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The Puzzle of Brazil's High Interest Rates

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Western Hemisphere Department
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Abstract

This paper highlights that real interest rates in Brazil have declined substantially over time, but are still well above the average of emerging market inflation targeting regimes. The adoption of an inflation-targeting regime and better economic fundamentals (reduction in inflation volatility and improvements in the fiscal and external positions) has helped Brazil sustain significantly lower real interest rates than in the past. Going forward, the paper shows that Brazil can converge towards lower equilibrium real interest rates if domestic savings increase to the level of other emerging market countries. The effect is particularly pronounced if the increase in domestic savings is achieved through higher levels of public savings. Still, econometric results suggest that, controlling for everything else in the model, real interest rates in Brazil are about two full percentage points higher than in other countries in the sample, suggesting that there are still Brazil-specific factors that have not been captured by the empirical analysis. Some of these factors may include credit market segmentation and inflation inertia generated by still pervasive indexation practices.

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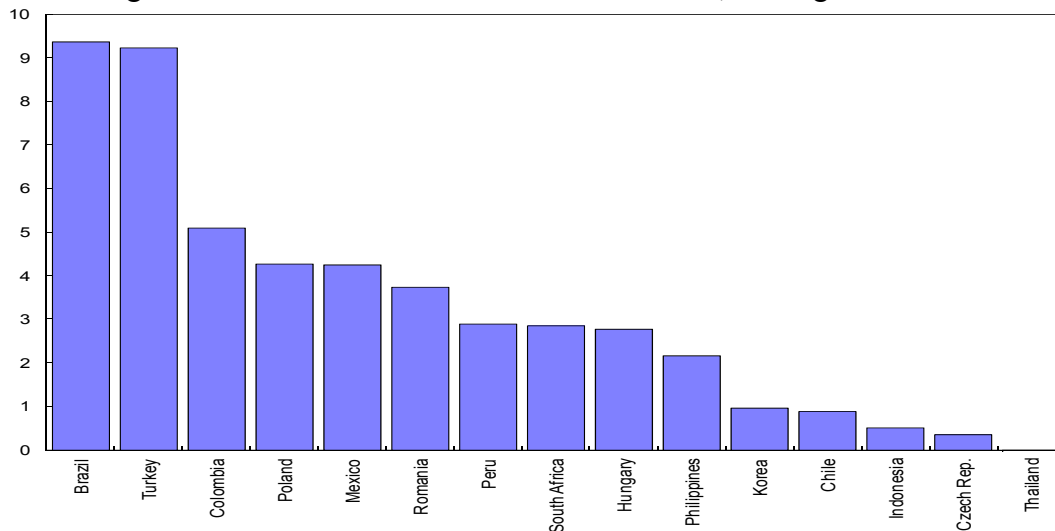
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I. INTRODUCTION

This paper studies the reasons why Brazil has relatively high real interest rates and provides some insights into possible factors that may help reduce them over time. The paper focuses on the determinants of the evolution of the (ex-post) short-term real interest rate (the policy rate set by the Central Bank adjusted for inflation) and leaves for future research the question of why Brazil has high intermediation spreads in the banking system. It is not possible to answer the second question without first developing a sound understanding of the first.¹

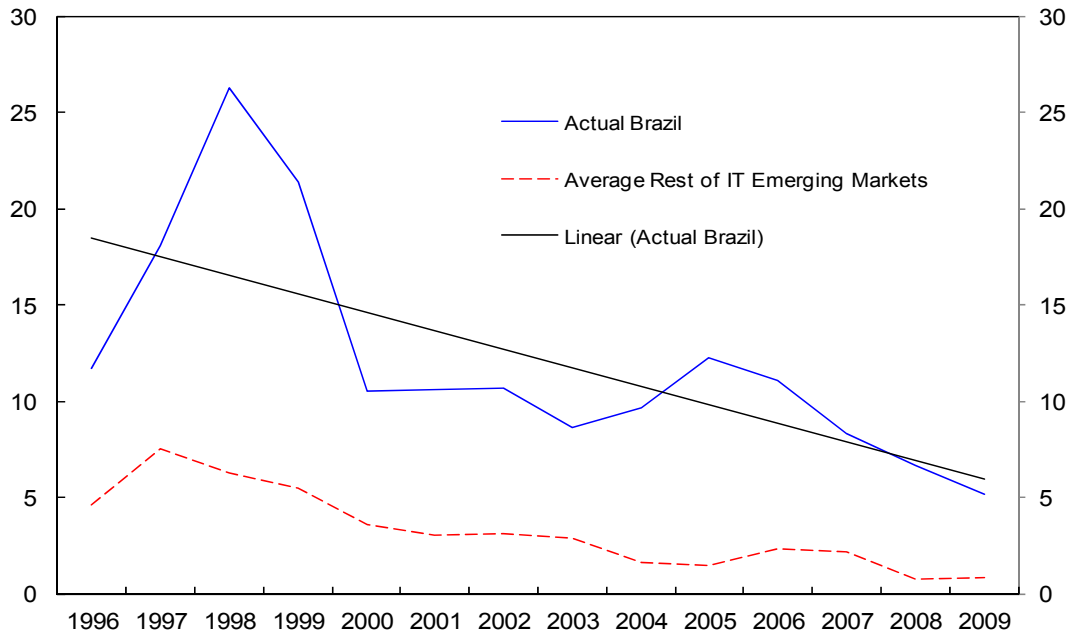
While still considerably higher than in other emerging market inflation targeting regimes (Figure 1), real interest rates in Brazil are currently low from a historical perspective. Excluding the period of hyperinflation (1988–1994), where real interest rates were extremely volatile and would distort the analysis, the ex-post real interest rate declined, on average, from about 40 percent in the 1980s to about 20 percent in the second half of the 1990s prior to the introduction of the inflation targeting regime and the floating of the currency in 1999. They declined further to an annual average of about 10 percent during 2000–2005, and further down to below 8 percent over the 2006–2009 period, reaching their lowest historical level (just below 5 percent) in 2009. This is a remarkably low level for Brazilian standards, even if it is still about four percentage points above the average of emerging market inflation-targeting regimes (Figure 2).

Figure 1. Ex-Post Short-Term Real Interest Rate, Average 2000–2009



¹ The paper covers the period 1980–2009 and therefore takes into account the monetary policy stance adopted by the countries in the sample in the aftermath of the financial crisis that started in 2008. It does not cover 2010 and 2011 due to data limitations in some cases as well as the fact that monetary policy is still being adjusted asymmetrically in a number of countries to deal with the current sovereign debt crisis in Europe.

Figure 2. Real Interest Rates in Brazil and the Rest of the Emerging Market IT Regimes, 1996–2009



Brazil's high real interest rates have often been cited as one of the most important constraints to economic development. Some authors have even referred to this problem as the most binding constraint to growth (Hausmann 2008). Understanding what factors may have been associated with this downward trend in real interest rates, and trying to explain how Brazil could converge to the average level of other emerging markets, is therefore an important exercise.

Answering the question of why Brazil has relatively high real interest rates cannot be done in isolation by focusing exclusively on Brazilian data. Doing so would lead us to conclude that Brazilian real interest rates are actually very low at the moment. We are interested not only in why interest rates have declined but why, at any point in time, they were considerably higher than in other countries and what factors may help Brazil converge to the level of other emerging markets. To this end, the analysis in this paper is based on a panel data set of 15 emerging market inflation targeting (IT) countries over the 1980–2009 period, which helps to identify the relationship between the real interest rate and key economic and institutional fundamentals. The rest of the paper is organized as follows: section II provides a selected review of the existing literature on interest rates in Brazil and presents some stylized facts; section III describes the econometric model and presents the main results of the analysis; and section IV summarizes the main conclusions and policy implications.

II. THEORETICAL DISCUSSION AND STYLIZED FACTS

The arguments about why Brazil has historically had very high interest rates can be grouped into several thematic groups. There are five types of reasons that have been presented in the literature:

- (A) *Fiscal considerations;*
- (B) *Low domestic savings;*
- (C) *Institutional weaknesses;*
- (D) *Previous history of high inflation and inflation volatility;* and
- (E) *Factors affecting the monetary policy transmission mechanism.*

This section reviews these arguments and provides some stylized facts that are necessary to develop a basic understanding of key economic relationships before using more sophisticated econometric techniques.

A. Fiscal Considerations

The main fiscal arguments refer to the effects of fiscal dominance and the risk of debt default. Favero and Giavazzi (2002) find that interest rates are high in Brazil due to the high levels of public debt. Rogoff (2005) argues that the history of debt default (seven defaults or restructuring episodes over 1824–2004) means that Brazil starts paying a significant default risk premium even at relatively low levels of debt.

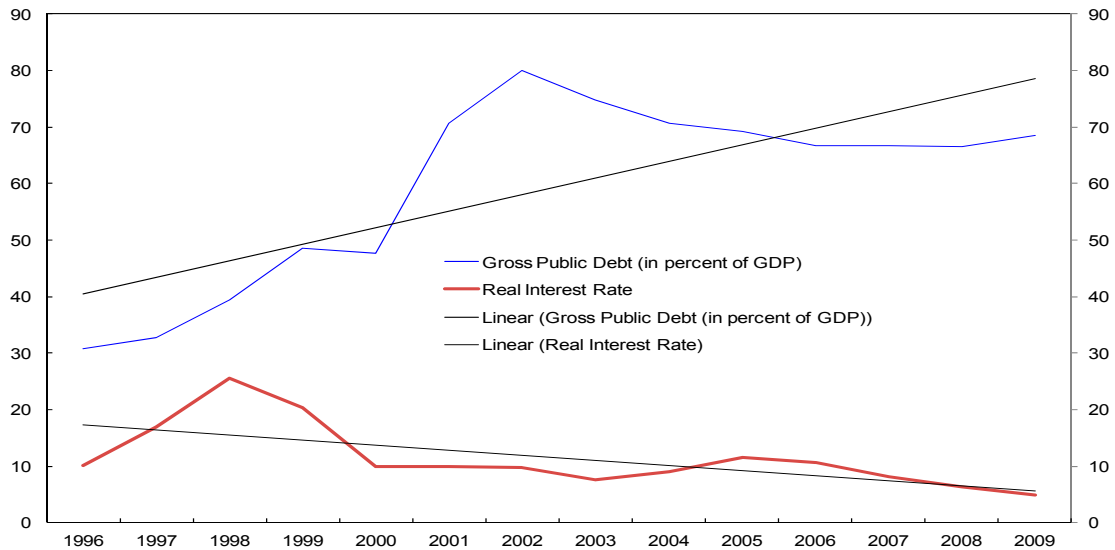
Arguments about fiscal dominance may still be relevant in the case of Brazil but are much less important than they used to be and cannot be made simply by looking at the evolution of public debt. Following Coates and Rivera (2004), we can distinguish two types of fiscal dominance:

- *Type I. Monetary Subordination.* This situation occurs when monetary policy is directed at financing the fiscal deficit through money creation. This was a problem in Brazil during the episodes of hyperinflation, but has not been an issue in the last 15 years. This no longer seems to be a valid argument for high interest rates in Brazil.
- *Type II. Crowding Out Effect in the Credit Market.* It occurs when the fiscal deficit is financed in domestic capital markets in local currency. In this scenario, Treasury and open market operations may be competing in similar segments of the yield curve, bidding interest rates up.

The empirical evidence about the effect of public debt on real interest rates in Brazil is mixed. Muinhos and Nankane (2006), for example, find no evidence of a negative relationship between public debt levels and the real interest rate. In fact, a simple

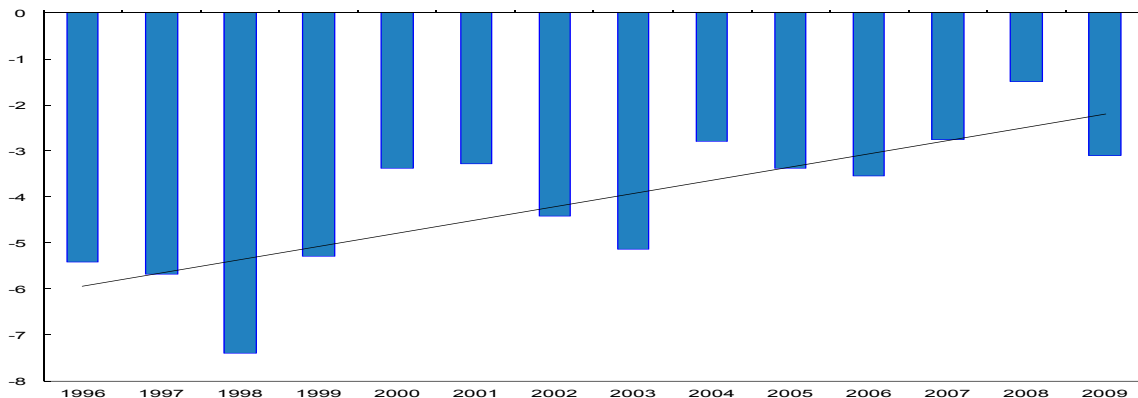
examination of real interest rate and public debt trends (Figure 3) shows that the relationship does not seem to hold. While this is just a bivariate relationship, the inclusion of gross public debt in panel regressions does not produce robust results either, and in some of the specifications the effect comes out with the opposite sign.

Figure 3. Brazil: Gross Public Debt in Percent of GDP, 1996–2009



However, Brazil’s fiscal discipline has improved substantially over time (Figure 4). A better fiscal position implies a lower public sector borrowing requirement and lower risk of fiscal dominance (i.e., public sector competing for limited funds in the credit market with the private sector). The gradual reduction of the overall fiscal deficit over time, thanks to a sustained policy of high primary surpluses, and the effects of the fiscal responsibility law approved in 2000 (which has reduced the effect of political cycles on public spending) are likely to have positively contributed to a reduction in real interest rates.

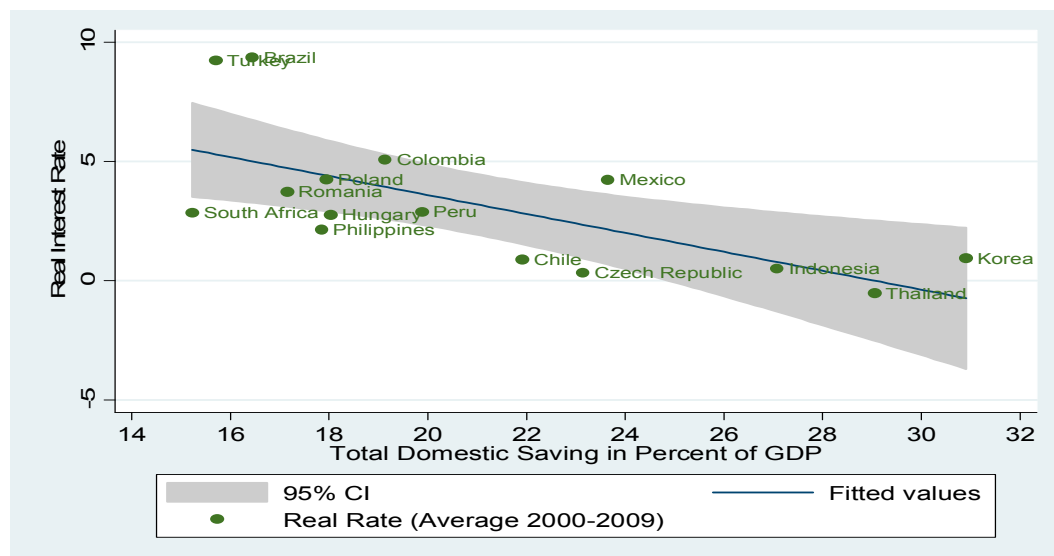
Figure 4. Public Sector Overall Fiscal Deficit (in percent of GDP), 1996–2009



B. Domestic Savings

Brazil has a relatively low level of domestic savings. Hausmann (2008) argues that Brazil's low domestic savings is the most binding constraint to growth and the reason for its high real interest rates. A similar argument about the effect of low savings on real interest rates is made by Fraga (2005). Miranda and Muinhos (2003) refer to this argument as well, but do not test it empirically. The intuition behind this argument is compelling. According to the classical investment-savings theory, if investment demand exceeds the supply of domestic savings, the equilibrium real interest rate increases. While in an open economy domestic savings should be less of a constraint, Feldstein and Horioka (1980), and a number of later studies, find a strong correlation between domestic savings and domestic investment. Rogoff and Obstfeld (2000) describe this phenomenon as one of the main puzzles of modern macroeconomics.

Figure 5. Domestic Savings and Real Interest Rates in IT Emerging Markets, Av. 2000–09



The relationship between domestic savings and the real interest rate seems to be strong (Figure 5). Among the lowest real interest rates in the sample of emerging market inflation targeters are countries in South East Asia (Korea, Indonesia and Thailand), which have very high levels of domestic savings (around 30 percent of GDP). Chile and Mexico also have average domestic savings 6–7 percentage points higher than Brazil and considerably lower real interest rates. But Brazil and Turkey seem to be outliers. They have higher real interest rates because their levels of domestic savings are lower than in the other countries, but the linear prediction would suggest average interest rates about four percentage points lower than actually observed.

C. Institutional Weaknesses

Institutional arguments focus on weaknesses in political and economic institutions necessary to provide protection to investors (contractual enforcement and property rights), on the one hand, and lack of Central Bank independence on the other.

- **Jurisdictional Uncertainty.** This is a vaguely defined term that refers to weaknesses in property rights and contract-enforcing institutions. The term was coined by Arida, Bacha, and Lara-Resende (2004) who describe it as some form of anticreditor bias, the risk of changing the value of contracts before or at the moment of their execution, and the risk of an unfavorable interpretation of contracts in case of a court ruling. The problem with this hypothesis is that many other emerging market countries do not have stronger institutional frameworks for the defense of property rights and contract enforcement than Brazil and yet have much lower real interest rates. The case could be extended to low income countries with much weaker institutions than Brazil and lower real interest rates in many cases. Furthermore, empirical evidence does not support this hypothesis as demonstrated by Goncalves, Holland, and Spacov (2007).
- **Lack of Full Central Bank Independence.** Cited by Rogoff (2005) and others. This hypothesis is theoretically appealing, but difficult to test empirically. It is not clear what the critical level of independence is, and why it is necessary if the highest political authorities are committed to maintaining a low inflation policy. Nahon and Meuer (2009) find that changes in the Board of Directors of the Central Bank of Brazil in recent years have not led to a loss of credibility for the Central Bank's conduct of monetary policy.

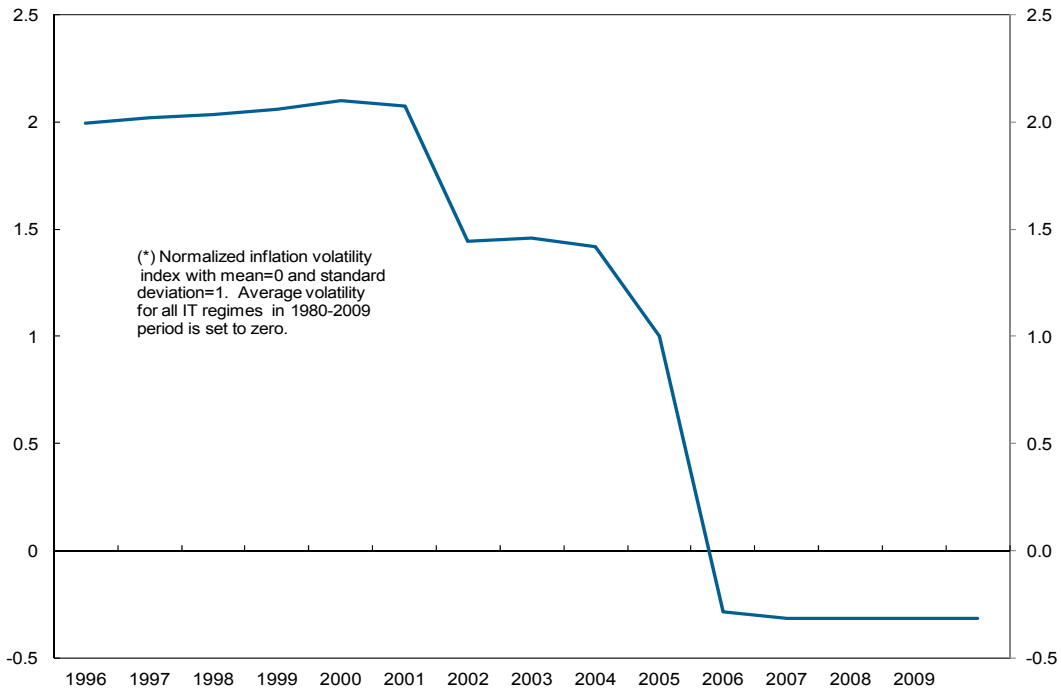
D. History of Inflation and Inflation Volatility

Brazil has had a long history of high and volatile inflation. Annual inflation was moderately high in the 1970s (averaging 30 percent); very high during 1980–88, (averaging over 200 percent); and turned into hyperinflation between 1989–1994, (averaging 1,400 percent). During 1980–1994, Brazil is the country with the longest history of high inflation in the sample of emerging market inflation targeting countries. Not surprisingly, there is a strong correlation between high inflation levels and high real interest rates in Brazil. The real interest rate needed to rise, sometimes to very high levels, to be able to bring inflation down.

The reduction in inflation and inflation volatility after 1995 is one of the most crucial and defining factors of recent Brazilian economic history. As the econometric results will show, this has played a crucial role in the reduction of real interest rates over time in Brazil. The introduction of the inflation-targeting regime is associated with the largest reduction in inflation volatility observed in the sample of inflation-targeting emerging market countries. In the mid-90s normalized inflation volatility was 2 standard deviations higher than the group average. By 2006, inflation volatility had fully converged to the group average. The reduction in inflation and inflation volatility in Brazil led to the “taming of

inflation expectations” (Bevilaqua et al, 2007). This seems to have been a key factor to account for the downward path observed in real interest rate levels.

Figure 6. Inflation Volatility in Brazil,* 1996–2009



E. Factors Affecting the Monetary Policy Transmission Mechanism in Brazil

Several particularities of the Brazilian case have also been cited as affecting the monetary policy transmission mechanism and as additional potential sources of upward pressure on interest rates. These include,

- Credit Market Segmentation.* Public lending provided at below market rates by the development bank (BNDES) and to the housing and agricultural sectors might be pushing upward the equilibrium real interest rate in the free credit market. The intuition behind this argument is that if the public sector supplies credit to the economy at a subsidized rate, the policy rate controlled by the Central Bank will have to increase more to keep credit demand in check at a level consistent with the inflation target. In other words, to the extent that public lending is provided at a rate that is below the policy rate, the Central Bank will only control part of the credit market. Hence, the (unobserved) equilibrium real interest rate consistent with full employment and price stability will be a function of the subsidized rate and the free

market rate – higher than the subsidized rate but lower than the free market rate. The size of this effect is, however, difficult to measure and test empirically.²

- *Minimum Remuneration Requirements in Savings Accounts (cadernetas de poupança).* Under current regulations, savings accounts in Brazil are remunerated at about 6 percent plus a reference rate (and tax exempted interest income). While there is no evidence that this is pushing the real interest higher than it would otherwise be, this minimum remuneration requirement will ultimately act as a floor for the policy rate, which could not fall further (even if the equilibrium real interest rate were to fall). Investors would find it more attractive to place their funds in savings accounts than in other financial assets (such as government debt), whose yield tends to track the policy rate (Selic).
- *The Inflation Target.* The mid-point of the inflation target in Brazil is 4.5, with upper and lower bands of 6.5 and 2.5 percent, respectively. Both the midpoint and the size of the band are relatively high in Brazil compared with other emerging-market countries. For a given equilibrium real interest rate, a higher inflation target is likely to be associated with a higher nominal rate. However, the inflation target per se would not be associated with higher real interest rates.
- *Other Factors.* Barbosa (2008) presents a comprehensive overview of other factors that affect the effectiveness of monetary policy in Brazil and could be associated with higher real interest rates. These include (i) inflation inertia caused by the indexation of key prices, which create rigidity of Brazilian inflation to changes in interest rates, and require a large reduction in aggregate demand to bring inflation down; (ii) the weakness of the wealth channel, given indexation and short maturity of public debt, which neutralizes the negative wealth effect that would affect public debt holders when the policy rate goes up; and (iii) a relatively low credit-to-GDP ratio when compared with other emerging markets, which reduces the impact of the credit channel for a given increase in the policy rate.

III. ECONOMETRIC ANALYSIS

This section uses time-series cross-section data to provide a more formal analysis of the factors that may have associated with higher real interest rates.

A. Sample and Data Sources

The sample includes all emerging market inflation targeting regimes.² It does not include advanced IT regimes (Australia, Canada, Iceland, Israel, New Zealand, Norway,

² In addition, direct transfers from the Treasury to BNDES, which increased its lending capacity by over 6 percent of GDP, only started in 2008 and expanded substantially in 2009–10. Hence, while this argument has been cited by several analysts, it cannot be tested empirically.

Sweden and the U.K.) because (i) causal processes are likely to be different; (ii) we are interested in countries that can be more easily compared to Brazil and (iii) there is a need to limit parameter heterogeneity (i.e., the model would be of little use if it works on average, but does not “explain” anything in Brazil). The data are collected from the International Finance Statistics (IFS), which ensures comparability across countries, and complemented by the World Economic Outlook (WEO) in case of data gaps. The time period covers almost three decades of data (1980–2009) and is sufficiently long to apply dynamic time series analysis.³

B. Model

The estimation is based on a panel error correction model (ECM)⁴ in the following form:

$$[1] \Delta Y_{i,t} = \alpha + \Delta X_{i,t-1} \beta_k + \phi [Y_{i,t-1} - X_{i,t-1} \gamma] + \xi_{i,t}$$

where, $Y_{i,t}$ is the ex-post short-term real interest rate in country i during year t , Δ is the first differences operator, X is a vector of independent variables and $\xi_{i,t}$ is a white noise error term. The model describes a short-term equilibrium relationship given by $\Delta Y_{i,t} = \alpha + \Delta X_{i,t-1} \beta_k$ and a an error correction term $\phi [Y_{i,t-1} - X_{i,t-1} \gamma]$, which measures the deviation from this short-term equilibrium relationship and captures long-term dynamics. In order to estimate Equation 1, it is useful to restate it through a simple mathematical operation: Let β_j be defined as $-(\phi * \gamma)$, where both parameters ϕ and γ come from equation 1, then it follows that $\gamma = \beta_j / -\phi$. Equation 1 can therefore be rewritten as:

$$[2] \Delta Y_{i,t} = \alpha + Y_{i,t-1} \phi + \Delta X_{i,t-1} \beta_k + X_{i,t-1} \beta_j + \xi_{i,t}$$

And equation 2 can be estimated through ordinary least squares (OLS) if the error term shows no signs of serial correlation, or through the General Method of Moments (Arellano-Bond estimator) in the contrary case.

The vector of independent variables includes per-capita GDP in purchasing parity values (PPPCAP), which tests the hypothesis that the real interest rate (or marginal productivity of capital) is lower in countries at a higher level of development; the current account balance in

² Brazil, Chile, Colombia, Czech Republic, Hungary, Indonesia, Korea, Mexico, Peru, Philippines, Poland, Romania, South Africa, Thailand, Turkey.

³ The panel is unbalanced given that data for some countries (especially those in Easter Europe) is only available from the early 1990s.

⁴ Preliminary tests suggest that some of the data series are not stationary, but can be modeled as sharing a common trend or cointegrating vector.

percent of GDP (CAB_Y); private savings in percent of GDP (PRIVSAVINGS_Y); the overall fiscal balance of the general government in percent of GDP (GOVBAL_Y), which is a proxy for net government savings; the federal funds rate (FED_RATE) to control for international monetary conditions; inflation volatility (INPVOL), and a dummy variable to test for the effects of the change to an inflation-targeting regime (IT). The baseline model is estimated through OLS with Huber iterations (robust regression) to control for outliers.⁵

The model works reasonably well, on average, for the entire sample (Figure 7) and for the case of Brazil (Figure 8). The main results can be summarized as follows: The real interest rate declines to the extent that private savings increase, and the overall government fiscal and the external current account balances improve. Increases in inflation volatility are associated with increases in the real interest rate, while adoption of an inflation targeting regime results in a significant reduction in real interest rates in the short-term. In particular:

- **Inflation Volatility.** An increase of one standard deviation in inflation volatility is associated with an increase in the real interest rate of about 1.4 percentage points. In the case of Brazil, the reduction in inflation volatility over time is associated with a reduction in the real interest rate of over two percentage points. This variable has had a very substantial effect in helping to reduce interest rates but is unlikely to play a key role in the future because Brazil has already achieved very low levels of inflation volatility (comparable to those observed in other emerging markets; Figure 6).
- **Inflation Targeting Regime.** Controlling for all other factors in the model, the adoption of an inflation-targeting regime is associated with an average reduction in real interest rates of almost 1.6 percentage points. The effect is not permanent, however, as the *levels* variable is not statistically significant.

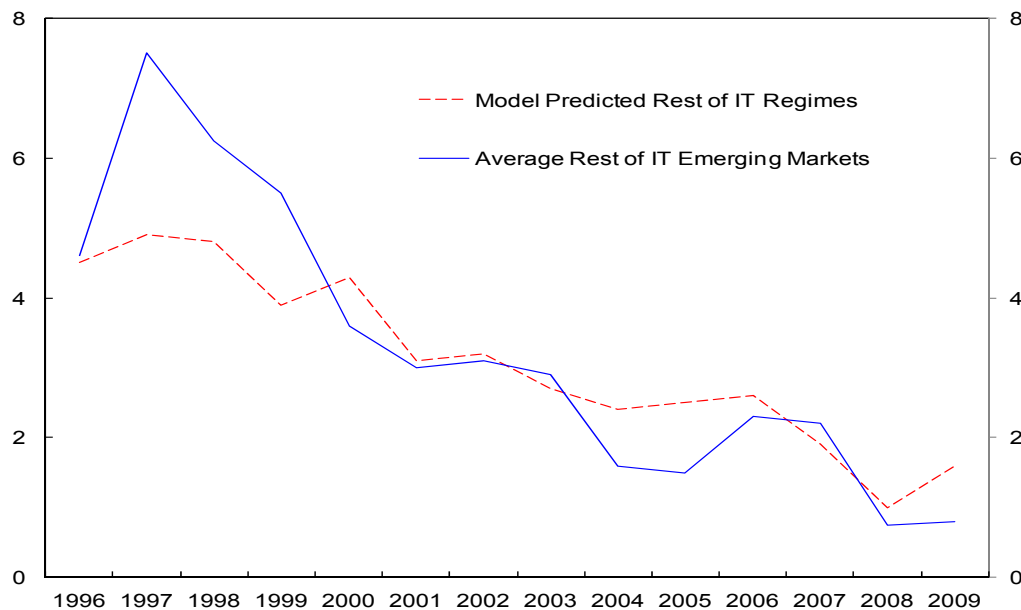
⁵ About 4 percent of the observations take extreme values and become outliers that need to be controlled for. Furthermore, some variables cannot be included in the model to avoid simultaneity bias. Granger causality tests show that changes in the dependent variable (real interest rate) have an impact on inflation and also on the real effective exchange rate. These variables cannot be used on the right hand side of the equation. The real interest rate does not “Granger cause” the level of private savings, inflation volatility or any of the other right-hand side variables. The residuals do not show signs of significant serial correlation, which suggests that the inclusion of a lagged dependent variable in the model is not biasing the results.

Table 1. Determinants of Real Interest Rates in Emerging Market Inflation-Targeting Countries, 1980–2009. (Dependent variable is D.REALINT)

	Coefficient	Standard Error	t	P> t
L.REALINT	-.31207***	.0122	-25.48	0.000
L.PPPCAP	0.00000	.0000	0.04	0.971
D.PPPCAP	0.00028	.0006	0.45	0.652
L.CAB_Y	-.12359**	.0614	-2.01	0.045
D.CAB_Y	-.12691	.0856	-1.48	0.139
L.PRIVSAVINGS_Y	-.08903*	.0539	-1.65	0.100
D.PRIVSAVINGS_Y	-.06259	.0906	-0.69	0.490
L.GOVBAL_Y	-.26077***	.0729	-3.58	0.000
D.GOVBAL_Y	-.37139***	.1064	-3.49	0.001
L.FED_RATE	.164647**	.0759	2.17	0.031
D.FED_RATE	.347821***	.1181	2.94	0.003
L.IT	-.47424	.6177	-0.77	0.443
D.IT	-1.6391**	.9321	-1.76	0.080
L.INFVOL	.458668*	.2721	1.69	0.093
D.INFVOL	1.31338***	.5901	2.23	0.027

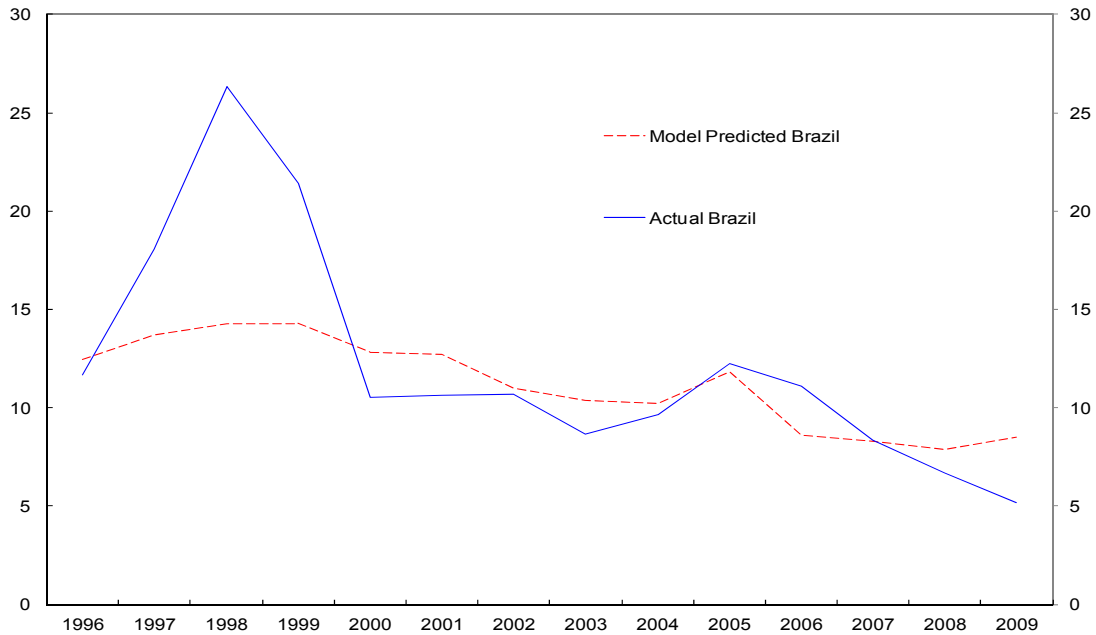
Notes: (***) Significant at the 99 percent level; (**) Significant at the 95 percent levels; (*) significant at the 90 percent level. $N = 364$; $F(29, 334) = 384.16$; $\text{Prob.} > F = 0.0000$. The “L” prefix indicates variable in levels with one lag, while the prefix “D” indicates a first-differenced variable. The suffix “Y” indicates that the variable is measured in percent of GDP. The long-term effect is obtained by dividing the coefficient of each independent variable in levels by the absolute value of the coefficient associated with the lagged dependent variable (L.REALINT). [See equation model discussion above]. Model estimated with fixed effects. The average fixed effect is about 2, suggesting that, controlling for everything else in the model, real interest rates in Brazil are about two percentage points higher than in other IT regimes for reasons that cannot be identified by the model.

Figure 7. Actual and Predicted Interest Rates in IT Regimes, 1996–2009



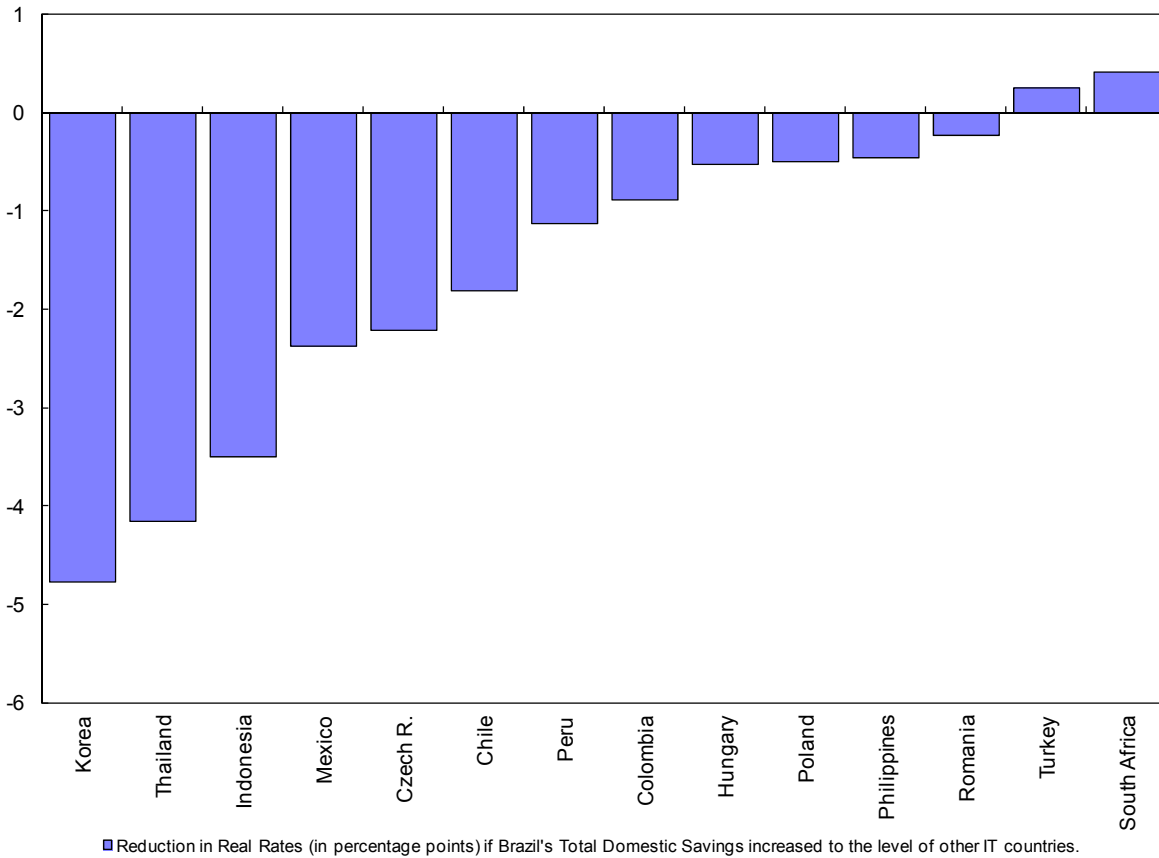
- International Monetary Conditions.** International monetary conditions, as proxied by the federal funds rate, also matter. An increase in the fed funds rate of one percentage point is associated with an increase in the real interest rate of about 0.3 percentage points in the short-term (D.FED_RATE) and has a long-term effect of about 0.5 percentage points (captured by the variable L.FED_RATE) .

Figure 8. Real and Model-predicted Real Interest Rates in Brazil, 1996–2009.



- Domestic Savings.** Increases in private savings and government savings (as measured by the improvement in the overall fiscal balance) are strongly associated with reductions in real interest rates. This is also in line with initial theoretical expectations. The model shows that the increase in domestic savings via an improvement in the fiscal position has an effect that is about three times higher than the one that would arise from an equivalent increase in private savings. This seems to be the most important variable in the Brazilian case because the margin to increase domestic savings in Brazil is substantial. As an illustration, if average domestic savings increased in Brazil from its sample average of 16.5 percent of GDP to the average of Mexico (22.6 percent of GDP), the model would predict that real interest rates would decline by over 2 percentage points. While a full reduction of 4–5 percentage points would require increasing domestic savings to the levels of Thailand or Korea (about 30 percent of GDP), which has never been observed in Brazilian history, reaching the level of domestic savings of Mexico should be more feasible for Brazil.

Figure 9. Brazil: Reduction in Real Interest Rates if Brazil's Domestic Savings Increased to the Level of Other IT Emerging Market Economies.



C. Robustness Checks

The results are robust to different model specifications and estimation techniques.⁶ An estimation using alternative methods yields similar results regarding the effects of the main variables, with the exception of the effects of private savings and the overall fiscal balance (a proxy for net government savings). The relative magnitude of the two coefficients varies depending on the estimation technique, but the coefficient associated with the overall fiscal balance is always larger, confirming the hypothesis that improvements in the government's fiscal position have a stronger impact in terms of reducing real interest rates over the long term than similar increases via private savings. Collapsing both variables (private savings

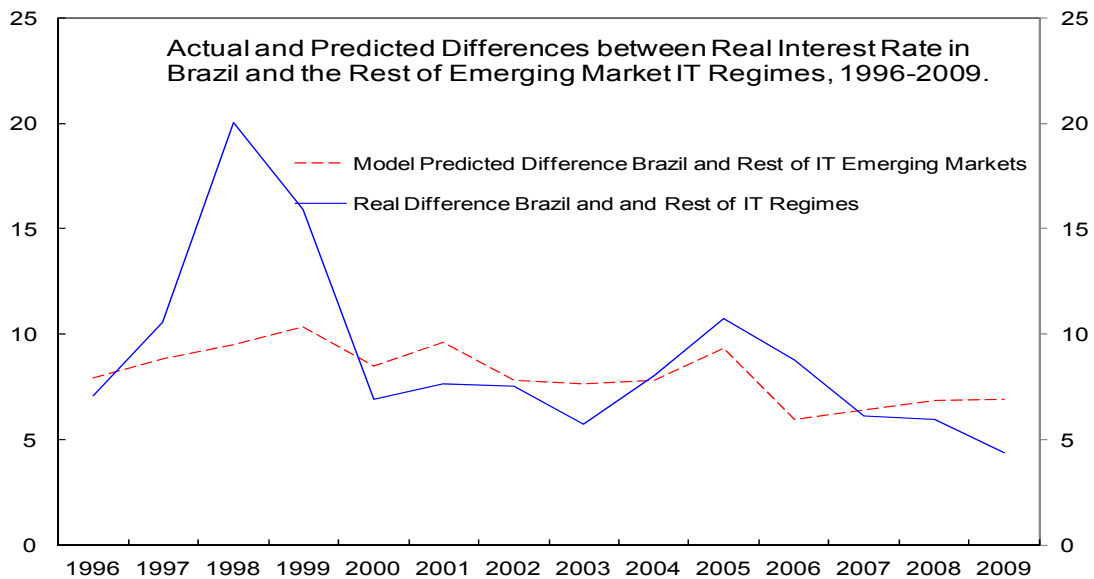
⁶ The following models have been estimated: OLS with panel-corrected standard errors (to control for spatial correlation), and with White-corrected standard errors (to correct for heteroskedasticity); the Arellano-Bond GMM model (to control for the effects of potential endogeneity bias), and a Generalized Least Squares Model (GLS).

and government savings) into one single variable produces an estimate that is between the two coefficients.⁷

IV. CONCLUSIONS

Brazil still has considerably higher real interest rates than other emerging market inflation targeting countries, but the difference has been reduced over time thanks to better economic fundamentals (i.e., drastic reduction in inflation volatility, an improved fiscal position, a stronger external position, and the credibility effect of the IT regime) (Figure 10).

Figure 10. Actual and Predicted Differences between the Real Interest Rate in Brazil and the Rest of Emerging Market IT Regimes, 1996–2009



Going forward, increasing domestic savings would seem to be the single most important factor to reduce real interest rates in Brazil over time. This is the variable that has potentially the most promising effect because Brazil still has a low level of domestic savings and there is therefore substantial room for this variable to expand. Raising domestic savings to the level of Mexico would reduce the average difference with the rest of the IT emerging markets by almost 50 percent.

Increasing domestic savings through an improvement in the fiscal position is likely to produce potentially larger effects. This is suggested by the larger magnitude of the regression coefficient associated with this variable. However, reducing the difference between Brazil and the rest of the IT regimes completely through increases in domestic savings alone would require saving rates similar to Korea or Indonesia (30 percent of GDP). This does not seem realistic for Brazil in the near term. The results also show that

⁷ This is the coefficient that has been used to generate Figure 9.

controlling for everything else in the model, Brazil's real interest rates are still about 2 percentage points higher than those of its inflation targeting peers (this is captured by the fixed effects in the regression model). This suggests that there are other country-specific factors that could be associated with higher real interest rates in Brazil beyond those presented in the model. A potentially important factor in this regard, which could not be tested empirically for lack of comparative data, and would require particular attention in future research would be the effect of public lending at subsidized rates. While this type of lending was one of the most effective countercyclical tools the Brazilian authorities used during the post-Lehman crisis, its use in normal times should be mindful of the fact that it may also be reducing the transmission mechanism of monetary policy and contributing to a higher market-determined equilibrium interest rate.

REFERENCES

- Arida, Persio, Edmar Bacha and Andre Lara-Resende, 2004, "High Interest Rates in Brazil: Conjectures on the Jurisdictional Uncertainty," *Nucleo de Estudos de Politica Economica*, Casa das Garcas (NUPE/CdG), March.
- Bacha, Edmar, Marcio Holland and Fernando Goncalves, 2007, "Is Brazil Different? Risk, Dollarization, and Interest Rates in Emerging Markets," IMF Working Paper 07/294 (Washington: International Monetary Fund).
- Barbosa-Filho, Nelson, 2008, "Inflation Targeting in Brazil: 1999–2006," *International Review of Applied Economics* Vol. 22(2), pp. 187–200.
- Bevilaqua, Afonso, Mario Mesquita and Andre Minella, 2007, "Brazil: Taming Inflation Expectations," Central Bank of Brazil Working Paper No. 129.
- Blanchard, Olivier, 2004, "Fiscal Dominance and Inflation Targeting: Lessons from Brazil," NBER Working Paper No. 10389 (Cambridge, Massachusetts: MIT Press).
- Catao, Luis, Douglas Laxton and Adrian Pagan, 2008, "Monetary Transmission in an Emerging Targeter: The Case of Brazil," IMF Working Paper 08/191 (Washington: International Monetary Fund).
- Coates, Kenneth and Edwin Rivera, 2004, "Fiscal Dominance and Foreign Debt: Five Decades of Latin American Experience," Paper presented at the Latin American Workshop, Banco de Portugal, Lisbon, October 14–15.
- D'Amato, Jeffrey, 2005, "The Role of the Natural Rate of Interest in Monetary Policy," BIS Working Paper 171 (Basel: Bank for International Settlements).
- Favero, Carlo and Francesco Giavazzi, 2002, "Why are Brazil's Interest Rates so High," Innocencio Gasparini Institute for Economic Research, Working Paper No. 224.
- _____, and Francesco Giavazzi, 2004, "Inflation-Targeting and Debt: Lessons from Brazil," NBER Working Paper No.10390, (Cambridge, Massachusetts: MIT Press).
- Feldstein, Martin and Charles Horioka, 1980, "Domestic Savings and International Capital Flows," NBER Working Paper No. 310, (Cambridge, Massachusetts: MIT Press).
- Fraga, Arminio, 2005, "Fiscal Dominance and Inflation Targeting: Lessons from Brazil," In Giavazzi, Francesco, Ilan Goldfajn, and Santiago Herrera, eds. *Inflation Targeting, Debt and the Brazilian Experience, 1999 to 2003*, (Cambridge, Massachusetts: MIT Press).
- Fried, Joel and Peter Howitt, 1983, "The Effects of Inflation on Real Interest Rates," *American Economic Review*, Vol. 73(5), pp. 968–980.

- Gonçalves, Fernando, Marcio Holland and Andrei Spacov, 2007, “Can Jurisdictional Uncertainty and Capital Controls Explain the High Level of Real Interest Rates in Brazil? Evidence from Panel Data,” *Revista Brasileira de Economia*, Vol. 61(1): pp. 49–76.
- ITAU and Unibanco, 2010, “Real Interest Rate: Where is Neutral?”, Weekly Macro Report, January 12, 2010.
- Hausmann, Ricardo, 2008, “In Search of the Chains that Hold Brazil Back”. *Harvard Center for International Development*, Working Paper No. 180.
- Miranda, Pedro Calhman and M. Muinhos, 2003, *A Taxa de Juros de Equilíbrio: Uma Abordagem Múltipla*. Central Bank of Brazil, Working Paper No. 66.
- Muinhos, Marcelo Kfoury and Marcio Nankane, 2006, “Comparing Equilibrium Real Interest Rates: Different Approaches to Measure Brazilian Rates,” Central Bank of Brazil Working Paper No. 101.
- Nahon, Bruno Freitas and Roberto Meuer, 2009, “Measuring Brazilian Central Bank Credibility Under Inflation Targeting,” *International Research Journal of Finance and Economics* Vol. 27, pp. 72–81.
- Neto, Paulo Chananeco and Marcelo Savino Portugal, 2009, “The Natural Rate of Interest in Brazil Between 1995 and 2005,” *Revista Brasileira de Economia* Vol. 63 No. 2, pp. 103–118.
- Rogoff, Kenneth and Maurice Obstfeld, 2000, “The Six Major Puzzles in International Macroeconomics: Is There a Common Cause,” NBER Working Paper No. 7777, (Cambridge, Massachusetts: MIT Press).
- _____, 2005, “Strategies for Bringing Down Long-Term Real Interest Rates in Brazil,” Presentation prepared for the Central Bank of Brazil, August 30, 2005.
- Woodford, Michael, 2003, *Interest and Prices, Foundations of a Theory of Monetary Policy*. (Princeton, NJ: Princeton University Press).
- World Bank, 2006, *Brazil: Interest Rates and Intermediation Spreads*, Report No. 36628-BR. (Washington, DC).