales and rentals. Its monthly index covers seven largest metropolitan areas in Brazil since August 2010, while the time coverage is a bit longer for Sao Paulo and Rio de Janeiro (since January 2008) and Belo Horizonte (since April 2009); and the other is a new index (IVG-R) that the Central Bank of Brazil (BCB) recently announced, using collateral appraisal values from new real estate loan contracts. It calculates a median sales price from all transactions that took place in geographical clusters distributed over eleven large metropolitan regions, computes a weighted average index based on the number of households, and then identifies the long-term trend through an HP filter. Unfortunately, the BCB only publishes a national index at this moment, and thus the former index is used in this paper to discuss about regional house price developments in detail.

[4] With the BCB index, Brazil's national house price increased 12 percent over the twelve months in 2012. In February 2013, the appreciation rate slowed down to 9 percent per annum, 4 percentage points lower than one with the FIPE–Zap index (13 percent). Readers need to bear in mind that the FIPE–Zap index may exaggerate house price booms.

2. The objective of the paper is to analyze systemic risk in housing markets, to learn from international real estate boom-bust experiences, and to consider preemptive policy options to contain a potential build-up of risks. Four questions are addressed:

- How strong is the two-way feedback loop between house prices and real estate loans in Brazil?
- Are there distortions exacerbating the feedback loop in housing markets?
- What do international experiences tell us about consequences of the feedback loop?
- Which policy measures could help limit risks and enhance efficiency in real estate markets?

B. House Prices and Real Estate Loans

3. Brazil's house prices rose substantially over the last few years, especially in two major cities (Figure 1). The national FIPE–Zap index has increased 62 percent from August 2010 to April 2013. It rose 26 and 14 percent in 2011 and 2012 respectively, while construction costs did not rise in tandem.[5] The prices for Sao Paulo and Rio de Janeiro have almost tripled since January 2009, and grew by 30 and 15 percent in 2011 and 2012. Brazil was one of two countries that showed the highest real house price appreciation in 2011 among 52 advanced and emerging market economies.[6]

4. Real estate loans have continued to grow fast. At end-2012, the outstanding balance of the loans reached R$300 billion and corresponded to 6.9 percent of GDP, increasing by 4.6 percentage points (R$230 billion) since end-2008. Public banks, especially Caixa Econômica Federal (Caixa), have played a major role in real estate loan markets, providing more than 70 percent of the total real estate loans. Private banks also started to participate actively in the markets, accelerating their real estate loan growth by about 35 percent in 2012, while they retrenched in other types of loans (Figure 2).

5. The rapid growth of mortgages has been funded by two earmarked sources: savings accounts (Sistema Brasileiro de Poupança e Empréstimo, SBPE) and workers' severance fund (Fundo de Garantia por Tempo de Serviço, FGTS).[7, 8] The National Monetary Council establishes

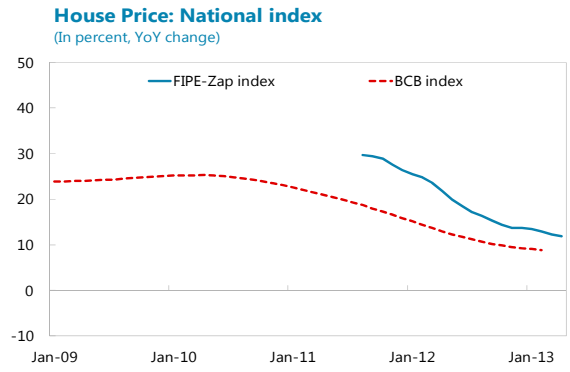
[5] The national index of building costs, reported by the Getúlio Vargas Foundation (FGV), increased 7 percent in both 2011 and 2012.

[6] House price indices are collected from the OECD and Global Property Guide and deflated by each country's CPI index before calculating real house price growth rates.

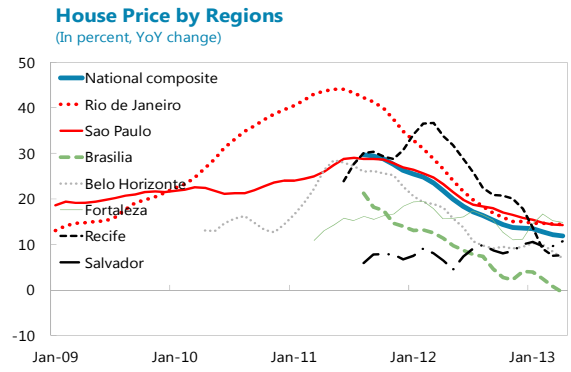
[7] The savings accounts are saving instruments used by the majority of population with various incentives, such as income tax exemption, free deposit and withdrawal, and a guarantee by the government. The accounts earned fixed interests of 0.5 percent per month (6.17 percent per annum), but the government eliminated the floor in April 2012. Under the new rule, if the Selic dropped to 8.5 percent of less, the accounts would pay savers at 70 percent of the Selic plus a reference rate (TR).

strict rules for the use of deposits in savings accounts: 65 percent have to be allotted to real estate finance (52 percent to housing with regulated interest rates and 13 percent to real estate in general with free market rates).[9] In March 2013, funds from savings deposits account for two-thirds of total real estate loans (about R$200 billion), increasing 40 percent from end-2011, and Caixa operates about R$100 billion on behalf of the board of the FGTS, 34 percent larger than one at end-2011, to finance real estate loans for low to lower middle income households, including "Minha Casa Minha Vida (MCMV)" program (R$58 billion) (Figure 2).[10]

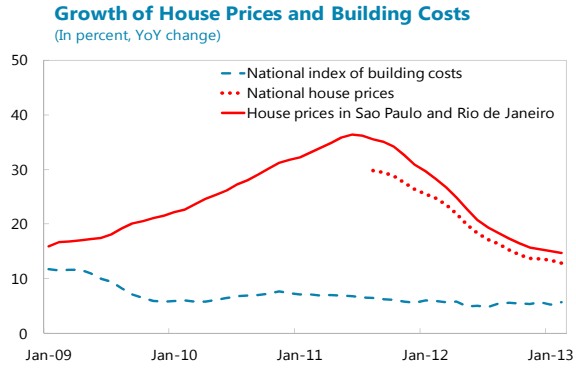
Figure 1. Brazil: House Prices



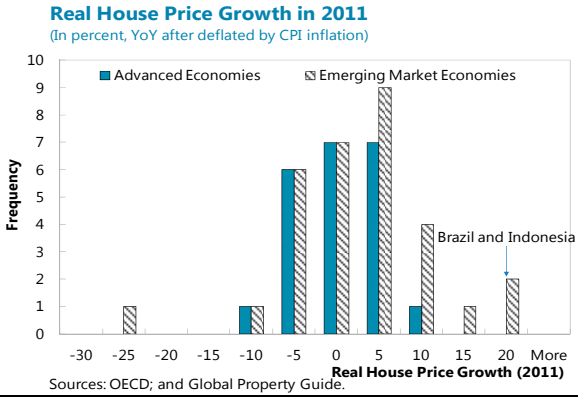
Sources: Haver Analytics; and Central Bank of Brazil.



Sources: Haver Analytics; and Fundação Instituto de Pesquisas Econômicas.



Sources: Haver analytics; and Fund staff calculation.



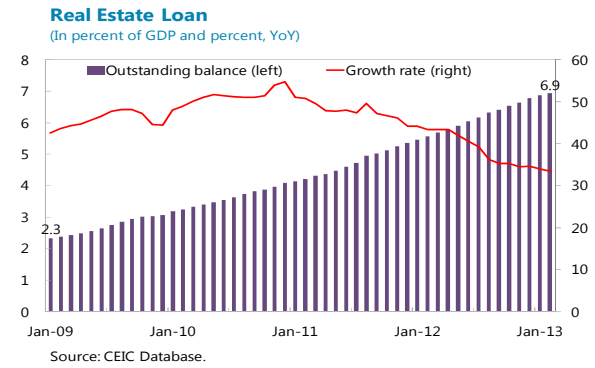
Sources: OECD; and Global Property Guide.

[8] The FGTS was created at the origin of the Housing Finance System (SFH) as an instrument of retirement policy, involving the urban infrastructure and housing and currently being operated by Caixa. Employers should collect 8 percent of monthly salary paid to each employee to a private employee's account with the FGTS. This account builds a safety net fund that can be withdrawn under special circumstances; for example, for housing acquisition, unemployment or early retirement due to health conditions.

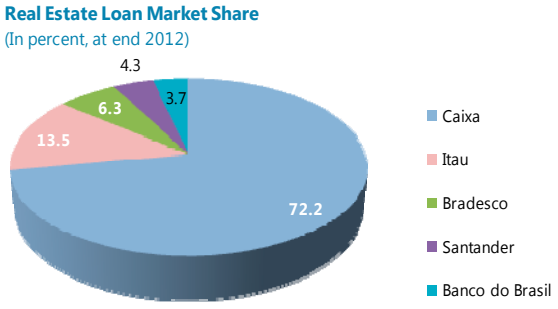
[9] The remaining 35 percent of the deposits have to be used as follows: 20 percent should be deposited as reserve requirement into the Central Bank of Brazil, yielding the same interests as banks pay to customers, and 15 percent can be used as cash reserves, loans to companies in the real estate sector, or invested in government securities and real estate related derivatives.

[10] In 2009, the government launched the MCMV program, aiming to provide real estate loans for families with income up to 10 minimum wages, and offers subsidy funded by the FGTS and the Treasury. The program has been effective in reducing the housing deficit in Brazil by delivering about 3 million units since its inception.

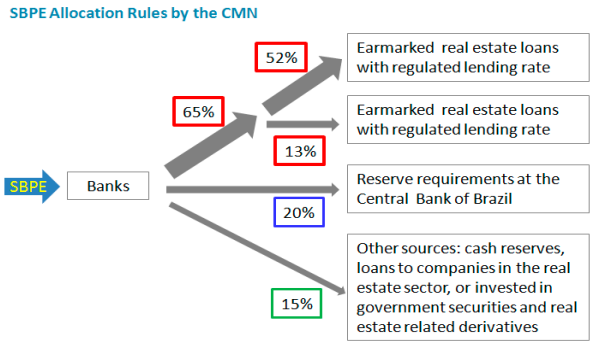
Figure 2. Brazil: Real Estate Loans



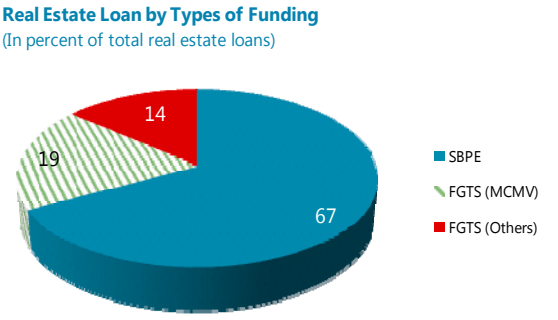
Source: CEIC Database.



Source: Central Bank of Brazil.



Source: Fund staff creation.



Source: Central Bank of Brazil.

6. Feedback loops appear to have emerged between real estate loans and house prices in recent years (Figure 3). Since 2009, house prices and real estate loans have changed mostly along the same direction. A correlation coefficient is +0.65, and house prices granger-cause real estate loans and vice versa.[11],[12] A variance decomposition from a VAR model with five variables, including house prices, real estate loans, real average earnings, construction costs, and the Selic rate, shows that house prices and real estate loans account for 37 and 68 percent of each other's variability, which is explained by other factors besides their own past changes.[13]

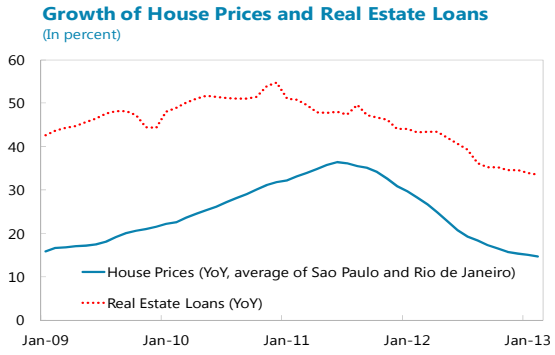
[11] Due to a limited availability of national house price index, these analyses are conducted with house price indices in Sao Paulo and Rio de Janeiro, which are available since Jan. 2008. The assessment would not change qualitatively even with the BCB house price index.

[12] A time series X granger causes another time series Y, if present value of X can be better predicted by using past values of Y than by not doing so, considering that other relevant information (including the past values of X) are also used. The test for granger causality is based on an F-statistic at the 10 percent level of significance.

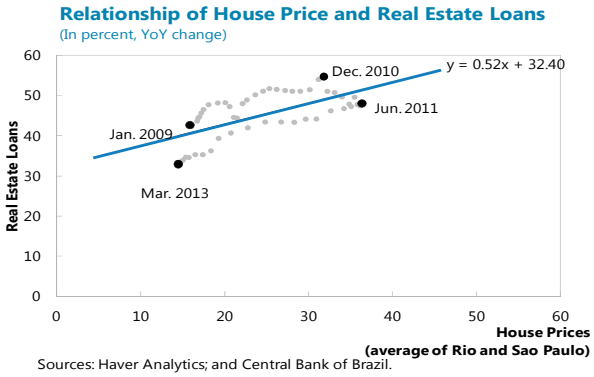
	Data: Jan. 2009 – April 2013		Data: Jan. 2010 – April 2013	
	F-statistic	Probability	F-statistic	Probability
Real estate loans → House prices	2.68	0.08	4.74	0.02
House prices → Real estate loans	2.87	0.07	2.89	0.07

[13] The VAR model has five endogenous variables, including house prices, real estate loans, real average earnings, construction costs, and the Selic rate. The first four variables, except the Selic rate, are in the growth rate per annum. Schwarz Bayesian criterion and Hanna-Quinn criterion are used to select a two period as its lag length.

Figure 3. Brazil: Feedback Loops Between House Prices and Real Estate Loans



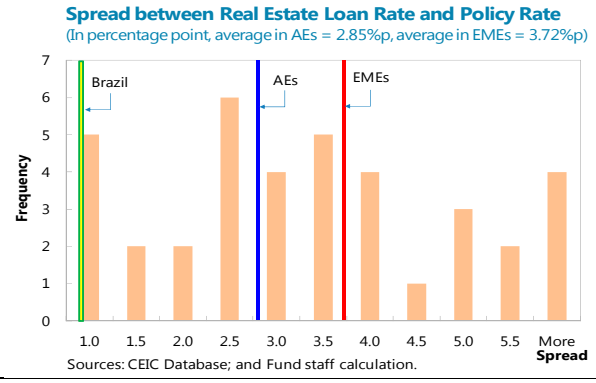
Sources: Central Bank of Brazil; CEIC database; and Fund staff calculation.



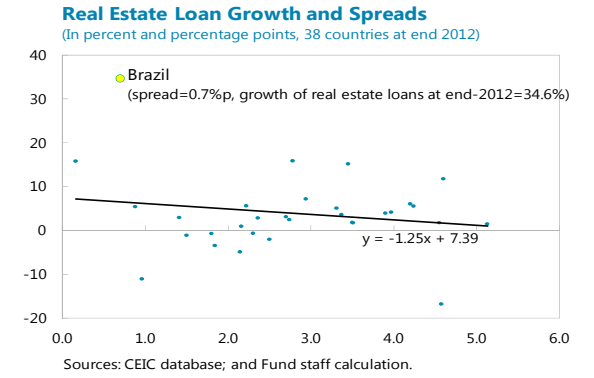
Sources: Haver Analytics; and Central Bank of Brazil.

7. Low real estate lending rates relative to a benchmark rate appear to have supported the feedback loops (Figure 4). A weighted average of real estate lending rates was 7.95 percent at end-2012, which was much lower than lending rates for other types of loans, such as households' vehicle financing (19.8 percent) and payroll-deducted loan (24.5 percent), non-payroll-deducted personal credit (66.3 percent), and working capital (15.1 percent). The spread between the weighted average and the benchmark rate, such as the policy rate in Brazil (the Selic), stood at 70 basis points, which was much smaller than an average of the same type of spreads among advanced economies (285bp) and other emerging market economies (372bp).[14] From a cross-sectional regression, a relationship between the spreads and real estate loans is negative.

Figure 4. Brazil: Real Estate Lending Rate and a Spread with the Policy Rate



Sources: CEIC Database; and Fund staff calculation.



Sources: CEIC database; and Fund staff calculation.

[14] Real estate lending rates for 23 advanced economies and 15 emerging market economies are collected from CEIC database. Using policy rates as benchmarks, spreads are calculated by subtracting the benchmark rates from the mortgage lending rates.

C. Lessons from International Experiences

8. Endogenous feedback effects between real estate loans and house prices can result in excessive leverage and increases the vulnerability of the financial system (IMF, 2011b). The global financial crisis showed that, when house prices started to be corrected, an increasing number of households, not only speculators but also owner-occupiers, were quickly pushed to a negative-equity territory. Externalities related to fire sales caused a further decline in the prices, defaults increased as strategic default incentives kicked in, and the balance sheet of financial intermediaries deteriorated. Crowe and others (2011) studied a sample of 40 countries and found that 21 out of 23 cases with "twin booms," i.e. a feedback loop between a real estate and a credit boom, ended up suffering from either a financial crisis or a poor macroeconomic performance.[15]

Table. Booms, Crises, and Macroeconomic Performance
(In percent, except last column)

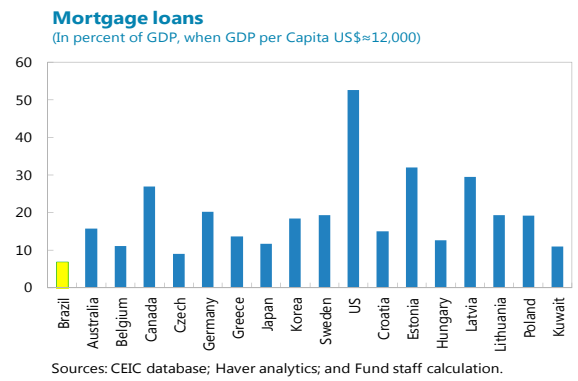
Boom	Followed by Financial Crisis	Followed by Poor Performance	Followed by Financial crisis or Poor Performance	Followed by Financial Crisis and Poor Performance	Number of Countries
Real Estate	53	77	87	43	30
Credit	67	78	93	52	27
Real estate but not credit	29	71	71	29	7
Credit but not real estate	100	75	100	75	4
Both	61	78	91	48	23
Neither	27	18	45	0	11

Source: Crowe and others (2011).
Note: The numbers, except in the last column, show the percent of the cases in which a crisis or poor macroeconomic performance happened after a boom was observed.

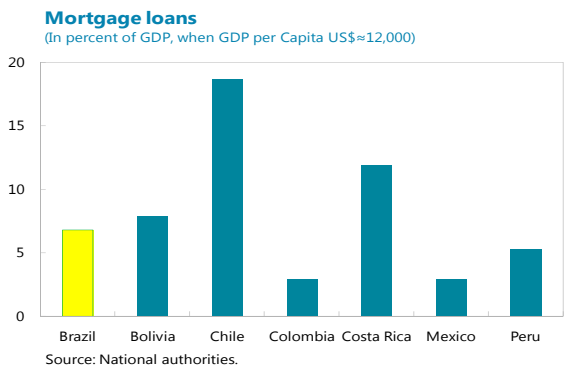
9. Brazil has experienced twin booms since the global financial crisis, but given the still low size of mortgage lending, systemic risk is low. There are significant specific risk mitigants (Figure 5):

[15] Crowe and others (2011) define a real estate boom and a credit boom, as follows: a real estate boom exists if the annual real house price appreciation rate during 2000–2006 is above the ad-hoc threshold of 1.5 percent or the annual real house price appreciation rate in the upward phase of the housing cycle prior to the crisis exceeds the country-specific historical annual appreciation rate; and a credit boom exists if the growth rate of bank credit to the private sector in percent of GDP is more than the arbitrary cut-off of 20 percent or it exceeds the rate implied by a country-specific, backward-looking, cubic time trend by more than one standard deviation. A financial crisis is a systemic banking crisis identified in Laeven and Valencia (2010), and poor macroeconomic performance is defined as more than 1 percentage point decline in the real GDP growth rate in 2008–09 compared to the 2003–07 average.

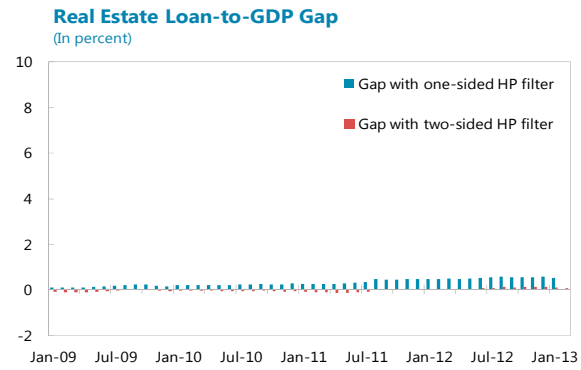
Figure 5. Brazil: Risk Mitigants



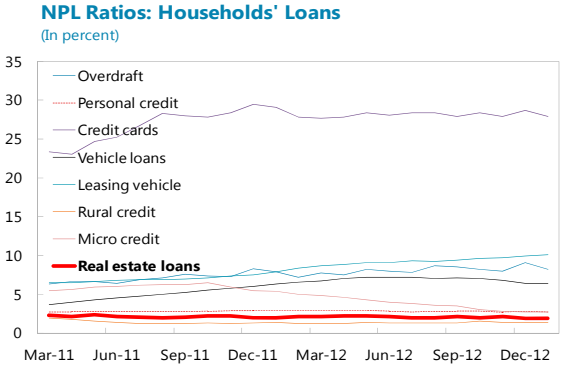
Sources: CEIC database; Haver analytics; and Fund staff calculation.



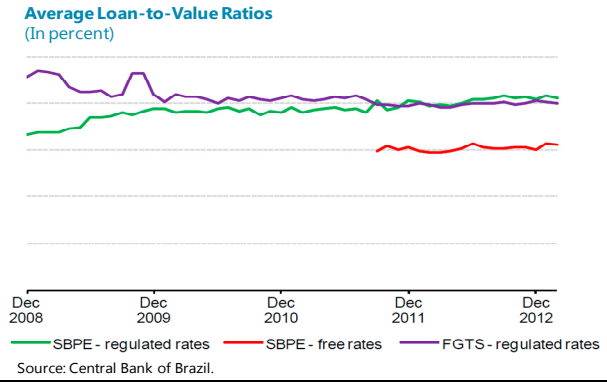
Source: National authorities.



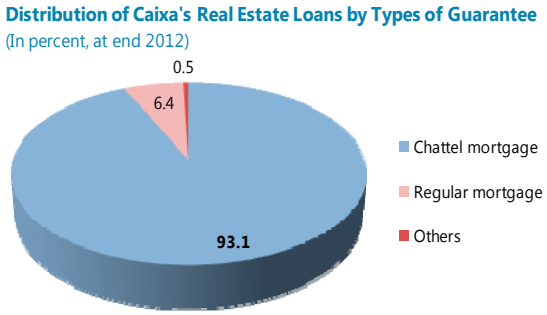
Sources: Central Bank of Brazil; and Fund staff calculation.



Sources: Central Bank of Brazil; and Fund staff calculation.



Source: Central Bank of Brazil.



Source: Central Bank of Brazil.

- While the recent expansion contributed to financial deepening, the overall level of real estate loan-to-GDP ratio remains low (6.9 percent) by international standards (IMF, 2012);[16]
- The real estate lending growth has slowed in recent months and the estimated real estate loan-to-GDP gap remains small;[17]

[16] In the first panel in figure 5, real estate loan-to-GDP ratio is compared across countries in the year that each country' GDP per capita reached US$12,000 as Brazil did in 2012.

[17] The gap is estimated with both one-sided and two-sided HP filter.

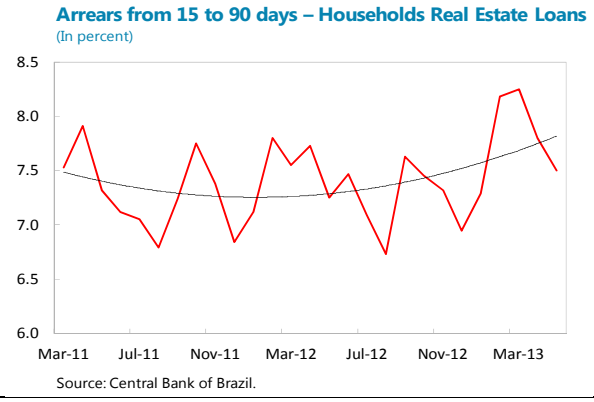
- NPL ratios of real estate loans are fairly low around 2 percent;
- Real estate loans have been granted at prudent loan-to-value (LTV) ratios, 70 percent for SBPE with regulated rates and FGTS and 60 percent for SBPE with free market rates on average. The amortization system also helps to mitigate risks with high LTV mortgage loans;
- The share of liens among real estate loans is over 90 percent, strengthening creditors' right and reducing strategic default incentives;[18]
- Securitization in Brazil is still incipient and not complex; and
- Second mortgages are only 1.5 percent of total mortgages (March 2013).

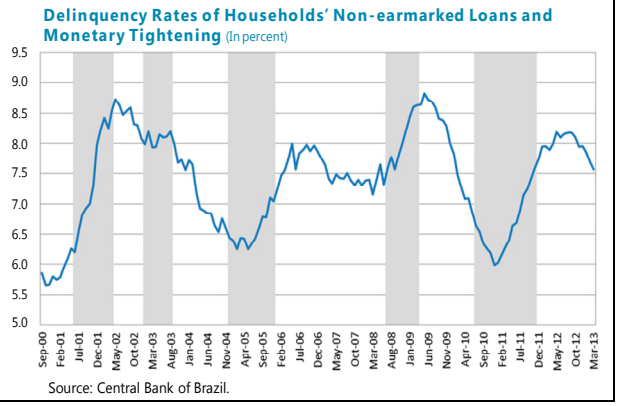
D. Policy Implications

Monitoring Systemic Risk

10. Even though there are important risk mitigants, the authorities should continue to closely monitor both housing and mortgage loan market developments. A correction in house prices, although not systemic, would still have adverse impacts on banks' asset quality and households' balance sheets. Recently, overdue rates (15 to 90 days) of real estate loans show an upward trend at the margin, with a potential impact on future NPLs. Given that delinquency rates in the past have moved along monetary policy cycles, the impact of the ongoing policy tightening on NPLs warrants close monitoring (Figure 6).

Figure 6. Brazil: Nonperformance of Real Estate Loans

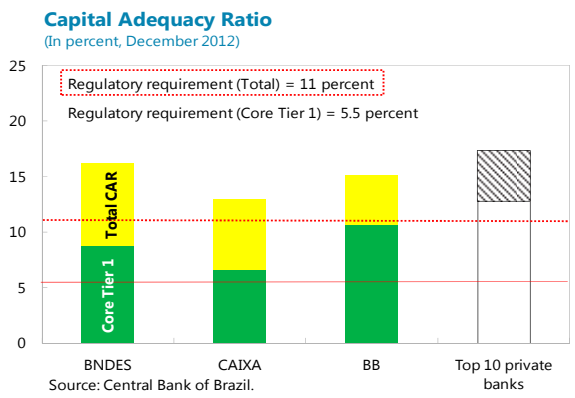


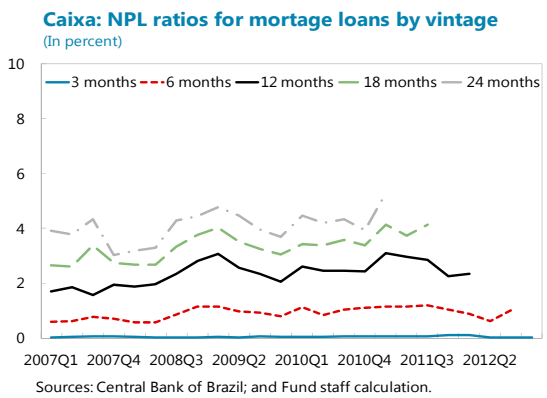


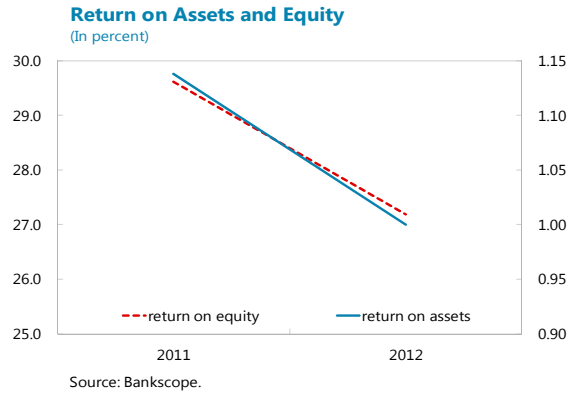
[18] With liens, also called chattel mortgages (alienação fiduciária), the ownership of the asset is transferred to creditors and, once the debt is paid, automatically returned to the original owner. In case of default, the liens allow a relatively quick out-of-court transfer of the title to the lender, and since the ownership of the asset stays with the creditor, the credits secured by fiduciary transfer are not affected by the debtor's insolvency procedures. Thus, strategic default incentives are reduced.

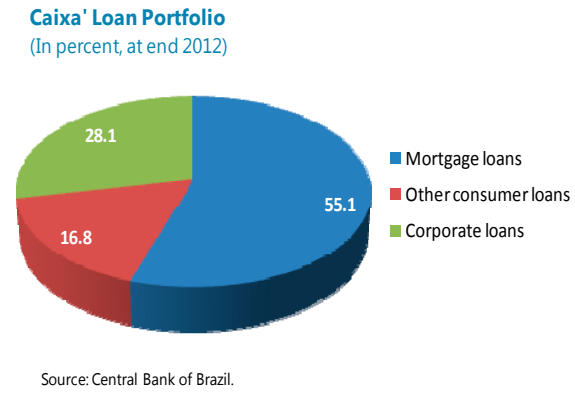
11. Given Caixa's preeminent role in Brazil's mortgage market and the rapid expansion of its balance sheet, heightened vigilance is warranting (Figure 7).[19] Caixa's capitalization has declined in recent years; its NPL ratios of mortgage loans by vintage recently show a marginal upward trend; and return on asset and equity dropped in 2012, albeit remaining relatively high by international standard.[20, 21]

Figure 7. Brazil: Financial Indicators of Caixa









[19] Moody's downgraded Caixa's senior ratings from A3 to Baa2 in March 2013, pointing out the deterioration of its standalone creditworthiness.

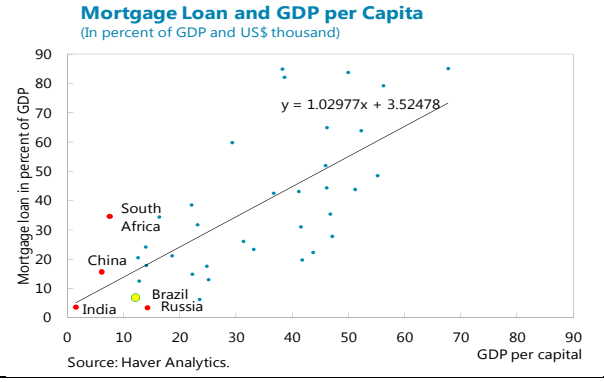
[20] More generally, combining the current monitoring framework with additional indicators can help monitor systemic risk. These indicators include: house prices with broad geographic coverage and commercial property prices by regions; changes in lending standards (senior loan officer or bank lending surveys); and measures of balance sheet exposures in the household and corporate sectors, as captured by debt- to-income (DTI) and LTV ratios for each sector and regions.

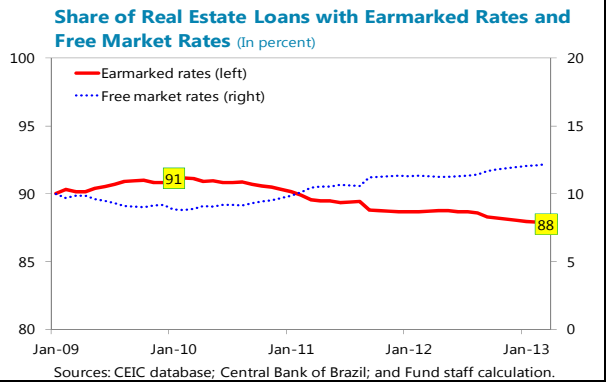
[21] Given Caixa's large role in the mortgage market, a correction of housing prices may affect its asset quality and give rise to potential fiscal liabilities.

SBPE Allocation Rules

12. The portion for SBPE funding allocated to mortgages at market rates should be gradually increased. The real estate loan market in Brazil is still in its early stages of development, which should be accompanied by an increase of the share of real estate loans with free market rates. To this end, the existing SBPE allocation rules should gradually change, decreasing the share for mortgage loan funding with regulated lending rates (Figure 8).

Figure 8. Brazil: Real Estate Loan Market





Macroprudential Policy Measures

13. In Brazil, risk weights have been used in the past to contain a build-up of systemic risk in households' credit, but implementing risk weights on real estate loans may face particular challenges.[22] In principle, a targeted increase in risk weights can be applied to any category of loans to reduce excessive credit growth, including real estate loans as in many countries.[23] However, sectoral risk weights may lose effectiveness when banks hold capital well above the regulatory minimum, which is often the case during real estate booms.

14. Explicit limits on LTV and DTI ratios can be an additional macroprudential tools, calibrated across housing cycles.[24] To mitigate systemic risk, these tools are increasingly viewed as useful demand-side macroprudential measures to contain boom-bust cycles in housing markets (Igan and Kang, 2011; Wong and others, 2011; Crowe and others, 2011). Limits on the LTV ratio can

[22] The Brazilian experience in 2010 and 2011 shows how changes in capital requirements and risk weights for long term consumer and vehicle loans can be used to limit risks associated with these credit segments (IMF, 2013).

[23] The countries include Argentina (2004), Australia (2004), Bulgaria (2004), Estonia (2006), Hong Kong SAR (2013), India (2008), Ireland (2006), Israel (2010), Korea (2002), Malaysia (2005), Norway (1998), Peru (2012), Poland (2007), Spain (2008), Switzerland (2012), Thailand (2009), and U.K. (2013). The parenthesis denotes the year that risk weights were increased to contain risks in housing markets in each country.

[24] Since the implicit LTV and DTI ratios in Brazil are currently prudent, the explicit limits will not be immediately binding and their implementation will be easier.

constraint targeted borrowers and limit housing demand. This can help alter market expectations and speculative incentives that play a key role in bubble dynamics. Limits on LTV and DTI ratios can enhance financial institutions' resilience to house price shocks. LTV limits bolster banks' resilience to house price volatility by increasing the collateral backing mortgage loans and reducing their loss given default. DTI restrictions also enhance banks' resilience to the extent that low DTI lending is correlated with lower delinquency rates and probability of default.[25]

Box. Recent Trend Introducing Official Limits on LTV and DTI Ratios

Several countries have used or recently introduced limits that would discourage loans with high LTV and DTI ratios (Table).[1] For example, Hong Kong has operated a LTV cap since the early 1990s and introduced a DTI cap in 1994; LTV limits in Korea were introduced in 2002, followed by DTI limits in 2005.[2] During the post financial crisis period, many advanced economies (AEs) and emerging market economies (EMEs), such as Hungary, Norway (loan-to-income limit, LTI), Singapore, etc, recently adopted these instruments as new tools. Up until now, nine AEs and fourteen EMEs implemented caps on LTV ratio. Six AEs and eight EMEs adopted limits on DTI ratio, which complemented the limits on LTV ratio in all the countries.

Table. Use of Macroprudential and Tax Measures Across Countries

	Advanced Economies	Emerging Market Economies	Total
Limits on LTV ratio	Canada (2008), Finland (2010), Hong Kong SAR (1991), Israel (2012), Korea (2002), Norway (2010), Netherlands (2011), Singapore (1996), Sweden (2010)	Bulgaria (2004), Chile (2009), China (2001), Colombia (1999), India (2010), Indonesia (2012), Latvia (2007), Lebanon (2008), Malaysia (2010), Hungary (2010), Poland (2011), Romania (2004), Serbia (2004), Thailand (2003), Turkey (2011)	24
Caps on DTI ratio	Canada (2008), Hong Kong SAR (2010), Korea (2005), Netherland (2007), Norway (2010, LTI), Singapore (2013)	Colombia (1999), Hungary (2010), Latvia (2007), Malaysia (2011), Poland (2010), Romania (2004), Serbia (2004), Thailand (2004)	14
Taxes (Stamp duty, capital gains tax, etc)	Hong Kong SAR (2010), Israel (2011), Korea (2003), Singapore (2010)	China (2013), Latvia (2007), Malaysia (2010),	7

Sources: Lim and others (2011) and IMF staff (Ivo Krznar) extension.
Note: Parentheses show the time when a country started to impose a measure or tightened it since 1990.

1/ This table contains information from Lim and others (2011) and remains work in progress. We do not claim that the table captures all countries' experiences with the three macroprudential tools.

2/ Since their launch in September 2002 and August 2005, the LTV and DTI limits in Korea have targeted speculative regions in the residential real estate market, rather than the whole housing market in the nation. Their specific conditions have also been flexibly adjusted in terms of maximum limits, loan types, and covered financial institutions. The measures were tightened six and five times respectively, and loosened four times.

[25] The inertia in house prices and the difficulty of breaking bubble dynamics once they set in real estate markets have been pointed out to highlight what makes real estate cycles potentially dangerous.

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