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Working Paper

Brazil in the 21st century: How to escape the high real interest trap?

Texto para discussão, No. 466

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Suggested Citation: Garcia, Márcio G. P. (2002) : Brazil in the 21st century: How to escape the high real interest trap?, Texto para discussão, No. 466, Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), Departamento de Economia, Rio de Janeiro

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Brazil in the 21st Century:

How to Escape the High Real Interest Trap?

Márcio G. P. Garcia¹

April 2003

Abstract

The hope that lower real interest rates and higher growth would follow the floatation of the Real was in large measure frustrated. Two international liquidity crises, caused by the reversal of capital flows, occurred in 2001 and 2002. These crises were associated with higher interest rates, lower economic activity, and higher inflation. Therefore, the term “exchange rate stagflation” seems to characterize the essence of this phenomenon. A stylized model by Caballero and Krishnamurthy [2002] explains these events. The main characteristic of the model is that domestic investment depends on the aggregate international liquidity of the economy, which is a limiting factor. During a liquidity crisis, liquidity is reduced, and the economy falls in recession. Neither the fiscal authority nor the monetary authority can reflate the economy by increasing government expenditures or the money supply.

The bulk of the difficulties Brazil faced in 2002 stemmed from the uncertainty associated with the course of the future economic policy to be followed by the new administration and from the sustainability of the public debt. To avert a painful default, real interest rates must fall and sustained growth must resume. To increase the chances of success, several policy measures are suggested:

- To further the integration of Brazilian and international financial markets;
- To increase the exportability of the economy;
- To increase the fiscal effort, in order to help dispel the doubts over the sustainability of the public debt;
- To increase the credibility of the monetary authority, by conferring instrument independence to the Brazilian Central Bank; and
- To resume the debt management efforts to lengthen the debt profile while reducing the indexation to the exchange rate and to the Selic short term rate, by making larger use of inflation-linked bonds.

When and if the international liquidity crisis is overcome, the above measures will help Brazil lower the real interest rates and achieve sustained growth.

Keywords: Interest Rate, International Liquidity, Risk Premium.

JEL Classification Index: E43, F31, G15

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¹ Visiting Associate Professor, CREDPR, Stanford University, and Associate Professor, PUC-Rio. Prepared for the III annual Latin American CREDPR conference on Financial Market Development in Latin America, Stanford University, November 8 and 9, 2002. Special thanks to Edmar Bacha, Marcos Chamon, Vittorio Corbo, José Antonio Gonzalez, Eduardo Guardia, Arnold Harberger, Nick Hope, Anne Krueger, Larry Lau, Eduardo Loyo, Ronald McKinnon, Pedro Miranda, Roberto Rigobon, Sergio Schmukler and Aaron Tornel. Also, thanks to Tiago Beriel, Marcelo Hallack, Gabriel Pinto, Slavi Slavov, and especially Bernardo Carvalho for superb research assistance. All errors are mine.

List of Abbreviations

BCB	Brazilian Central Bank
bps	Basis points
BRL	Brazilian Real
CK	Caballero and Krishnamurthy (as in model)
COPOM	Comitê de Política Monetária (Brazilian equivalent of the FOMC)
COR	C-Bond spread over US Treasuries (a measure of country-risk)
CUR	Currency Risk
CIPD	Covered-interest-parity differential (a measure of country-risk)
DL	Domestic Liquidity
EMBI	Emerging Markets Bond Index (JP Morgan)
Fed	US Federal Reserve
FOMC	Federal Open Market Committee
LHS	Left Hand Side (as in scale on a chart)
RHS	Right Hand Side (as in scale on a chart)
USD	United States Dollar
VAR	Vector Auto-Regression

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1. Introduction

With the Real Plan of July 1994, Brazil finally tamed inflation. Eight years later, inflation remains subdued, but real interest rates in Brazil still rank among the highest in the world. The high real interest rates harm public finances and also jeopardize the Brazilian economy's growth prospects. The banking spread is also extremely high, making credit exceptionally expensive. Not surprisingly, outstanding credit provided by the financial sector remains below 25% of GDP². Finance through equity is also small. The total Brazilian market capitalization is 122 billion of US dollars (USD).³ The public sector remains the main attractor of private savings. The gross bonded domestic debt of the public sector has jumped from 11.5% to 39.5% of GDP in this eight-year period.⁴

For the financial sector to properly act as a support for sustained growth, several challenges loom ahead. Among those, this paper will deal with the fundamental question of how to lower the basic interest rate (Selic). This is a *sine qua non* condition both for the resumption of economic growth and for the sustainability of the public sector debt.

Section 2 lays out the main stylized facts for Brazil during the floating exchange rate period (1999-2002). It also presents a decomposition of the domestic interest rates identifying the main components of the high real interest rate. These components, in turn, will be interpreted in light of the model of Section 3 to derive policy recommendations.

Section 3 describes the IS-LM version of the model proposed by Caballero and Krishnamurthy (CK) for emerging markets [2002]. We use this simple adaptation of the traditional Mundell-Fleming model to explain the events and policy reactions that marked the first years (1999-2002) of the floating exchange rate experience.

Section 4 presents policy recommendations derived from the CK model aimed at reducing the real interest rate in the next years. Finally, Section 5 presents the conclusions.

² See Brazilian Central Bank, Monetary Policy Press Release of 28/01/2003.

³ See Bovespa, "Capitalização Bursátil," Market Daily Bulletin of 27/12/2002.

⁴ See Brazilian Central Bank, Fiscal Policy Press Release of 30/01/2003.

2. 1999-2002: The floating exchange rate experience

In this Section, we analyze the behavior of interest rates and of the exchange rate during the floating rate period of the Real Plan, which corresponds to the second term of President Fernando Henrique Cardoso. Table 1 displays the main macroeconomic indicators of that period.

Table 1: Macroeconomic Indicators of the Floating Period of the Real Plan				
	1999	2000	2001	2002*
<i>GDP Growth</i>	0.8%	4.4%	1.5%	1.5%
<i>Inflation (CPI)</i>	8.9%	6.0%	7.7%	12.5%
<i>Exchange Rate Depreciation</i>	48.0%	9.3%	18.7%	52.3%
<i>Nominal Interest Rate (Selic)</i>	24.8%	17.4%	17.2%	19.2%
<i>Real Interest Rate</i>	14.6%	10.8%	8.9%	11.1%**
<i>Fiscal Surplus (%GDP)</i>				
<i>Primary</i>	3.3%	3.6%	3.8%	3.9%
<i>Nominal</i>	-5.8%	-3.6%	-3.5%	-4.6%
<i>Current Account</i>				
<i>USD Billion</i>	-25.3	-24.2	-23.2	7.8
<i>%GDP</i>	-4.8%	-4.1%	-4.6%	1.7%

* Preliminary data.

** Ex ante real Interest Rate computed with the nominal Selic target rate of 25%, set on 12/18/02 and with the median CPI inflation expectation for 2003 according to the Brazilian Central Bank weekly survey (available at www.bcb.gov.br). The ex post real interest rate for 2002 was 6%, since inflation unexpectedly surged in the last months.

The second term of President Cardoso began with the change in the exchange rate regime. The Brazilian Real (BRL) was floated in January 1999. The inflation-targeting regime was introduced later in the second quarter. Also in marked contrast with the 1995-98 period, the primary fiscal balance posted a significant improvement. Growth, however, faltered, and the current account balance, despite the earlier depreciations, only fell below the 4% of GDP threshold in 2002.

The very high real interest rate, the low growth rate, the risky debt structure (which is highly indexed to the exchange rate and to the short term interest rate), and the recognition of hidden liabilities (the so called “skeletons in the closet”), made the net public debt to GDP ratio increase dramatically: from 30.4% in 1994 to 41.7% in 1998 and 55.9%⁵ in 2002.⁶ The sustainability of the public debt depends not only on the capacity of keeping high primary fiscal surpluses, but also on the lowering of the real interest rate and on the resumption of growth.⁷

Chart 1, which displays the evolution of both the Selic (Left Hand Side (LHS) scale) and Fed Funds (Right Hand Side (RHS) scale) target rates, demonstrates two features of the

⁵ See Brazilian Central Bank, Fiscal Policy Press Release of 30/01/2003.

⁶ See Garcia [2002] for a decomposition exercise of the debt growth.

⁷ For debt simulations under different scenarios, see Goldfajn [2002].

Brazilian monetary policy regime. First, the interest rate in Brazil is remarkably larger than its counterpart in the US (note the difference in the two scales). From the inflation data displayed in Table 1, it can be shown that these much higher nominal rates also translate in much higher real interest rates. Second, the changes in the interest rate targets display a clear negative correlation. As it is well known, monetary policy in the US operates counter-cyclically. However, Brazilian monetary policy is pro-cyclical, and is negatively correlated with the US's. The model in Section 3 will aim at explaining these seemingly paradoxical stylized facts.

In order to better understand the joint behavior of the exchange rate and interest rates, we perform a decomposition of Brazilian domestic interest rates according to the covered interest parity condition. This condition states that a US investor should be indifferent between investing in US bonds receiving the USD interest rate i_t^* , and investing in Brazilian bonds receiving the BRL interest rate i_t , plus contracting the exchange rate forward, thereby insuring against exchange rate fluctuations, so that both returns in USD are the same.⁸ The insurance premium is the depreciation rate computed by dividing the forward rate by the spot rate, also known as forward premium, fp_t . The forward premium encompasses not only the expected depreciation $E_t(\ln(S_T/S_0))$, but also a risk premium, usually called currency risk, CUR_t .⁹ Therefore, if the covered interest parity held, the domestic rate would equal the international interest rate plus the forward premium, i.e., Equation (1) would hold:

$$i_t = i_t^* + fp_t = i_t^* + E_t(\ln(S_T / S_0)) + CUR_t \quad (1).$$

The analysis for Brazil uncovers a substantial positive residual once both the international interest rate and the forward premium are subtracted. This covered-interest-parity differential (*CIPD*) is a measure of the country-risk.¹⁰ Therefore, Equation (1) must be adapted to fit the Brazilian data:

$$i_t = i_t^* + fp_t + CIPD_t = i_t^* + E_t(\ln(S_T / S_0)) + CUR_t + CIPD_t \quad (2).$$

Alternatively, sovereign bonds traded in international markets could be used to infer the country-risk. One of the most widely used measures of country-risk is the C-Bond spread, obtained from deducting the yield on US treasuries of the same duration from the yield offered by the C-Bond¹¹ in international secondary markets. We call this measure the country-risk, COR_t , since it is a measure derived from secondary international markets, which are not directly affected by domestic monetary policy measures. The comparison

⁸ The same parity condition holds from the perspective of a Brazilian investor, since this condition also implies that BRL returns are equal.

⁹ The currency risk may be negative, but this possibility is not relevant for Brazil.

¹⁰ The differential (or deviation) of the covered interest rates parity¹⁰ is the best measure of the lack of perfect capital mobility ...because it captures all barriers to integration of financial markets across national boundaries: transactions costs, information costs, capital controls, tax laws that discriminate by country of residence, default risk, and risk of future capital controls [Frankel, 1991].

¹¹ Among the several bonds traded in the international market during the eight-year period, the C-Bond (Capitalization Bond) was the most liquid one, thereby being chosen as the benchmark.

of the two measures of country-risk, $CIPD_t$ and COR_t , has important consequences for the joint behavior of the exchange rate and the interest rate, as we will argue below.

Chart 2A displays the interest rate decomposition described by Equation 2 from the time when President Cardoso took office in January 1995. The one-year nominal interest rate is the upper dark line. The one-year rate is usually higher than the basic rate (Selic) displayed in Table 1 because the yield curve has usually sloped upwards during the period studied.

The one-year interest rate is decomposed in three series, according to Equation 2. The lower dark blue area is the one-year interest rate on US Treasuries, i_t^* . On top of the international interest rate, the red area is the forward premium, fp_t . Finally, the yellow residual is the covered-interest-parity differential, $CIPD_t$.

To better contrast the behavior of the CIPD with the C-Bond spread, these two series are displayed separately in Chart 2B. Although the two lines are country-risk measures, they should differ for several reasons, as analyzed in Garcia and Valpassos [2000]:

1. The maturity and duration of the bonds involved are different; the C-Bond's being much longer than one year during the period studied. This effect is smaller the closer to the end of the period.
2. The tax treatment may be very different and it varies according to the investor.¹²
3. Capital controls (on capital inflows) affecting the domestic bonds were in place during the first half of the sample.¹³
4. The credit risk (default risk) may be perceived to vary across debt types (domestic vs. foreign). I.e., investors may believe that there is an order of default, and domestic debt may be junior or senior in relation to foreign debt.
5. In the event of an exchange rate crisis, restrictions on capital outflows may be imposed. If this were done without defaulting on the debt, it would only affect foreign investors who purchased domestic debt, while those that acquired foreign debt would not be harmed.

Despite all the reasons outlined above, the two Brazilian country-risk measures cannot drift too much apart without triggering financial strategies that revert the spread between the two to “normal”. In other words, if a negative shock—as an increase in the international investors risk aversion—increased the C-Bond spread, domestic interest rates would also have to rise. Otherwise, capital would flee the country, causing losses of foreign reserves (under the old crawling peg regime), or exchange rate depreciation (under the flexible exchange rate regime). In the first half of the sample, the crawling-peg period, the CIPD has systematically surpassed the C-Bond spread. Only during crises, when the C-Bond spread jumped upwards, has it been above the covered-interest-parity differential.

¹² See Oliveira [1997].

¹³ See Garcia and Barcinski [1998].

Salgado, Garcia, and Medeiros [2001] explain this behavior through a non-linear central bank reaction function. The argument is the following: the Brazilian Central Bank (BCB) faced two different constraints. In “good times,” foreign capital was plentiful, and the central bank reaction function did not take into consideration the pressure from the exchange rate (since it was a crawling peg, the pressure would materialize in a loss of foreign reserves to preserve the peg). During those periods, the BCB would act as a developed country central bank, concerned only with the inflation expectation and with the output gap. During crises, however, the loss of reserves necessary to preserve the peg would trigger another channel (call it the exchange rate channel) that would make interest rates jump upwards. Typically, as shown in Chart 2B, the C-Bond spread is the first to jump, and the CIPD moves later when domestic interest rates are raised to avoid further foreign reserves losses. Therefore, the increase in the difference between the C-Bond spread and the CIPD has served as a very good coincidental, and sometimes leading, indicator of crises.

After a turbulent initial period that followed the floatation of the BRL in January 1999, the relationship between the two country-risk measures was reversed: the C-Bond spread became systematically larger than the CIPD. Two possible reasons for that were the large increase in foreign direct investment (FDI) and the much lower inflow of short-term-arbitrage-funds to invest in Brazilian domestic debt. This suggests that the difference between the C-Bond spread and the CIPD—given all the taxes, legal restrictions, and perceived risks involved—was enough to prevent capital flight, but not enough to attract foreign funds as in the previous period.¹⁴

Chart 3 displays the interest rate decomposition data in a different format, more akin to the model of Section 3. It covers the period from January 2000 to April 2002. The year of 2000 was the only good year of the flexible regime. During 2000, the basic interest rate (Selic)—the dark green line (LHS scale)—fell throughout the year, and the exchange rate—the yellow area in the background (RHS scale)—stabilized. The slope of the yield curve is measured by the difference between the one-year interest rate—the black line (LHS scale)—and the Selic rate. The yield curve was not very steep,¹⁵ and even became inverted during brief periods, signaling the expectation of further fall in interest rates.

In Chart 3, the one-year interest rate is decomposed in two parts: the forward premium—the red line (LHS scale)—, corresponding to the depreciation one-year ahead; and the domestic USD rate—the blue line (LHS scale)—, corresponding to the yield one gets by investing in a domestic bond indexed to the USD. I.e., one can either get a nominal rate

¹⁴ It is likely that the exchange rate volatility introduced by the new regime increased the risks involved in the financial strategy known as carry trade. This strategy consists of borrowing in low-yielding currency, exchanging the proceeds into a high-yielding currency and reverting the trade at the end. The gain is the difference in interest rates. If the low-yielding currency depreciates vis-à-vis the high-yielding currency, there is an additional capital gain. However, if the high-yielding currency depreciates, then the interest rate differential may be wiped out.

¹⁵ Liquidity for BRL-denominated government bonds without indexation clauses has always been very low for maturities longer than one year. This is an example of the so-called original sin, i.e., the extreme difficulty in having a long-term credit market in the domestic currency (see Goldfajn and Rigobon [2000]).

in BRL, or buy a bond that pays the actual (ex-post) depreciation plus the USD domestic rate. In terms of the variables in Equation (2), the domestic USD rate equals $i_t^* + CIPD_t$.

The C-Bond yield is also included as the brown line (LHS scale). Finally, the difference between the C-Bond spread and the CIPD is portrayed as the purple line (LHS scale). During 2000, the forward premium and the USD domestic rate were both falling, evenly splitting the BRL domestic rate.¹⁶ The C-Bond yield remained stable. In early January 2001, the COPOM¹⁷ cut the Selic target to 15.25%, the lowest rate since the start of the Real Plan.

Unfortunately, a sequence of domestic and international events¹⁸ hindered the resumption of economic growth. After March 2001, it became clear that the good times were gone. The country-risk, as measured by the C-Bond spread, started trending upwards. The domestic interest rates also reacted. The Selic was increased several times, and the yield curve steepened drastically. The large increase in the one-year interest rate, can be fully attributed to the hike in the forward premium. The USD domestic rate actually fell during 2001, increasing the difference between the two country-risk measures.¹⁹ Until September 2001, the exchange rate depreciated continually.

The immense liquidity that was injected by the US Federal Reserve (Fed) after September 11, 2001 allowed the situation to improve until the first quarter of 2002. The C-Bond yield fell to its previous level, while the exchange rate appreciated. Interest rates fell, and the yield curve flattened.

However, not everything had reverted to the configuration that prevailed one year before. The forward premium remained at a much higher level, warning that the exchange rate appreciation was not to be seen as a long-lasting phenomenon. The difference between the two measures of country-risk was also large, signaling that “quasi-arbitrage” financial strategies involving capital outflows remained.

With the benefit of hindsight, we now know that another negative combination of domestic and international events created a confidence crisis that made the country-risk explode after April 2002. Chart 4 displays what happened during the second crisis bout.

¹⁶ This is most likely just a coincidence.

¹⁷ Comitê de Política Monetária (Monetary Policy Committee), the Brazilian equivalent of the FOMC (Federal Open Market Committee).

¹⁸ On the domestic side there were the energy crisis and the political disarray inside the government coalition. On the international side, it became clear that the US economy entered a recession and the Argentina crisis worsened considerably, bringing contagion to Brazil.

¹⁹ At least in theory, this high spread between the two country-risk measures, subject to the previous caveats, could have given rise to “good-deal arbitrages”. Such a financial strategy was accomplished through the purchase of the C-Bond or other external securities with Brazilian country-risk while shorting the domestic dollar-indexed securities, i.e., by borrowing in the domestic USD rate and converting the proceeds in USD to purchase the C-Bond in the international secondary market. The existence of this quasi-arbitrage opportunity during a long period was probably due to restrictions on capital outflows that limit the ability of domestic firms and financial institutions to remit funds abroad.

As during the 2001 crisis, the one-year interest rate rose along with the increase in the country-risk. Nevertheless, the COPOM decided to keep the downward movement in the Selic rate, justifying this move with the ensuing recession and a low pass-through from exchange rate depreciation to inflation. The Selic target was raised by 300 basis points (bps), from 18% to 21%, only on October 14, 2002. The decomposition of the increase in the one-year interest rate during the second crisis bout, however, reveals a completely opposite picture from the 2001 crisis. In 2002, the one-year interest rise was entirely due to the increase in the domestic USD rate, which lagged behind the C-Bond yield during the previous year. Simultaneously, in a clear indication that markets expected an appreciation of the BRL, the forward premium decreased substantially, even becoming negative.²⁰ A negative forward premium is akin to a lower forward exchange rate compared to the spot exchange rate.²¹ The BRL/USD exchange rate overshot, depreciating 70%, before closing the year around 50%.²² The real exchange rate was at the most depreciated level in the last three decades, a period that included several depreciation episodes and international financial crises.

The decomposition of the forward premium into the expected depreciation and the currency risk sheds more light in the joint behavior of interest rates and the exchange rate. However, the separation of the two components is not a clear-cut procedure. First, the expected inflation is itself a theoretical construct, since market players may disagree in their expectations. Even if we agree upon the existence of an expected inflation variable, the empirical literature points out the existence of a severe bias in survey data (see Chinn and Frankel [1994]). Alternatively, econometric methods may be used to disentangle the two components (see Garcia and Olivares [2001]).

Notwithstanding the previous caveats, a survey²³ compiled by the BCB is used to decompose the forward premium in the expected depreciation and the currency risk. The results are presented in Chart 5. The forward premium is the red line (LHS scale); the expected depreciation, the dark green line (LHS scale); and the currency risk, the light blue line (LHS scale). On the RHS scale is the exchange rate, as shown by the yellow in the background.

Chart 5 shows that during the 2001 depreciation episode, the forward premium increase was due to the hike in the currency risk, while expected depreciation became negative.²⁴ The same movements happened during the 2002 crisis, except that the expected depreciation became much more negative, while the currency risk still increased vis-à-vis the calm interim between the two exchange rate depreciation episodes. Chart 5

²⁰ This “expected” appreciation could be a sheer market outcome or a result of future measures that restricted capital outflows.

²¹ In market parlance, the forward market is said to be in backwardation.

²² In terms of the USD/BRL exchange rate, the dollar appreciation at the overshooting peak was 42%, ending the year with an appreciation of 35%.

²³ See Brazilian Central Bank, Focus-Market Readout of 10/18/2002.

²⁴ If agents believed that the exchange rate is a martingale (or a random walk), thereby issuing forecasts equal to the current values, and if these forecasts were measured with a lag, we would get expected appreciation when the currency is depreciating, and expected depreciation when the currency is appreciating.

demonstrates that the currency risk premium has almost always been positive,²⁵ even in periods of large expected appreciation of the BRL.

As Chart 4 shows, during the 2002 depreciation episode, the USD domestic rate became larger than the BRL domestic interest rate. Consequently, the forward premium became negative. Since there is an arbitrage between the domestic rate in BRL and the domestic rate in USD plus exchange rate indexation, the negative forward premium caused the yield curve in instruments indexed to the exchange rate to stay above the yield curve for BRL instruments. This effect is higher the shorter the instrument, since rates are annualized. For example, if the 1 month forward premium is -5% , an investor who purchased a USD indexed instrument would have to get at least a 5% a month, or 60% per year, just to break-even.²⁶

Chart 6 displays the yield curves for BRL and USD-indexed domestic instruments on October 22, 2002. For maturities equal to or less than one year, the USD domestic yield curve is higher than the BRL domestic yield curve. This is a very unusual situation that signaled the extreme scarcity of foreign liquidity in Brazilian domestic markets.

In summary, the stylized facts are the following:

1. In both of the large depreciation episodes in 2001 and 2002, the country-risk measure given by the C-Bond spread increased, although the increase was much more pronounced in the latter episode than in the former. This latter episode is associated with large exchange rate outflows from Brazil in fear of a possible future default on the public debt.
2. In the 2001 episode, the CIPD and the domestic USD interest rate decreased, while they increased significantly during the 2002 episode. Conversely, the forward premium increased substantially in 2001, and became negative in 2002.
3. The negative forward premium gave rise to an inverted yield curve of USD domestic rates that surpassed the BRL yield curve for maturities up to one-year.
4. The 2002 depreciation created an expectation of nominal appreciation of the BRL, a very unusual situation. Nevertheless, the currency risk remained positive in both depreciation episodes.

An alternative way to put the above facts is the following: the extreme scarcity of foreign liquidity in the 2002 crisis substantially increased the return in USD domestic instruments. Because of no arbitrage, either the domestic interest rate would have to increase much more than it did, or an expected appreciation of the BRL would have to be generated. For this to happen—and given that the long term equilibrium real exchange rate should have also depreciated because of the worse prospects of capital inflows—the BRL/USD exchange rate had to overshoot. The model in the next section will help to interpret some of the facts, and to derive policy recommendations.

²⁵ Except for a brief period around the end of March 2000, when the exchange rate reached a trough.

²⁶ Simple interest is used because these financial contracts are traded with this interest rate convention.

3. A version of the CK model for segmented financial markets

The fundamental characteristic for a model to adequately represent the events described in the previous section is the imperfect integration (segmentation) between the Brazilian domestic market and international financial markets. Here we resort to the simplest version of the dual liquidity models developed by Caballero and Krishnamurthy [2002].²⁷ This static simple model is akin to the traditional Mundell-Fleming IS-LM-BP model²⁸ with a restriction on the amount of foreign liquidity that can be used as collateral for foreign capital inflows.

To simplify, CK assumes a small open economy where all private investment and public outlays must be foreign-financed, i.e.:

$$I + G = CF \quad (3)$$

where I is domestic investment, G is government outlays, and CF is net capital inflows.²⁹ Given this simplifying assumption, an external crisis is a situation where there is not enough capital flows to implement the desired levels of investment and public outlays. I.e., the economy is restricted by the availability of foreign capital inflows. CK assumes that, during crises, the economy has an insufficient amount of international liquidity (financial claims on futures cash flows that can be sold to foreign and domestic lenders alike), IL . Loans backed by international liquidity are made at the international rate i^* . Inequality (4)—always valid—holds as equality in a crisis:

$$I + G \leq IL \quad (4).$$

The sole function of the domestic financial market is to redistribute international liquidity among domestic agents, since the domestic owners of international liquidity are not necessarily those with investment projects. Domestic agents may borrow from other domestic agents according to their domestic liquidity, DL , which is a decreasing function of the domestic interest rate, i^p .³⁰ When a firm borrows international liquidity from a domestic agent, it pays a domestic rate indexed to the currency depreciation, call it, the domestic dollar rate, i^d .

Investment is a decreasing function of both rates i^p and i^d . Since i^d is the firm's cost of capital, the higher the i^d , the lower the investment. When the central bank tightens

²⁷ See also Caballero and Krishnamurthy [2001a, 2001b, 2001c, and 2001d].

²⁸ See Williamson [1986] and Blanchard and Fischer [1989].

²⁹ In fact, all that is needed is that domestic absorption be larger than national output, generating a need for external savings (current account deficits).

³⁰ In Caballero and Krishnamurthy [2002], the superscript p stands for peso. We opted not to substitute the real rate for the peso rate to avoid the possible confusion between the name of the Brazilian currency and the adjective real.

monetary policy, i.e., increases i^p , the present value of future cash flows falls, reducing DL , the collateral firms can offer, thereby reducing investment, *ceteris paribus*.³¹

$$I(i^d, i^p); \frac{\partial I}{\partial i^d} < 0, \frac{\partial I}{\partial i^p} < 0 \quad (5).$$

The CK model of emerging markets' crises is better understood with the help of Figures 1A and 1B, where i^d and G are taken as given for the moment. The horizontal axis is $I+G$, which in this simplified framework determines the domestic absorption. According to inequality (4), $I+G$ is limited by the amount of international liquidity, represented in Figure 1 by the reversed-L shaped supply curve. A crisis is a reduction of the amount of IL , which forces firms to reduce aggregate investment.

$$I(i^d, \bar{i}^p) + G = IL \quad (6).$$

As shown in Figure 1A, the reduction in IL forces the dollar rate, i^d up, above the international rate, i_0^* . This does not represent an arbitrage opportunity for foreign investors because the amount of internationally accepted collateral is limited. Foreign loans have to be fully collateralized with international liquidity. Figure 1B represents the usual modeling of crises, where an external shock increases the risk premium, increasing i^d . While the same amount of aggregate investment could be produced with both models for the appropriate rescaling of the parameters, the key difference is that the supply of capital flows in the upper panel is completely inelastic, as opposed to the lower panel, where the supply of capital flows is completely elastic at the higher rate. This inability of higher dollar rates to increase the capital inflows will generate a completely new set of results that conforms to most stylized facts of the Brazilian experience, as it will be shown. Certainly, no supply is completely inelastic. However, anecdotal evidence supports the conjecture that the extremely large country-risk premium (above 2500 bps) on Brazilian sovereign bonds in 2002 was a result of quantitative restrictions.³²

A *domestic* investor with a unit of international liquidity may either lend this unit to another domestic agent, receiving the domestic dollar rate, i^d , or convert this unit in domestic currency and invest it at the domestic interest rate, i^p . The *domestic* interest parity condition that corresponds to the non-arbitrage condition of a *domestic* investor that possesses one unit of international liquidity is given by Equation (7), where \hat{e} is the expected appreciation of the domestic currency.

$$i^d = i^p + \hat{e} \quad (7)$$

³¹ We could simply assume that higher domestic interest rates would lower domestic absorption. However, since CK assumed that investment is fully financed from abroad, this domestic credit channel is needed.

³² A few large international banks that used to do the short term carry trade in Brazil simply stopped doing such "arbitrage" strategies after April 2002. Also, trade credit lines, which remained even during the worst moments of the previous crises, were severely curtailed after April 2002.

If the domestic dollar rate rises, either the monetary authority has to tighten monetary policy by raising i^p , or an expected appreciation must be generated.³³ Future expected appreciation is generated through the current depreciation of the spot exchange rate (overshooting). The depreciation causes the dollar value of all domestic assets to fall, i.e., even though the future cash flows may remain the same, prices in dollar of, say, domestic stocks fall just because the economy lacks international liquidity.

Figure 1(A): External Crises: The Dual-Liquidity Model

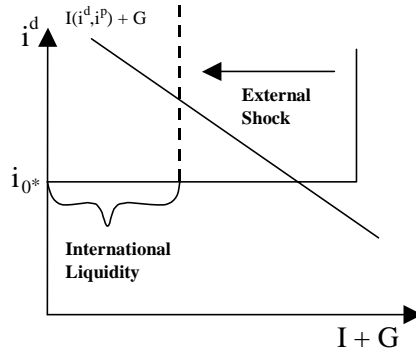
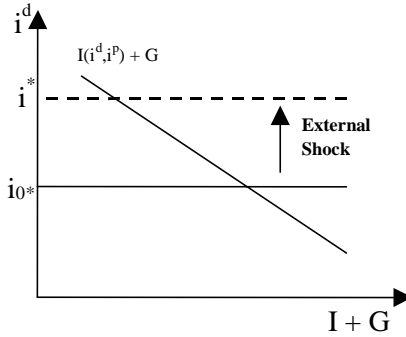


Figure 1(B): External Crises: The Standard Model



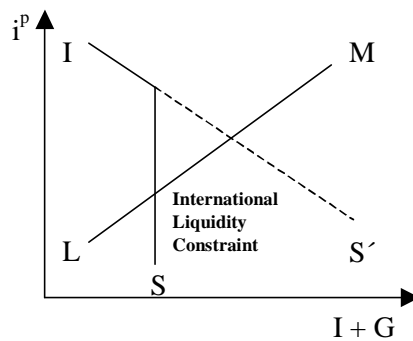
Caballero and Krishnamurthy [2002] models the monetary side with a simplified LM curve, Equation (8). Figure 2 illustrates the equilibrium in both the goods and the money markets. The standard model is represented by the IS' curve, while the CK model curve is IS, where the vertical segment follows from the limited IL .

$$L(\bar{i}^p, I + G) = M \quad (8)$$

Figures 1A and 2, together with Equation (7) determine the equilibrium of the investment plus government outlays level, the domestic interest rate, the domestic dollar rate and the exchange rate.

³³ Since this simple static model does not consider uncertainty, the expected appreciation must equal the actual one.

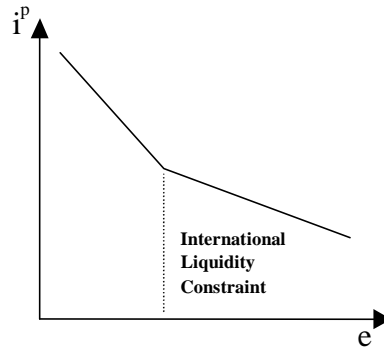
Figure 2: Equilibrium



This simple model is sufficient to exemplify some of the new results arising from assuming the segmentation of the domestic and the international financial markets. For example, in the standard model, an expansionary monetary policy, by moving the LM to the right and reducing the domestic interest rate, i^p , raises firms' net worth, relaxing their domestic financial constraint, thereby increasing investment. In the CK model, that does not happen because the model assumes that, during crises, the aggregate level of investment depends solely on IL . If, during a crisis, the monetary authority tries to reflate the economy by increasing money supply, it will create the aggregate effect of having all firms (now with a higher net worth, or DL in domestic currency) bidding higher for the fixed international liquidity, in order to invest more. It will only shift up the $I(i^d, i^p)$ schedule in Figure 1A, thereby raising i^d , and further depreciating the exchange rate through the domestic interest parity condition, Equation (7).

The broken curve in Figure 3 shows the impact of monetary policy on the exchange rate in the CK model. The steeper segment corresponds to the non-crisis regime, where, according to the domestic interest parity condition, a decrease in the domestic interest rate causes the exchange rate to depreciate, while the domestic dollar rate remains fixed. However, when the amount of international liquidity becomes binding, further decreases in the domestic interest rate cause the domestic dollar rate to increase, requiring additional depreciation of the domestic currency.

Figure 3: The Relationship between the Domestic Interest Rate and the Exchange Rate



Regarding fiscal policy, the CK model also delivers contrasting results to those of the standard Mundell-Fleming model. The CK model introduces a new crowding-out effect, since investment and government outlays are competitors for the restricted international liquidity during crises. An increase in government outlays increases the domestic dollar rate, causing exchange rate *depreciation*. The contrast becomes even stronger under a fixed exchange rate regime with perfect capital mobility. In that case, the usual Mundell-Fleming model would predict that an increase in government outlays would create an incipient increase of the domestic interest rate, thereby attracting capital inflows that would appreciate the currency. To prevent the appreciation, the central bank would expand money, driving down the domestic interest rate to the previous international level. This causes the output to expand without the traditional crowding out effect. In the CK model, however, the increase in government outlays creates an incipient *depreciation*, because of the increase in the domestic dollar rate, while nothing happens to output. To keep the peg, the central bank has to increase the domestic interest rate (decrease the money supply).

Finally, more sophisticated versions of the CK model allows for the study of welfare effects of ex-ante policy options. The idea is that private agents face a trade-off while contemplating the alternative uses of a unit of international liquidity. It may be invested at the domestic dollar rate or used to import investment goods. A free-rider externality keeps the domestic dollar rate below the social value of an extra unit of international liquidity, thereby creating over-borrowing in good times that, which reduces the amount of international liquidity during crises. This market failure may be corrected in three different ways: the central bank may keep extra foreign reserves, it may tax the capital inflows, or it may commit to expansionary monetary policy during crises. Such commitment of lowering the domestic interest rate during the crisis would increase the domestic dollar rate towards its social optimal level. As Caballero and Krishnamurthy [2001] points out, however, such policy is time inconsistent.

As it will be discussed in the next section, these results are important in understanding the rationale of the BCB's actions under an inflation-targeting regime, as well as most of the movements in asset prices.

4. How to reduce the real interest rate?

The simple model depicted in the previous Section shows that the high real interest rates are not a result of “irrational” monetary policy, as some have claimed.³⁴ If the BCB had tried to reflate the economy out of the recession in the middle of an international liquidity crisis, all it would have obtained is further exchange rate depreciation, which in turn would have caused more inflation and no growth. If the basic interest rate (Selic) were to fall substantially, it would prompt larger capital outflows and further currency depreciation, which would fuel inflation. In the short run, the current account would adjust mainly through a decline in imports, since exports take time to increase. Investment would not pick up, since macroeconomic uncertainty would increase. Consumption could increase, but that alone would not lead to sustained growth. In summary, in this exchange-rate-led stagflation, the Brazilian economy would have more inflation without being able to resume growth.

The shortage of capital flows causes the exchange rate to depreciate and the real interest rate to rise, negatively affecting economic activity and inflation. This powerful transmission channel of the business cycle in emerging markets—which works through the exchange rate—has been of little or no relevance in developed economies. For example, the fear of massive capital outflows³⁵ has never entered in the realm of the practical considerations that geared the Fed’s decisions of lowering interest rates to reflate the economy. This, however, is a luxury that emerging market central banks cannot afford. Reflating a recessionary economy in times of high-risk aversion is a procedure that is not found in emerging markets’ monetary policy manuals. The CK model captures the essence of the difference between an economy integrated in the international financial markets and an economy where international liquidity is binding.

The risk factors that account for the high real interest rate have to be addressed to obtain its sustained reduction. The stylized facts outlined in Section 2 show that, even in a context of segmented financial markets, there is a connection between the domestic interest rates and the secondary market yields of the foreign debt, as predicted by the covered interest parity condition with country-risk (Equation (2)). Therefore, the

³⁴ A few Brazilian economists have written that the interest rate is so high because the market knows less than the Central Bank and reads between the lines of the Central Bank’s actions to infer the amount of default risk. The Central Bank, according to the argument, has the power of choosing: if it signals high default risk through a high interest rate, that is what the market will believe. If, however, it signals low default risk through a low interest rate, the market will charge a low default risk premium. I do not think that asymmetric information is at the heart of the problem of the very high interest rate in Brazil, and therefore do not agree with this reasoning. In their assessment of this point, Favero and Giavazzi [2002] say that “... the experience of other countries which have successfully made the transition to a ‘good’ equilibrium suggests that one should not rely on such a transition happening automatically: Brazil may have to raise its primary surplus further, at least for some time, before the transition to a good equilibrium will allow the government to relax fiscal policy. A temporary increase in the primary surplus should be seen as an investment: the returns will justify the temporary sacrifice with a vengeance.”

³⁵ The IMF’s *Global Financial Stability Report* [2002] raises doubts on whether or not “... the United States will continue to attract and distribute substantial shares of international capital.”

reduction in the domestic real rate has to happen in the context of a reversal of the extremely high secondary market yields of the Brazilian foreign debt.

A large body of literature has been dedicated to uncover the explanatory factors of country-risk spreads.³⁶ The characteristics of the domestic economy as well as the conditions of the international financial markets usually explain the bulk of the spreads. Garcia and Didier's [2002] attempt to explain the time-series behavior of the Brazilian country-risk indicates that the expectations for the future path of the fiscal and current account balances, as well as the conditions of the domestic and international financial markets are able to account for large part of the variance.

There is not much that domestic policies can do to improve the state of extreme risk aversion in international markets. However, the behavior of the Brazilian country-risk has been much worse than the average emerging markets bond index, measured by the JP Morgan family of Emerging Market Bond Indices (EMBI). This is an indication that domestic actions may potentially play a large role in reducing the country-risk spread.

The 2002 "explosion" of the country-risk spread, which surpassed the 2500 bps threshold, was in large measure due to the uncertainty of the presidential election. Investors feared that the election of then front-runner candidate Luís Inácio Lula da Silva would be followed by a public debt default. As of early March 2003, the uncertainty in this regard has been considerably reduced as President Lula da Silva unveiled a set of orthodox economic policies, as well as nominated market-friendly names as members of his economic team. If the new administration sticks to the terms of the IMF agreement, both in deeds and words, the country-risk spread is bound to fall, especially considering that pre-election bond prices were highly depressed due to the fear of abandonment of austere fiscal and monetary policies. Such result is consistent with the multiple equilibrium model developed by Razin and Sadka [2002], where "... an external correction of the country's credit rating can be self-validated in the sense that it could reduce the country's prime rate, restore investment and shrink the fiscal deficit." If, however, lax fiscal and monetary policies are followed, the country-risk spread will not fall and no reduction in real interest rate can occur barring heterodox measures as controls on capital outflows.³⁷

But the challenges that loom ahead for the new president are more complex than merely maintaining the policies of his predecessor's second term. Even before the uncertainty generated by the presidential elections became an issue, the country-risk spread was already high. During the good year of 2000, the behavior of the interest rate risk components analyzed in Section 2 reveal that much more has to be achieved in order to reduce the real interest rate and resume sustained growth.

³⁶ See, for example, Bekaert et al. [1996], Duffie et al. [2001], and Cruces et al. [2002].

³⁷ Lower (even negative) real interest rates may result from financial repression if exchange rate controls are introduced (McKinnon [1973]). However, such scenario will not be analyzed, as it would not bring the ultimate objective of sustained economic growth.

In their study of the causes of the high interest rates in Brazil, Favero and Giavazzi [2002] conclude that:

future expected monetary policy plays a very small role in explaining fluctuations of interest rates at longer maturities. (...) Such term premia are strongly correlated with Brady bond spreads, which are not (at least directly) affected by devaluation expectations. We conclude that macroeconomic fundamentals and debt dynamics are the main determinants of the term spread of Brazilian rates.

With the benefit of hindsight, we now know that after the large depreciation of 2002, the pass-through coefficient from the exchange rate depreciation to inflation is much higher than previously estimated,³⁸ causing a surge in inflation. That prompted the BCB to raise the Selic rate from 18% in October, 2002 to 26.5% in February, 2003. Such a gargantuan increase in interest rates would probably justify the large term premia present in the data. Therefore, Favero and Giavazzi's [2002] econometric results suffered from a small sample bias akin to the Peso Problem.³⁹

In any case, their vector auto-regression (VAR) exercise is flawed because it excludes the exchange rate. Chart 7 makes it clear that not only the C-Bond spread is highly positively correlated with the one-year-term premium (the difference between the one-year interest rate and the Selic rate),⁴⁰ but also that both are highly positively correlated to the exchange rate.⁴¹ By excluding the exchange rate from their simulation model of future Selic rates, Favero and Giavazzi [2002] overlooks the effect of the exchange rate channel on domestic inflation, which feeds into the central bank reaction function.

The hypothesis of how term premia are formed is the following: the increase in the country-risk premium reflects the reduction of international liquidity, which in Figure 1A would be seen as a shift of the vertical part of L-shaped curve. By the domestic interest parity condition, Equation (7), the rise in the domestic dollar rate, in the absence of a monetary policy tightening, causes the exchange rate to depreciate. Large depreciations are associated with increases in both the mean and the variance of the (future) inflation distribution.⁴²

The BCB must then react to the increase in both the expected inflation and in inflation uncertainty. Market participants may form different beliefs as to what such reaction will be. The key point, however, is that all (possibly different) beliefs lead to the same (qualitative) conclusion that the nominal interest rate for medium term (six-months to two-years) will rise.

³⁸ The nonlinear nature of the pass-through coefficient seems to be responsible for the downward estimation bias. See Carneiro, Monteiro, and Wu [2002].

³⁹ See Lewis [1995].

⁴⁰ The simple correlation coefficient is 0.78.

⁴¹ The simple correlation coefficients are 0.84 (exchange rate and C-bond spread) and 0.79 (exchange rate and one-year-term premium).

⁴² The high inflation numbers observed by the last quarter of 2002 seem to corroborate the non-linear behavior of the pass-through coefficient (see note 37).

To illustrate the above argument, consider that, given the increase in expected inflation and in inflation uncertainty, two mutually exclusive and opposite beliefs are formed as to how the BCB will react. One belief is that the central bank will stick to the inflation-targeting framework. The BCB will have to increase the Selic rate in the future to counteract the rise in inflation expectation, leading to both higher nominal and real interest rates. The nominal rate rises immediately and falls in the future as inflation expectations decrease. Since monetary policy is believed to take more than nine months to take effect, the average nominal rate increases for the six-month to two-year maturities.

Conversely, the alternative belief is that the necessarily tight monetary policy will not be pursued, and actual inflation will rise. The real interest rate will fall, and will keep falling as long as inflation expectations rise. Eventually, the nominal interest rate will have to be raised to avoid the capital flight associated with very low or negative real interest rates. Since inflation may grow unboundedly, Selic rates in the future would be extremely high, ultimately leading to a very steep yield curve.

Therefore, both scenarios lead to higher nominal rates for the six-month to two-year maturities, possibly explaining the shift in the term premia. Furthermore, the size of the term premium is positively related to the probability attributed that the BCB will revert to loose monetary policies. Unlike in developed economies, Brazilians have a fresh experience with hyperinflation. Indexation could come back very fast, quickly propping inflation to high numbers. In such a scenario, even low or negative real rates would be associated with much higher nominal interest rates in the medium term. If this hypothesis is true, the loss of credibility of the monetary authority would probably lead to even higher term premia, since loose monetary policies are associated with higher future inflation rates.

Compared to 2001, the 2002 depreciation episode also revealed a very different behavior in bond prices. In 2001 the depreciation was associated with a slight fall of the USD domestic rate, while in 2002 the (larger) depreciation was associated with a large increase in the USD domestic rate, as predicted by the CK model in the event of an international liquidity crisis. The different behavior is probably linked to the role of domestic-USD-indexed instruments as hedging instruments for *domestic* agents, which is not modeled in the CK model. The perfect foresight version of uncovered interest parity used in the CK model—Equation (7)—does not have all the elements of the covered interest parity with country-risk—Equation (2).

Suppose that agents incorporate the workings of the CK model in their behavior. In that case, they know that times of international liquidity crises are associated with low output and large depreciations, but the majority cannot diversify away this risk. Therefore, exchange rate depreciation constitutes a systemic risk for domestic agents. When an international liquidity crisis is expected to hit, the price of the insurance against the

systemic bad shock increases, i.e., the USD domestic dollar rate tends to fall.⁴³ This effect, absent in the CK model, tends to offset the increase of the USD domestic rate stemming from the smaller supply of international liquidity, given the domestic investment schedule. In 2001, the former effect slightly dominated. However, in 2002, the international liquidity shortage was much higher,⁴⁴ and the prevailing effect was the one modeled by the CK model. Also, in 2002, fears of the Brazilian government defaulting on the debt were widespread, which reduced the effectiveness of USD-indexed government bonds as systemic hedges. Looking at Equation (2) and Chart 4 we can see that for the price of the exchange rate depreciation hedge to fall, i.e., for the USD domestic rate to increase, the exchange rate overshoot, creating a negative forward premium.

In both cases, however, the depreciation was large, harming domestic output and inflation. The extreme vulnerability to external financial shocks is the Achilles' heel of the Brazilian economy. Without properly addressing it, sustained growth will continue to be elusive. While the enormous real depreciation that happened from 1999 to 2002 caused the trade balance and the current account balance to improve, as shown in Table 1, the cost of this is higher inflation rates and lower growth. The structure of the economy must be improved to allow a better trade-off for the monetary authority.

As explained above, the credibility of the BCB's inflation targeting regime is at the heart of the large term premium of Brazilian interest rates, ultimately harming economic growth. It goes without saying that improving credibility, by conferring instrument independence to the BCB, would be of great help. However, it would probably not be enough. It is necessary to reduce what has been called external vulnerability. As argued before, this is extremely relevant to enable the BCB to set interest rates compatible with economic investment and sustained growth.

Bacha [2002] refers to three, possibly complementary, ways of making emerging market economies less prone to exchange rate crises. The "global option" would be the creation of an international lender of last resort. However, this option would not be politically viable in the near future. The "regional option" would be "... the establishment of a free trade area in the Americas, accompanied by full dollarization." Given the reluctance of the US in letting international concerns intervene with its monetary policy, this option would likewise be of little immediate use. Finally, there would be measures at the national level, mainly "... to deepen and further long-term domestic financial markets, thus making the investment process less dependent on foreign finance." This would require an improvement in the long-term financial market, and an increase in the economy's "exportability."

This last point can again be illustrated with the CK model. If the amount of international liquidity of the economy is made to depend positively in the exchange rate, i.e.,

⁴³ An USD-linked domestic bond provides hedge against the exchange rate depreciation. The higher demand for exchange rate depreciation hedge builds up the bond's price, thereby lowering its yield, the USD domestic rate.

⁴⁴ As previously mentioned, even trade credit lines are reported to have been slashed.

depreciations increase net future cash flows in foreign currencies by improving the trade balance, then international liquidity crisis will not be as severe. The strength of this effect depends on the alluded “exportability” of the economy, which is very low in Brazil.⁴⁵ Therefore, increasing the tradable sector in the economy is fundamental to allowing better trade-offs to the central bank, which translates into lower average interest rates.

Unfortunately, this point is commonly misunderstood. For example, all the contenders in the 2002 presidential election, including President Lula, had in their economic programs “import substitution” as the main policy to deal with the external vulnerability. Although import substitution and export promotion may both lead to lower current-account deficits, the emphasis on import substitution is completely mistaken. After all, the goal is to have a (much) higher portion of the output that is “exportable”, i.e., which both meets the quality standards and is competitively produced (without subsidies). Import substitution promotion schemes in the past have led to low quality and high prices, while requiring large subsidies. If such policy slippage materializes, it will further jeopardize growth prospects.

Finally, much has been debated about the sustainability of the Brazilian public debt. Although this issue is not addressed in this paper,⁴⁶ it is clear that the increase in the perceived credit risk was responsible for the bulk of the “explosion” of the country-risk. When and if the crisis initiated in 2001-02 comes to an end, special attention must be paid to lowering the fragility of the debt structure, which today is mostly short-term and indexed to the Selic interest rate or to the exchange rate. The use of inflation-linked bonds, as the Chilean economy has been successfully using for decades, seems to be the least costly way to lengthen the debt maturity, thereby reducing risk and the interest rate.

⁴⁵ Brazil’s Export to GDP ratio has seldom surpassed 10%.

⁴⁶ See Garcia [2002], Goldfajn [2002], and Goldstein [2003].

5. Conclusion

Even after adopting the flexible exchange rate regime, Brazil suffered two major depreciation episodes in 2001 and 2002. These episodes were caused by the reversal of capital flows, and were associated with higher interest rates, lower economic activity and higher inflation. Therefore, the name “exchange rate stagflation” seems to characterize the essence of the phenomenon.

In order to explain the exchange rate stagflation, a stylized model, due to Caballero and Krishnamurthy [2002], was used. The main characteristic of the model is that domestic investment depends on the aggregate international liquidity of the economy, which is a limiting factor. During a liquidity crisis, the amount of aggregate international liquidity is reduced, and the economy falls in recession. Neither the fiscal authority nor the monetary authority can reflate the economy by increasing government expenditures or the money supply. Either action results in higher domestic dollar rate and do not affect the output. These stylized facts seem to fit the Brazilian experience, as well as of several other emerging markets.

The bulk of the difficulties Brazil now faces is derived from the unfortunate combination of higher risk aversion in international financial markets and greater uncertainty associated with the course of the future economic policy to be followed by the new administration, and to the sustainability of the Brazilian public debt. To avert a painful default, in the medium and long run, real interest rates must fall and sustained growth must resume. To increase the chances of success, several policy measures are suggested:

- To further the integration of Brazilian and international financial markets. This will help increase the amount of international liquidity of the economy;
- To increase the exportability of the economy. This implies both larger exports and larger imports. It is not akin to import substitution. More exports or more services and products that can be shifted to external markets represent further international liquidity. Import substitutes that can only survive protected by high tariffs do not increase international liquidity;
- To increase the fiscal effort in order to help dispel the doubts over the sustainability of the public debt. If the default risk premium is significantly reduced, the initial fiscal effort will support higher growth, lower interest expenditures and higher fiscal revenues.
- To increase the credibility of the monetary authority, by conferring instrument independence to the Brazilian Central Bank to use monetary policy to achieve the inflation target set outside the central bank. During crises, the large exchange rate depreciation caused by the reduction in aggregate international liquidity passes through domestic inflation, requiring a restrictive monetary policy from the BCB. Note that these episodes are usually associated with recessions, making the BCB's contractionary monetary policy more painful and less credible. The stronger the BCB credibility, the lower the term premium caused by such episodes, the lower Selic rate hike by the BCB in attempting to keep inflation under control, and the lower the negative effect in economic activity.

- To resume the debt management efforts to lengthen the debt profile while reducing the indexation to the exchange rate and to the Selic short term rate. This will require larger use of inflation-linked bonds.

When and if the international liquidity crisis is overcome, the above measures will help Brazil to lower the real interest rates and achieve sustained growth.

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Chart 1
Fed Funds Target x Selic Target

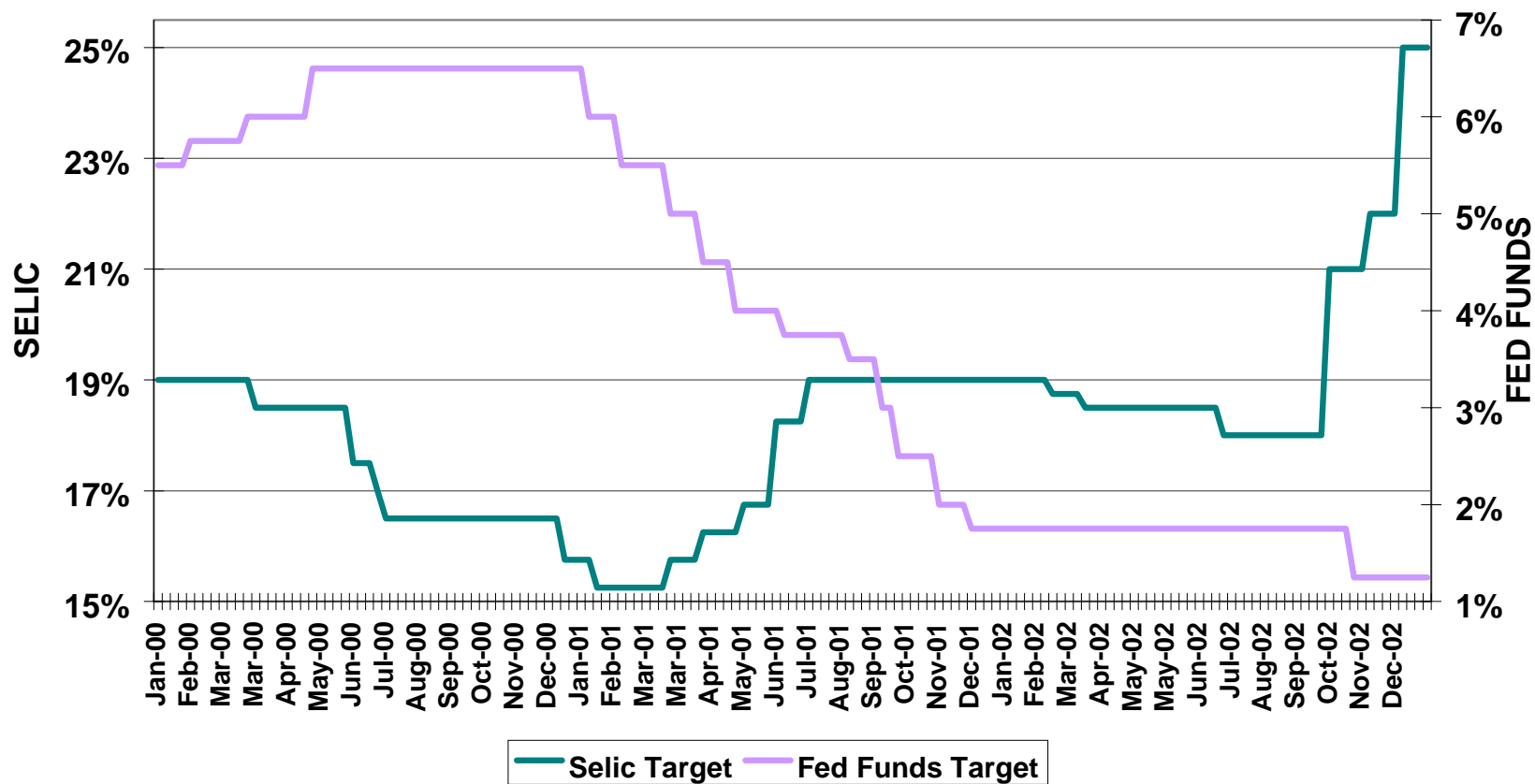


Chart 2A
Interest Rate Decomposition

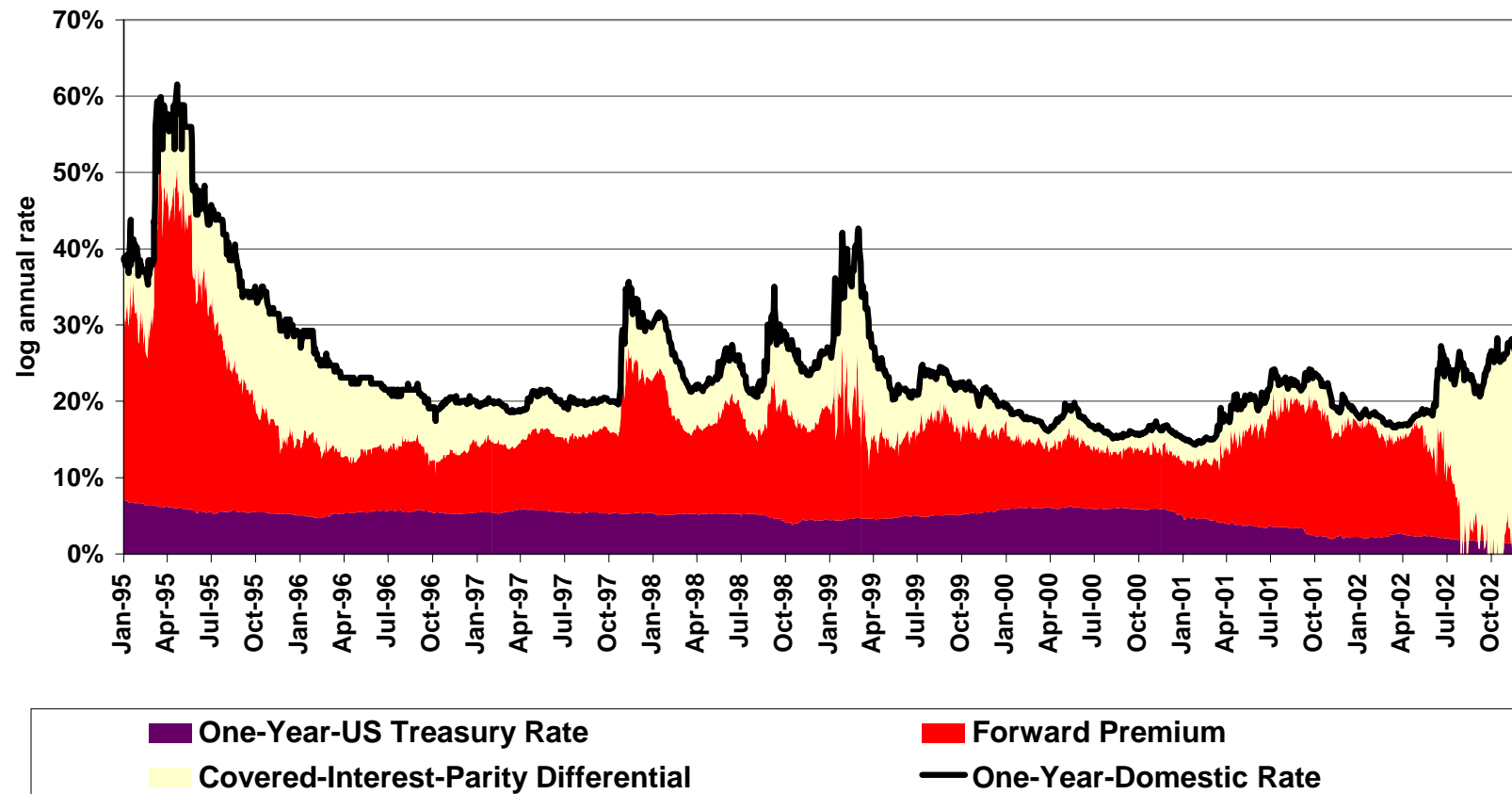


Chart 2B
Interest Rate Decomposition

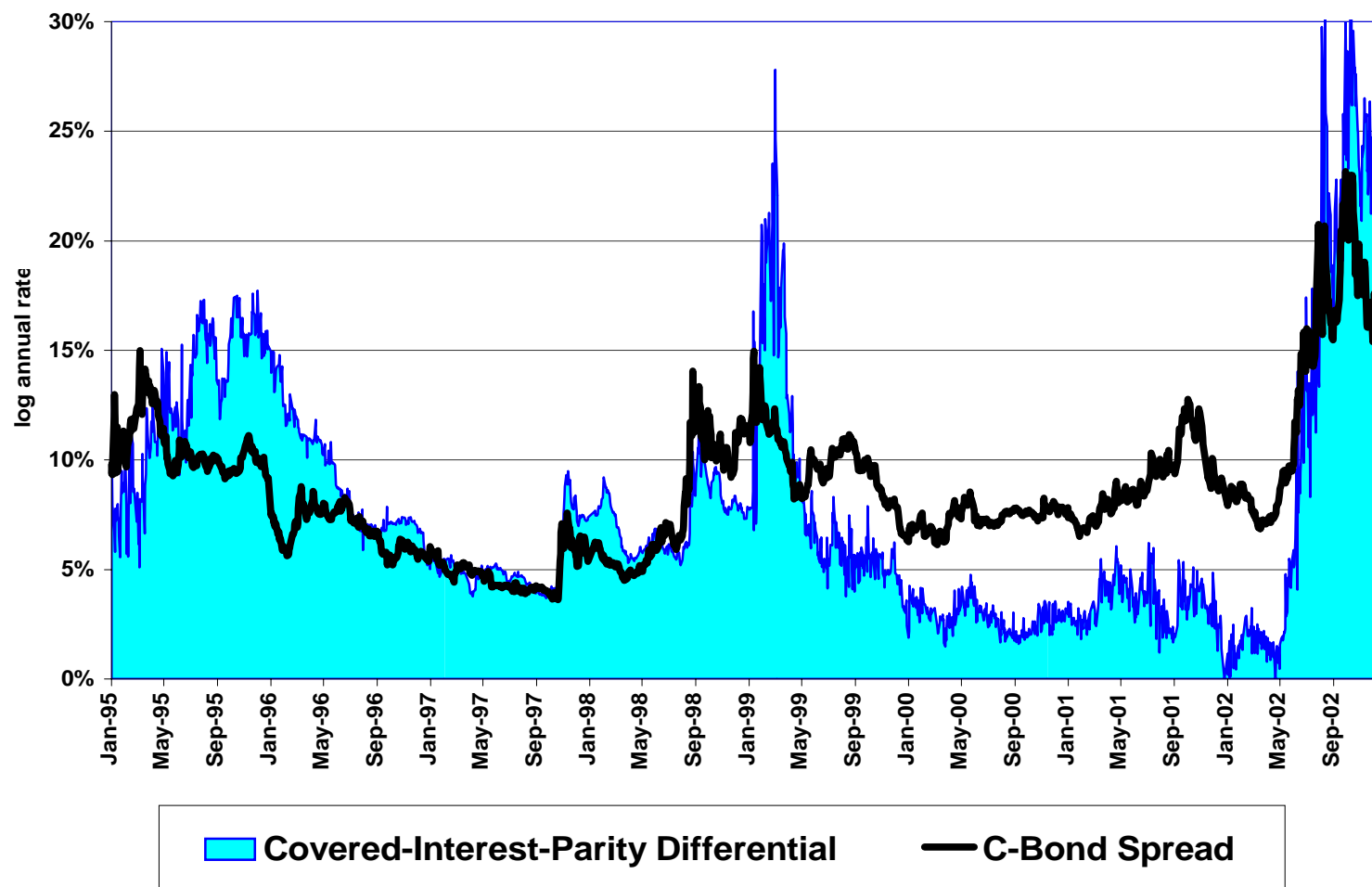


Chart 3
Interest and Exchange Rates: The First Crisis Bout

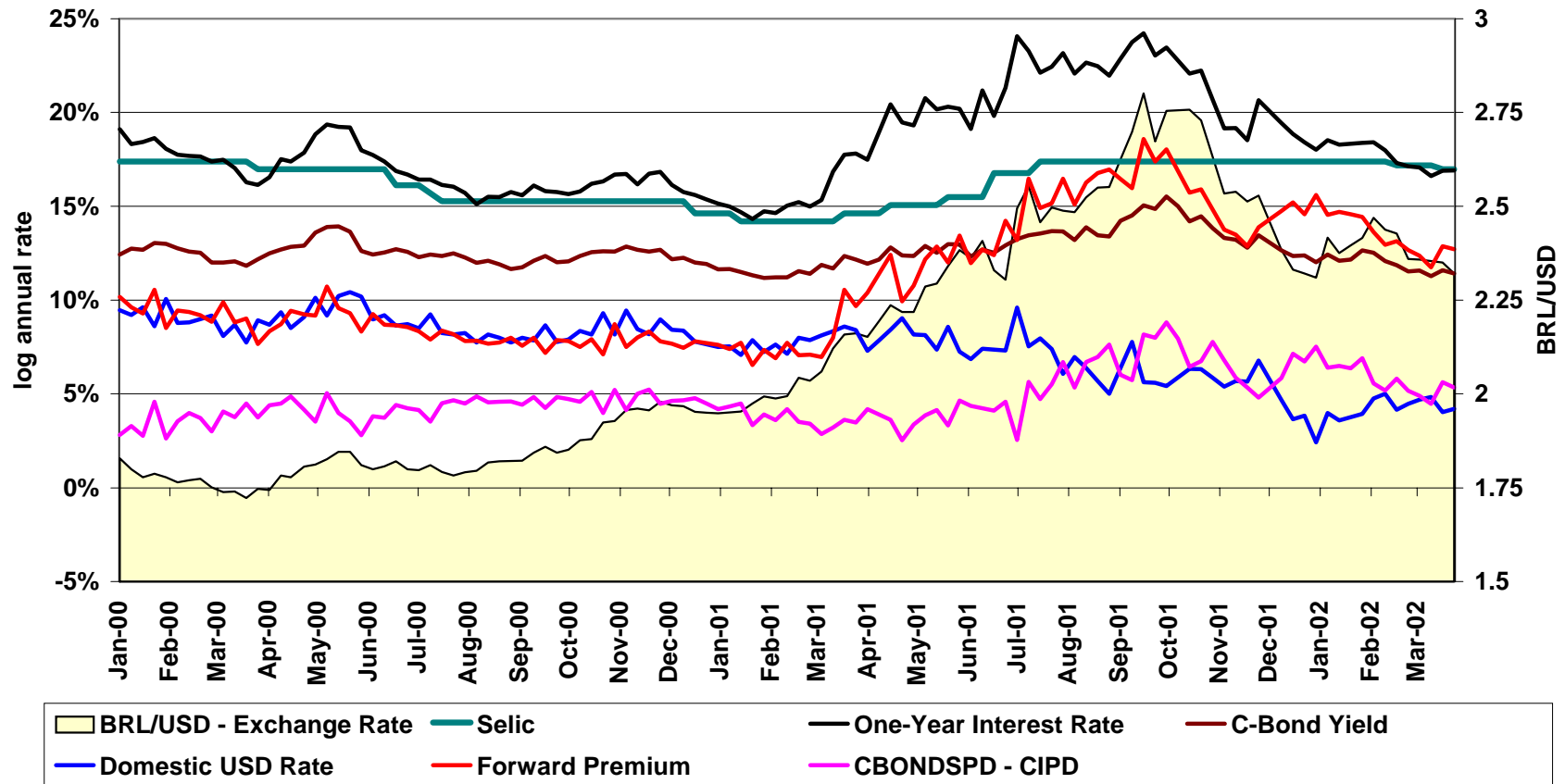


Chart 4
Interest and Exchange Rates: The Second Crisis Bout

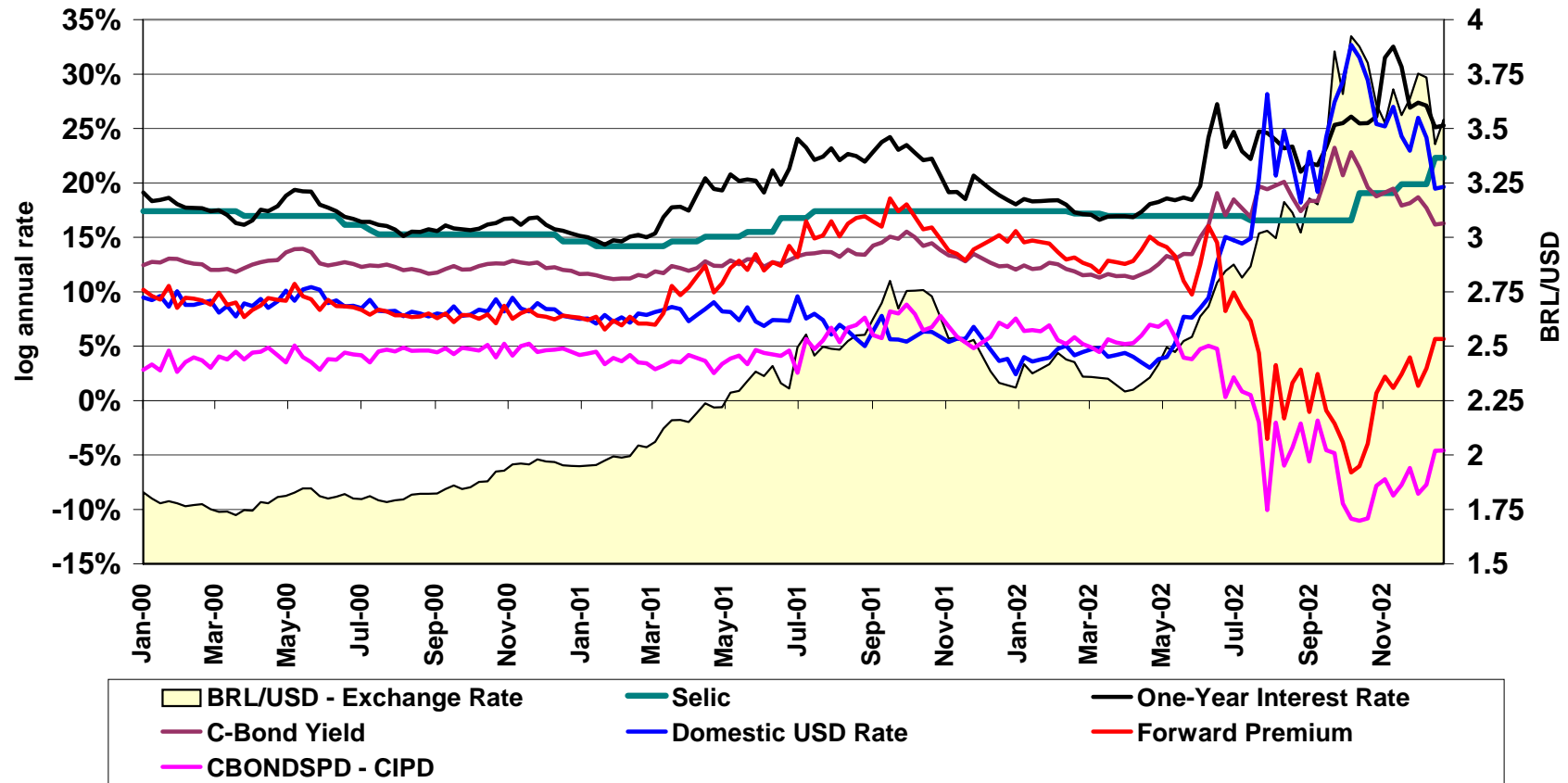


Chart 5
Forward Premium Decomposition: Expected Depreciation and Currency Risk

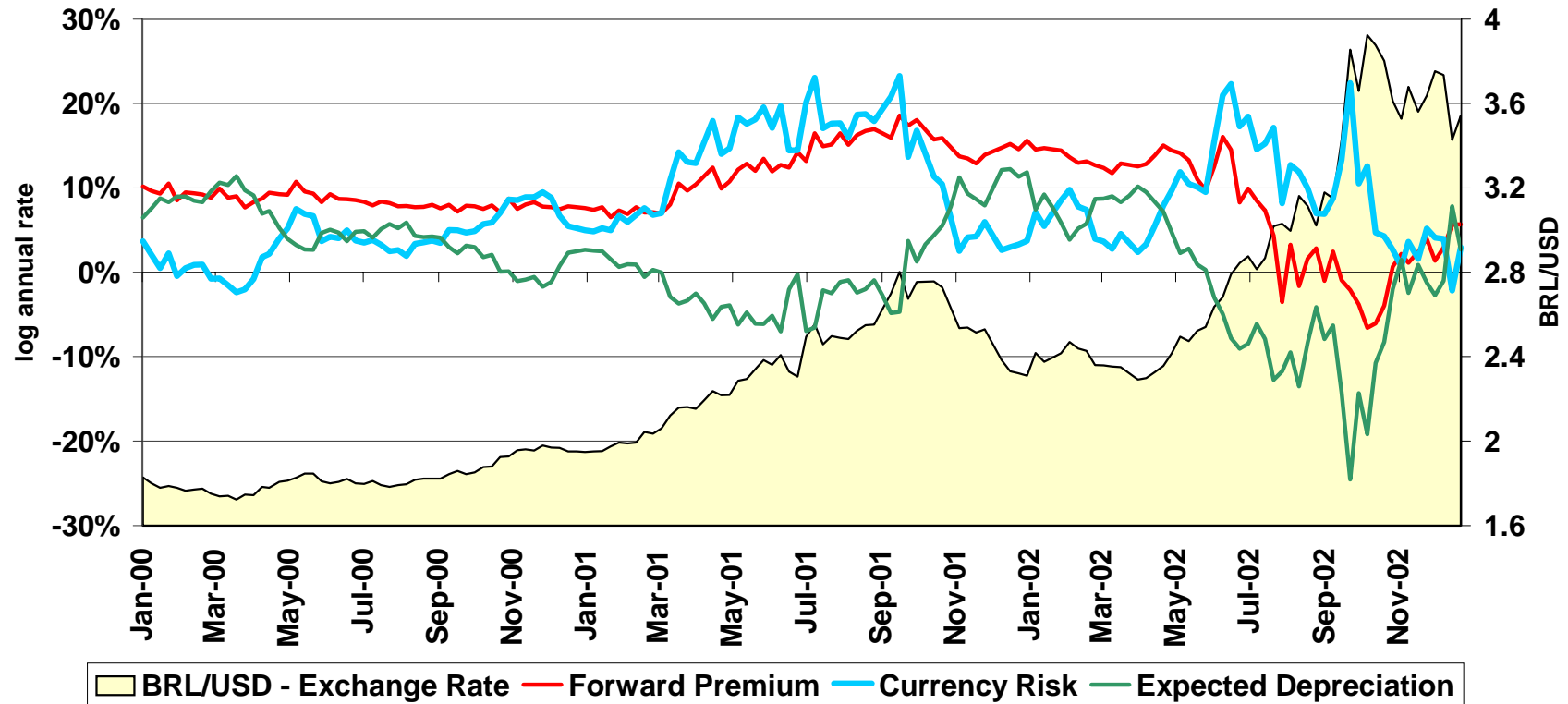


Chart 6
BRL and USD Domestic Yield Curves: 10/22/2002

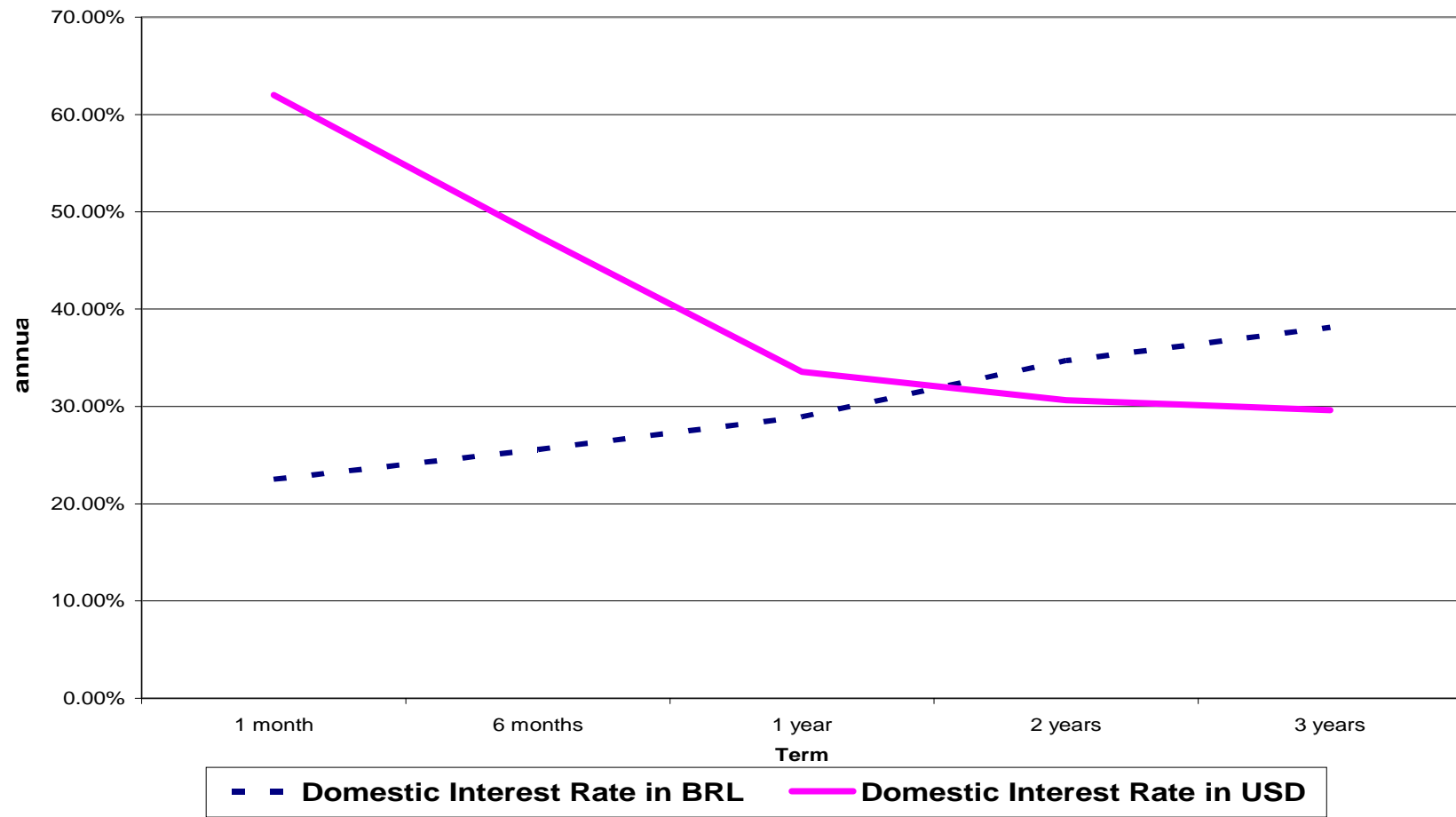


Chart 7
Exchange Rate and Country & Term Risk Premia

