

SM/07/245
Correction 1

August 29, 2007

To: Members of the Executive Board

From: The Secretary

Subject: **Brazil—Selected Issues**

The attached corrections to SM/07/245 (7/10/07) have been provided by the staff.

Typographical Errors

Page 43, Table 1, columns 3–5: formatting of numbers corrected

Page 44, Table 2, column 1: formatting of numbers corrected

Page 45, Figure 1: Figure renumbered to “Figure 2”

Page 46, Figure 3: Figure renumbered to “Figure 3” and labels corrected

Page 47, Table 3, column 1: for “Inflation” read “Inflation Volatility”
columns 2–6: level of significance corrected

Page 48, table 4, columns 2–7: formatting of numbers and level of significance corrected

Questions may be referred to Mr. Terrier (ext. 35498) and Mr. Goyal (ext. 36875) in WHD.

This document will shortly be posted on the extranet, a secure website for Executive Directors and member country authorities.

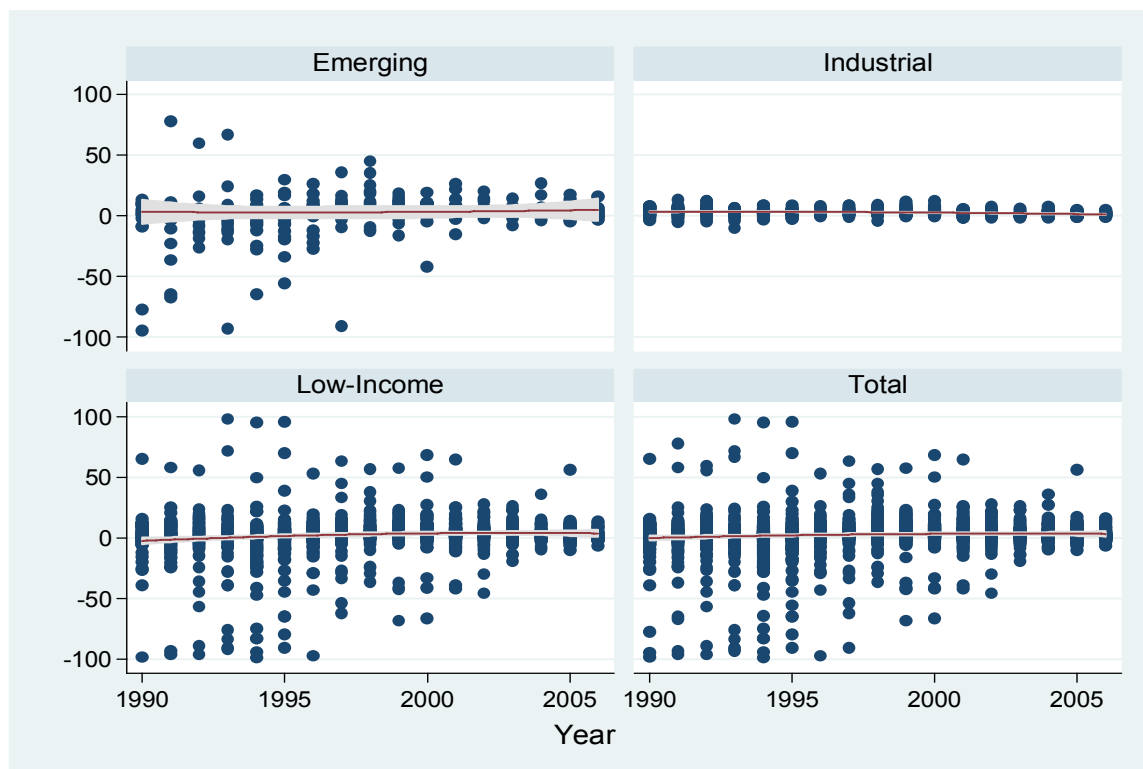
Att: (6)

Other Distribution:
Department Heads

Table 1. Summary Statistics of Real Interest Rates by Country Groups, 1990-2006

		Period		
		1990-95	1996-00	2001-06
Low-Income	Average	-1.7	4.0	3.5
	St. Dev.	20.6	11.4	5.8
	Min	-90.6	-50.6	-28.5
	Max	73.6	56.9	27.8
	No. Obs.	448	466	506
Emerging Markets	Average	-4.4	4.9	3.8
	St. Dev.	20.3	7.4	4.3
	Min	-71.1	-15.8	-2.2
	Max	49.1	21.1	15.2
	No. Obs.	101	95	115
Industrial	Average	3.1	3.2	1.6
	St. Dev.	2.6	1.9	1.5
	Min	-5.3	-0.1	-0.9
	Max	7.0	7.7	5.2
	No. Obs.	210	173	178
Brazil	Average	123.9	21.1	15.2
	St. Dev.	151.7	13.3	4.2
	Min	-7.6	8.3	8.0
	Max	421.0	35.7	20.3
	No. Obs.	6	5	6

Figure 1. Evolution of Real Interest Rates by Country Groups, 1990-2006



Note: excludes years with real interest rates in excess of 100 percent.

Source: International Financial Statistics and IMF staff calculations.

C. Stabilization of Real Interest Rates: How Fast? How Far?

7. *To analyze the behavior of real interest rates around peak periods, a group of countries with a history of high real interest rates was selected.* The selection criterion was countries with a history of real interest rates surpassing an arbitrary threshold of 20 percent real rates in at least one year during 1980-2006. This criterion produced a group of 36 countries, including 27 low-income and 9 emerging market economies. Aside from Argentina during the hyperinflation in 1988-89, Brazil displayed the largest real interests in the group, with a peak in 1990, followed by Uruguay (2002), Mongolia (1993), and again Argentina (1983).¹

8. *Real interest rates in Brazil around their historic maximum were substantially higher than those in comparator countries.* To compare the evolution of real interest rates in Brazil and the selected countries around peak periods, an eleven-year window was used and centered at the historic maximum of each series (labeled T0). The results (Table 2) showed a substantial and persistent dispersion of real interest rates within the group of countries analyzed, as indicated by the yearly standard deviations of real interest rates, as well as by their range. Overall, real interest rates in Brazil around the historical peak reached in 1990 were systematically (and substantially) higher than the group average, reaching the maximum values in the sample in six out of the eleven years.

Table 2. Summary Statistics of Real Interest Rates Around their Historic Peaks

Year	Brazil	Entire Sample			
	1985-1995	Mean	St. Dev.	Min.	Max.
T-5	17.1	-7.9	34.5	-93.0	63.2
T-4	-17.0	-5.2	27.6	-64.8	56.8
T-3	59.7	0.5	30.6	-94.2	59.7
T-2	77.3	5.1	23.7	-40.9	77.3
T-1	325.0	19.3	58.8	-21.1	325.0
T0	421.0	56.0	78.9	20.2	421.0
T+1	77.8	8.3	37.4	-91.6	77.8
T+2	59.2	5.6	29.6	-98.5	70.1
T+3	66.9	4.7	25.0	-96.2	66.9
T+4	126.1	11.8	24.0	-7.0	126.1
T+5	-7.6	5.7	13.6	-42.3	40.8

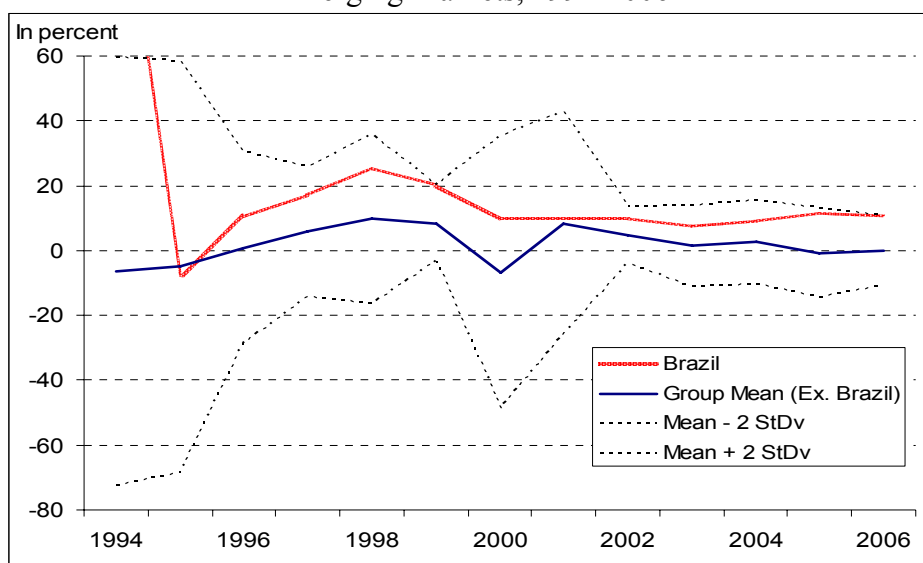
T0 stands for the year of the peak in real interest rates.

Based on a sample of 36 countries with a history of real interest rates exceeding 20 percent at least in one year during 1980-2006.

¹ Annual data from IFS are used to compute real interest rates. Although real interest rates in Brazil may be overstated for the year 1990 because of highly volatile monthly inflation rates, this methodology was used because of data constraints and to ensure uniformity of treatment across countries.

9. ***Real interest rates in Brazil after macroeconomic stabilization remained substantially higher than those in other emerging market countries.*** To analyze real interest rate dynamics after macroeconomic stabilization, Brazil's real interest rates after the launching of the 1994 Real plan were compared with the rates of a group of comparator emerging market economies. The latter included countries in which real interest rates were above 20 percent for at least one year after 1994, using the constituents of the EMBI+ index. The filtering criterion produced five countries (Argentina, Ecuador, Indonesia, Turkey, and Ukraine). The results show that real interest rates in Brazil dropped substantially immediately after the beginning of macroeconomic stabilization, but remained persistently higher than those in the comparator countries, with an average of 8.4 percentage points above the group mean during 2000-06 (Figure 2).²

Figure 2. Comparison of Real Interest Rates in Brazil and Selected Emerging Markets, 1994-2006

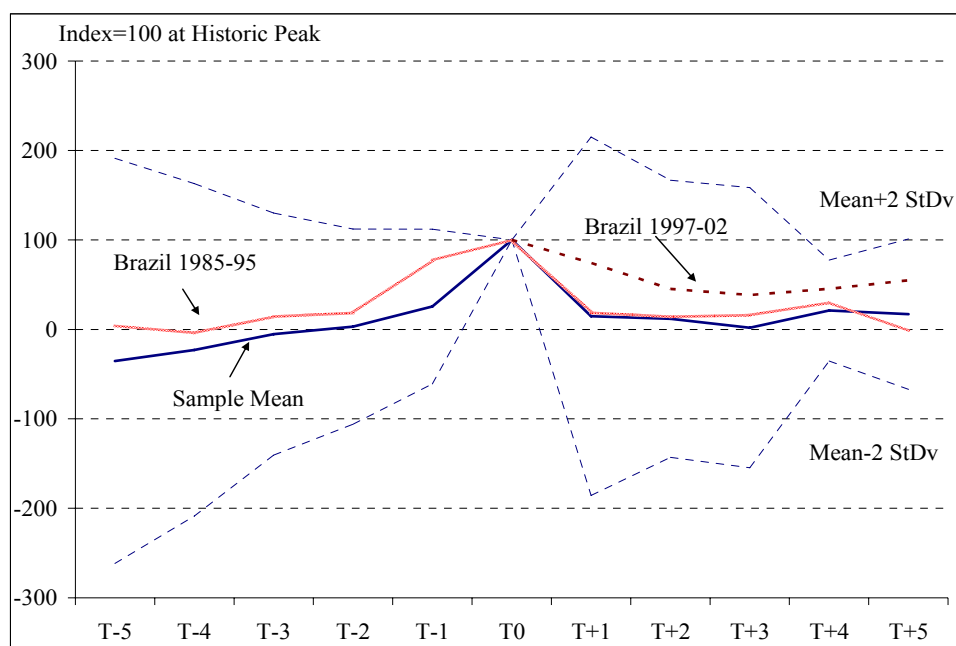


10. ***In relative terms, however, the behavior of real interest rates in Brazil was broadly comparable to that observed in comparator countries.*** To assess the relative evolution of real interest rates, the series were normalized to 100 at the peak (in T0), and a 95 percent confidence interval was constructed around the group mean. Using this metric, the relative behavior of Brazilian rates during the eleven-year window was very close to the average, with a steady increase from negative values in the years preceding the peak, a sharp drop in the year immediately after the peak, and a leveled evolution afterward (Figure 3). On average, real rates in the selected countries dropped from their peaks by a substantial 85 percent in the first year following the peak, and remained broadly unchanged afterward. In

² A parallel exercise using a set of 12 emerging market economies with real interest rates surpassing at least 10 percent in at least one year after 1994 produced similar results.

recent years, the relative evolution of both money market rates and the Selic rate after the beginning of the stabilization were also broadly consistent with the behavior in other countries.

Figure 3. Comparison of Normalized Real Interest Rates
Around Historic Peaks, 1980-2006



11. ***Overall, these results suggest that a key difference between real interest rates in Brazil and in comparator countries resides in the levels, rather than in their relative evolution.*** The observed pattern suggests that real interest rates may stabilize at very different levels across countries and that these levels may depend critically on the sustainability of macroeconomic policies and the implementation of institutional and structural reforms. For example, in the case of Mexico following the Tequila crisis of 1995, sound macroeconomic management was not sufficient to fully bring real interest rates down, and a sustained stabilization effort, combined with an agenda of deeper economic reforms, was needed to reduce uncertainties. Eventually, market expectations improved, allowing for a more substantial drop in real interest rates. The next section exploits cross-country data to assess the potential role of macroeconomic factors behind the levels of real interest rates.

D. Real Interest Rates and Macroeconomic Factors

12. ***Dynamic panel regressions were estimated to examine the role of selected macroeconomic factors in determining the level of real interest rates.*** All the specifications included one lag of the dependent variable to account for the strong persistence of real interest rates, country-level fixed effects, and time dummies to control for common (global)

shocks to the sampled countries. A more detailed description of the specification is presented in Appendix 1.

13. ***Baseline results indicate that real interest rates are strongly influenced by their previous levels, the history of inflation volatility, and public debt fundamentals:***

- The strong inertia of ***real interest rates*** is reflected in the autoregressive coefficients, which vary between 0.41 and 0.48 (Table 3), suggesting that, on average, more than 40 percent of a shock to real interest rates in any given year is carried to the subsequent year.

Table 3. Within-Group Regressions of Real Interests on Macroeconomic Factors
Sample: 1980-2006

	[1]	[2]	[3]	[4]	[5]
L.Real Interest Rate	0.434 [0.084]**	0.413 [0.097]*	0.407 [0.109]*	0.475 [0.049]*	0.474 [0.048]*
L. Inflation Volatility	-0.033 [0.017]	-0.035 [0.017]	-0.019 [0.014]	0.062 [0.020]	0.060 [0.021]
L2. Inflation Volatility	0.062 [0.018]*	0.059 [0.016]*	0.052 [0.019]	0.023 [0.014]	0.021 [0.013]
L3. Inflation Volatility		0.086 [0.005]***	0.061 [0.007]**	0.038 [0.002]**	0.036 [0.003]*
L4. Inflation Volatility			0.161 [0.007]***	0.142 [0.009]**	0.141 [0.009]**
L2. Public debt to Gross National Income				0.048 [0.004]**	0.048 [0.004]**
L. Short-term Debt to Total Debt					0.090 [0.012]*
Observations	2488	2346	2206	1540	1540
Number of Countries	150	148	147	109	109
R-squared	0.22	0.20	0.20	0.25	0.25
Sum of Inflation Volatility Coefficients	0.029	0.110	0.255	0.265	0.258
Standard errors	[0.004]**	[0.012]**	[0.006]***	[0.000]***	[0.001]***
Long-term Impact on Real Interest Rates (basis points)					
Inflation Volatility	5.2	18.8	43.0	50.5	49.1
Debt to Gross-National Income				9.1	9.1
Short-term Debt to Total Debt					17.1

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

- As expected, ***inflation volatility*** entered with a positive sign, indicating that real interest rates include a premium for price-dilution risks. Notably, up to four lags of inflation volatility influence real interest rates, underscoring the importance of persistent price stability. A sustained increase in inflation volatility by 1 percent a year translates into a 25.8 basis points increase in real interest rates in the short run (column 5), and a 49 basis points increase in the long run.

- Similarly, weaker *public debt fundamentals* correspond to higher real interest rates. A 1 percent increase in the ratio of public debt to gross national income translates into a 4.8 basis points increase in real interest rates in the short run and a 9.1 basis points increase in the long run, while a 1 percent increase in the share of short-term debt corresponds to a 9 basis points increase in real rates in the short run and a 17.1 increase in the long run.

14. ***Results based on GMM estimation of the model in first differences were broadly consistent with previous estimates, but suggest a stronger incidence of macroeconomic factors on real interest rates.*** A parallel set of regressions were computed using the Arellano-Bond (1991) estimator, by restating the variables in first-differences to remove the fixed-effects, and using lagged levels of the explanatory variables as instruments to take into account their potential endogeneity. The estimation was carried out on the entire sample (1980-2006) as well as on two sub-samples. The results (Table 4) were roughly consistent with those discussed previously, albeit with generally larger point estimates, suggesting a stronger impact of macroeconomic factors. Overall, the coefficients displayed in the second column, estimated with GMM on the entire sample, exceed those displayed in the first and were also more precise, as reflected in their lower standard errors.

Table 4. Alternative Regression Estimates and Robustness Check
(Varying Samples)

	Sample 1980-2006		Sample 1990-2006		Sample 1990-2006 Excluding Brazil	
	Within- Levels	GMM- Differences	Within- Levels	GMM- Differences	Within- Levels	GMM- Differences
L.Real Interest Rate	0.474 [0.048]*	0.470 [0.001]***	0.455 [0.058]*	0.460 [0.000]***	0.346 [0.037]*	0.367 [0.001]***
L. Inflation Volatility	0.060 [0.021]	0.082 [0.001]***	0.057 [0.016]	0.092 [0.001]***	0.045 [0.005]*	0.089 [0.001]***
L2. Inflation Volatility	0.021 [0.013]	0.035 [0.001]***	0.020 [0.012]	0.039 [0.001]***	0.014 [0.003]	0.031 [0.001]***
L3. Inflation Volatility	0.036 [0.003]*	0.050 [0.001]***	0.037 [0.003]**	0.055 [0.001]***	0.040 [0.003]*	0.047 [0.001]***
L4. Inflation Volatility	0.141 [0.009]**	0.169 [0.001]***	0.156 [0.017]*	0.178 [0.000]***	0.155 [0.010]**	0.177 [0.000]***
L2. Public debt to Gross National Income	0.048 [0.004]**	0.055 [0.000]***	0.031 [0.012]	0.059 [0.000]***	0.021 [0.000]***	0.050 [0.000]***
L. Short-term Debt to Total Debt	0.090 [0.012]*	0.171 [0.006]***	0.131 [0.036]	0.193 [0.005]***	0.122 [0.031]	0.241 [0.007]***
Observations	1540	1417	1317	1254	1300	1237
R-squared	0.25		0.28		0.17	
Number of Countries	109	109	109	109	108	108
Arellano-Bond Test for AR(1) z =		-1.89		-1.86		-1.53
Arellano-Bond Test for AR(2) z =		-1.03		-0.63		-0.78

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%