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Volatility of Financial Flows and Capital Flight: Brazilian external vulnerability between 1995 and 2010

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Abstract

The surge of capital inflows in the post-crisis period prompted proposals for reassessing capital flow volatility in developing countries. Based on that, this article analyzes Brazilian external vulnerability from 1995 to 2010. The objective is twofold: 1) to measure Brazil's capital-flow volatility; and, 2) to apply and analyze two measures of capital flight. Specifically, it aims to compare the volatility and capital flight measures in order to evaluate external vulnerability. While financial flow volatility may capture moments of waves of massive capital inflows and the transition to sharp reversals, capital flight may indicate the sensitivity of capital flows toward Brazil due to unstable factors and external shocks. In this sense, large capital flight from Brazil of the kind that occurred during the 2008 international financial crisis can be caused by high capital-flow volatility.

Key words: external vulnerability, Brazil, volatility of financial flows, capital flight.
JEL Classification: F32, F36, G11, G15.

Introduction

Capital flow volatility and capital flight in an economy are affected by a loss of confidence in the global economy. It is international liquidity that determines international capital flows, particularly in developing countries. More specifically, it is the dynamics of international financial markets that determine capital flows to peripheral economies, and the dynamics of this market in the advanced countries determine the volume of these flows (Prates, 2005).

Thus, in the case of Brazil, whose balance of payments is dominated by highly flexible and speculative financial flows, capital flight causes a macro-

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economic instability difficult to revert. Capital flees from Brazil when international investors' expectations change suddenly, causing a loss of resources in the domestic economy and, consequently, serious implications for long-term economic performance.

Based on the verified possibility of an abrupt reversion of resources and, thus, in an attempt to analyze external vulnerability in Brazil, this article aims to measure capital flow volatility in the country's balance of payments and to apply two different measures of capital flight frequently used by international literature but not yet fully explored in national literature. The main objective is to compare volatility and capital flight measures in order to evaluate which indicator best reveals the reversal potential for the Brazilian economy. Consequently, the purpose is to verify which indicator (volatility or capital flight measures) is best for characterizing the external vulnerability in this economy at a moment of the international financial system's ongoing instability. The underlying argument is that this vulnerability is caused by the financial liberalization process, intensified over the last decade in Brazil.

Specifically, the objective of this article is twofold. Firstly, it aims to measure the volatility of each sub-account of the Financial Account, detecting which flows have more influence on its vulnerability, verifying if these flows are strongly dominated by expectation and speculative movements formed on external markets. Secondly, it aims to apply two different measures of capital flight to find out which is better for the Brazilian scenario. Based on these two applications it will be possible to observe the behavior of the financial flows toward the Brazilian economy as well as the volume of capital flight and its relationship to external vulnerability.

The article is organized as follows: after this introduction, we briefly examine capital inflows to emerging countries in an attempt to understand what drives the volatility of capital flows and capital flight and how they impact the domestic economy. Section third analyzes volatility in the Financial Account of Brazil's balance of payments, using a generalized autoregressive conditional heteroskedastic model (GARCH); and section four applies two different measures of capital flight. Finally, we present a few preliminary conclusions, with a conclusive analysis of the impact of two empirical exercises, not only on Brazil's external vulnerability, but on its economic performance.

Causes and effects of capital inflows to emerging economies and capital flight

The dynamics of international capital flows and their determinants are one of the main themes in contemporary international economics. The diversification of portfolio investment and the pursuit of high returns generate impressive growth in capital flows that move quickly and intensely. Because of this constant change in the volume and direction of capital movements, new specific elements should be incorporated into old analyses of boom-and-bust cycles of capital, given the repercussions of the 2007/2008 international financial crisis and the euro crisis, for capital flows to emerging economies. So, financial flows seem to have entered into a new wave moving toward emerging markets.

It is growing, and recent experience shows the influence of external factors in explaining the reversal of capital flows to emerging economies. The literature calls this influence "push factors" (Calvo, Leiderman, and Reinhart, 1993; Fernandez-Arias, 1996; Villar, 2010; Akyüz, 2011; Forbes and Warnock, 2011; Fratzscher, 2011), which refer to elements that emanate from macroeconomic policies and conditions in major advanced countries, and, therefore, are factors unrelated to domestic economies. In turn, the same literature points to another set of factors to explain the determinants of capital flows, called "pull factors." According to Fernandez-Arias (1996), there is a new wave of positions that recognize that capital flows are driven by attractive domestic conditions, generating new opportunities for investment and profitability gains in domestic economies due to improvements in credibility in emerging countries (the pull factors). In this case, sound macroeconomic policies and an improvement in the institutional setting are important.

Focusing on the influence of push factors, we point out that, throughout history, the conditions of rapidly expanding international liquidity and falling interest rates in countries that issue hard currency can be considered common characteristics of great cycles of expansion and shrinkage of capital. Among the "super cycles," we highlight the important flow dynamics after the mid-1960s, when the process of internationalization of capital begins to deepen. Following Akyüz (2011), the first post-war boom in capital inflows to developing countries occurred in the 1970s. The second great cycle began in the early 1990s and was followed by a series of balance-of-payments and debt crises that characterized East Asia and Latin America, among other economies. The third cycle started in the early years of the new millennium and broke in mid-2008 after

the subprime crisis (in 2007), which became the global financial crisis in the following year. This last cycle was quickly followed by the current boom (the fourth cycle), which began in the first half of 2009 and is still continuing in full force in 2011 and 2012 (Akyüz, 2011).

In the first cycle, the capital flows to emerging economies were predominantly foreign direct investment (FDI) and the main recipients were the countries of Latin America. These countries' debt was determined by the rapid expansion of international liquidity surpluses resulting from oil exports and the growing U.S. external deficit, and facilitated by financial deregulation beginning in advanced economies and the rapid growth of the Eurodollar market. This cycle ended when the U.S. adopted a restrictive monetary policy, sharply raising the Fed's interest rate to combat inflation at the end of the 1970s. The result was an excess of foreign debt in Latin American countries.

The second cycle, after almost ten years of scarce resources (through the 1980s), was determined by the rapid expansion of liquidity and a large interest-rate cut in the U.S. The early 1990s were difficult for that economy in the face of the recession and banking crisis. So, the government cut interest rates, allowing borrowers to refinance their debt. Thus, capital flows to emerging economies increased, also encouraged by the success of the Brady Plan for restructuring Latin American sovereign debt and rapid financial liberalization in many developing countries. In this second cycle, in addition to Latin America, East Asia and countries of Central and Eastern Europe were also major recipients of large international capital movements.

To the extent that the liquidity cycle continued over a long period, international investors gradually became less cautious, as did borrowers in emerging economies, resulting in growing speculation among the most leveraged assets and operations. Moreover, a resulting speculative bubble in assets was created in emerging economies. The first warning sign was the Mexican crisis in December 1994. After the effects of the crisis ("the Tequila effect"), the generalized boom in capital inflows, which marked the pronounced cycle of the 1990s, shifted to Asia, ending with the crises in Southeast Asia in 1997. These were followed by the moratorium in Russia (1998), Brazil's currency crisis (1999), and the crises in Turkey and Argentina (2001-2002). Between 1999 and 2002, international financial markets were characterized by a dynamic of "feast or famine," bringing alternate moments of abundance and scarcity (IMF, 2003; Prates, 2005).

We can construct a timeline of international capital flows, that is, the sharp swings between abundance and scarcity in private external financing for the

developing world. Between 1998 and 2002, the movements in volatility in developing countries were associated with U.S. monetary policy management, or events occurring in the major countries that generated reversals of expectations. Thus, the non-convertible currencies of emerging countries are the first target of escape movements, indicating these countries' vulnerability, which we would like to analyze with the empirical exercise for Brazil in this article.

In the third cycle of capital inflows to emerging economies resulting from low interest rates in the U.S. and an expansion of liquidity in advanced countries, the wave of inflows was helped by developing countries' willingness to invest in international reserves primarily in U.S. Treasury securities. Particularly, the year 2003 was marked by expanding investments in the debt securities of emerging countries, influenced by the low interest rates in the central countries (especially the U.S.), combined with an improvement in the world economy. There was a sharp increase in "risk appetite" and new waves of riskier borrowing characterized the emerging economies. Moreover, capital inflows peaked in these economies in 2007 before the outbreak of the subprime crisis.[1] When the crisis erupted, there was a mass withdrawal of funds invested in emerging economies, so that the net capital flows were negative in the following year, 2008, which was a strong reversal of financial resources and a sudden stop that hit major emerging countries. However, the contraction of capital inflows to emerging economies was short-lived. Thus, from 2009 onward, capital flows to emerging economies began to recover. However, it is worth noting that when capital flows come back, most of them are portfolio investments. They were attracted by the carry trade due to the high interest rate differential, especially in Brazil.

The main feature of the recent cycle of floating capital across borders is the change in the composition of flows and the heterogeneity of the agents responsible for the financial transactions involved in these flows. The composition of flows to emerging economies was dominated by portfolio investments with a short-term bias. Following the IMF (2011), historically, portfolio flows have been more volatile; meanwhile, bank flows have been less volatile, but their volatility rises sharply around times of crisis. On the other hand, foreign direct investment is only slightly more stable than other types of flows for emerging economies. So, as speculative investments often do not generate significant im-

[1] For the IMF (2010), the global liquidity cycle started in 2003 and accelerated from the second half of 2007.

pacts on productive capacity and thus on the development of economies, they increase contagion, sparking a search for security at the expense of profitability.

Moreover, the potential for reversion of investments impacts exchange rate volatility and increases the risk of financial crises, among other outcomes. For Cardarelli, Elekdag, and Kose (2009), the surge of capital inflows is associated with a real, effective currency appreciation, damaging the competitiveness of exports and potentially reducing economic growth.

Akyüz (2011) identifies some channels of external vulnerability of developing economies facing a reversal of capital flows. The first are credit and asset bubbles in periods of changes in commodity prices, generally associated with financial cycles, and the second is the uncontrolled expansion of domestic credit with external resources (especially the consumption and production of non-tradables), and, above all, the accumulation of large external liabilities denominated in foreign currencies in response to the exchange-rate appreciation and current account deficits.

Moreover, by taking a pro-cyclical character, international capital flows reduce the maneuvering room for counter-cyclical macroeconomic policies. High interest rates and an appreciated exchange rate, resulting from this pro-cyclicality of capital flows, produce deleterious effects on the public debt and on the pace of productive activity, thus creating great challenges to macroeconomic policies in emerging countries. One major negative effect is the high fiscal effects of holding international reserves for financing the current account deficits resulting from exchange-rate appreciation in these economies.

Given these effects of volatile capital flows, we point out a difference between the recent financial crises and the previous crises (in the 1990s): emerging and developing countries have resorted to capital controls. The recent crisis spurred a revival of the debate about capital controls, not as a tool for managing crises, but as a tool for preventing financial crises. We will return to this topic in the conclusions.

Capital flow volatility: an analysis using the garch model

arch/garch models and data treatment

When we observe the financial accounts of Brazil's balance of payments and its sub-accounts, a simple analysis clearly shows us that capital movements are highly volatile, because they move abruptly. When we analyze monthly data,

this volatility is multiplied. Therefore, in this article, we consider that capital flows toward Brazil are highly unstable because they quickly revert if there is any change in expectations. Thus, the objective of this section is to measure the volatility of each of these flows.

The standard —and also the simplest— way to measure volatility is through standard-deviation, variation coefficient, and variance. Despite its frequent use, the knowledge of the historical value has limitations, because the variance in the period t can be conditioned to past information. In other words, in periods of great uncertainty the conditional variance can vary sharply for short periods of time. That is, the limitation of these descriptive indicators is that they cannot evaluate the instantaneous volatility at specific moments of the trajectory of a series.

In this way, a more sophisticated approach used to treat auto-correlated volatility is the autoregressive conditional heteroskedasticity (ARCH) model. For this article, we chose the GARCH model because it is more precise in estimating series volatility than the ARCH.

ARCH is in a non-linear model, considering its variance equation, since it is a non-linear function based on past information. This is appropriate for representing variance changes for time series with periods of great volatility alternating with periods of relative tranquility. However, the GARCH model, an extension of ARCH, is more widely adopted and generates more inclusive correlation standards. In this model, the conditional variance not only depends on the lag of squared return as in the ARCH model, but also depends on the past values of the conditional variance itself.

In a general way, the Brazilian financial account series shows the necessary properties for using GARCH models,[2] which are non-autocorrelation in level (white noise); time variant variance (clustered volatility); and distributions with excess (fat-tailed) kurtosis.

The data from movements of Brazilian capital flows are part of the National Account System, particularly the financial account, which was created to capture the flows that most affect the volatility in this account. Such data are presented in time series and involve resources measured in millions of U.S. dollars by the Central Bank of Brazil.

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[2] For stylized facts of the GARCH model, see Vargas and Martínez (2006).

The financial account registers financial assets and liabilities transactions between residents and non-residents. Basically, this account is divided into four groups: 1) direct investment; 2) portfolio investment; 3) derivatives; and 4) other investments. Each of these is again divided into further sub-accounts to show specific details. Unpacking the accounts on three hierarchical levels came to 25 series. The details and opening levels of these accounts are shown in Appendix 1.

This article uses monthly data set, and the time cuts were made in two periods: first between January 1995 and December 1998, and then between January 1999 and December 2010. This choice of time periods is explained by the following facts: the first period is characterized by a managed exchange rate, and in the second period the exchange rate started to float, implying a change in volume and composition of the international capital flows toward the Brazilian economy. From these data, we analyzed the statistical behavior of each series in the Financial Account of the Brazilian balance of payments through average, variance, symmetry, and kurtosis coefficients, as well as Jarque Bera statistics. From these descriptive statistics, we observed that these series do not show a normal distribution due to the values of the symmetry and kurtosis coefficients. The non-normality is confirmed by the Jarque Bera statistic, which rejects the null hypothesis of normality in every case. Furthermore, it must be pointed out that the averages, medians, and standard deviations in each series show different levels, indicating heterogeneity in these accounts. It corroborates our purpose in verifying the most volatile series. This motivated us to use the GARCH model to measure financial account volatility. The intention is to measure the volatility of each sub-account so as to analyze instability in the capital flow series and point out the most volatile financial sub-accounts. The underlying hypothesis is that the most volatile financial accounts are those with a speculative bias.

Following this, we focus on the use of stationary series through an augmented Dickey-Fuller test (ADF).[3] When this unit root test is applied to the first period of analysis, almost every series is found stationary on level. That is, using the calculated values, the null hypothesis of unit root presence to all series is rejected, showing that the financial account series analyzed are I(0). For the second period of analysis, again it was observed that series are stationary

[3] Dickey, D. A., and Fuller, W.A. 1979. Distributions of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, LXXIV, pp. 427-31.

on level, with one exception: Brazilian company equities with the third openness level in the sub-account foreign portfolio investment series. In this case, since this series is stationary in the first difference, it corresponds to an integrated series of first order, I(1).

After this descriptive analysis, we move to the methodological procedures to estimate the GARCH model for each series, using the following steps: identification, through an autoregressive moving average (ARMA) model estimation, in order to remove serial correlation; the application of the GARCH model to the square residuals of the ARMA model; a study of identified GARCH model residual properties; and, finally, prediction of the GARCH conditional variance (volatility).

Analysis of the results

We followed the steps described above to find the volatility values for each financial account series. The first step, identification, was the most arduous. According to Morettin and Toloi (2004), the identification of a GARCH model order to be adjusted to a real series is usually difficult. It is recommended to use a low-order model, like (1,1), (1,2), or (2,1), and then choose a model based on criteria like Akaike information criterion (AIC) or Schwarz information criterion (SIC), symmetry and kurtosis values or log-likelihood. Once the model has been identified —Appendix 2 shows the identification order of series of first and second level, as an example—, a GARCH model is constructed for each series, according to the financial account openness level (as in Appendix 1). Twenty-five conditional variances (volatilities) were estimated.[4] It must be pointed out that the volatility values found are very high (numbers of six and seven digits),[5] since the volatility generated from this model is a crescent quadratic function of the past values of the series.

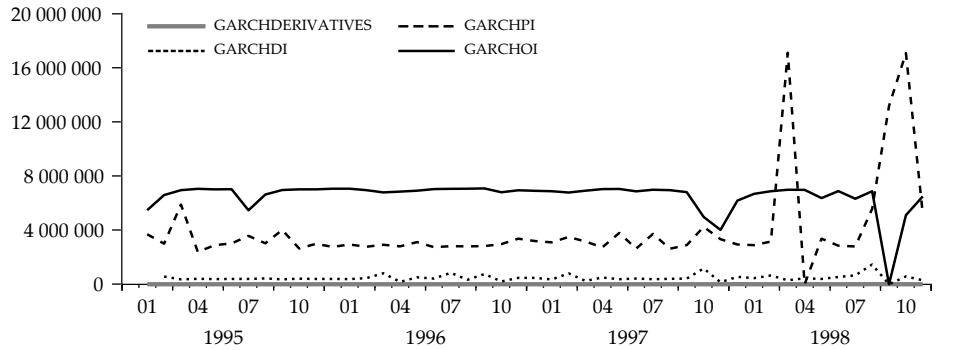
Figure 1 verifies that at a first level of openness, in the first period of analysis, between January 1995 and December 1998, the accounts with greater volatility levels were the portfolio investment (GARCHPI) and other investments (GARCHOI)

[4] Estimates were obtained using the Eviews 7.0.

[5] We will verify in the following figures that volatility values, displayed in the coordinate axis, are shown with exponential references (E + 07 or E + 06, representing 07 or 06 digits, respectively).

series, as we expected.[6] We observed a huge difference between these two series of conditional variance and direct investment (DI) and derivatives (GARCHDERIVATIVES). Moreover, this last account shows very low levels of volatility. It is also necessary to highlight the volatility peaks during moments of instability on the international scene, such as at the beginning of 1995 (the Mexican crisis), during 1997 (the Asian crisis), and the high peaks in 1998 (the Russian crisis).

Figure **1**
Financial account series volatility
January 1995 to December 1998
(first level of BoP openness)



Source: developed by the authors using Central Bank of Brazil data.

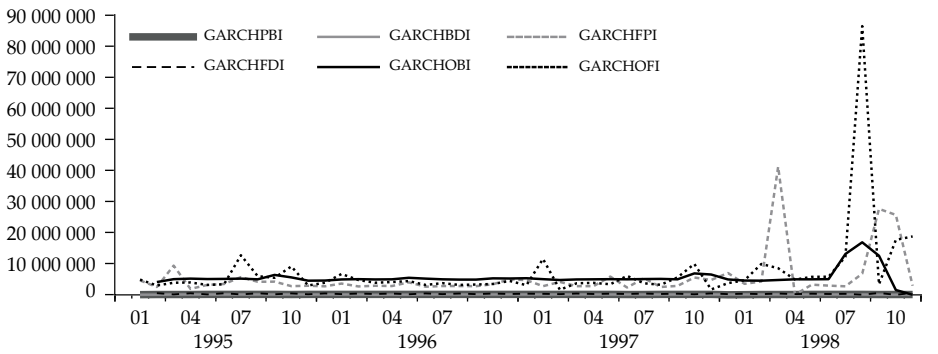
Furthermore, it is observed that the portfolio investments and other investments series showed opposite movements. While the first raised volatility, the second reduced its volatility in moments of contagion effects related to crisis. This is explained by the occurrence of huge capital inflows through the portfolio investments account, resulting from the high amount of external debt amortization registered as a "long-run bonus," a sub-account of portfolio investments. Meanwhile, the other investments account was more characterized by capital flight.

At the second level of openness, within these two former most volatile accounts, foreign portfolio investments (FPI) and other foreign investments (OFI)

[6] The portfolio investment group registers asset and liability flows, constituted by equity securities issues, commonly negotiated in secondary market paper. Other investment registers loans and financing (to monetary authorities and other sectors); commercial credits and other liabilities; and money and deposit flows. Thus, these accounts are very speculative.

are the most noticeable. In Figure 2 it is clear that these accounts (FPI and OFI) are raising the volatility levels of the portfolio investments (PI) and other investments (OI) series. Again, highlighted peaks are seen in 1997 and 1998, when Brazil started to feel the impacts of the international financial crisis.

Figure **2**
Financial account series volatility
January 1995 to December 1998
(second level of BoP openness)



Source: developed by the authors using Central Bank of Brazil data.

Therefore, the excessive inflow of resources brought great risks to the Brazilian economy. Not surprisingly, in 1997 (the Asian crisis), Brazil suffered a resource reversal and, consequently, moments of instability in its financial flows. However, early in 1998, Brazil was again experiencing great foreign capital inflow. Following this, it suffered from the impact of events in Russia, when in August and September of that year, huge capital flight was observed. Actually, great volatility episodes occurred during the most part of the first period (1995 to 1998). According to Palma (2006: 729):

> […] 1998 posted both the all-time record for net inflows (first quarter), and for net outflows (third quarter)! This exemplifies the difficulties confronted by economic authorities in the implementation of their macro-policies when they voluntarily operate with a liberalized capital account in a world of highly volatile flows, a high degree of "contagion," and asymmetric information.

In this sense, what can be concluded is that, although the average volume of capital flight does not seem so huge when compared to other developing econo-

mies, the peak of capital flight was reached during a period in which Brazil was already integrated into the world economy. This may be a result of institutional changes, more specifically of the capital account liberalization process.[7]

Beyond the volatility analysis, we are also concerned with the sub-account weight in the total financial account. This is important since the volatility of sub-accounts is not sufficient: to be sure that it a good indicator of potential macroeconomic instability, we must know if this account has significant relative participation in Brazil's balance of payments. Thus, using the values found in Appendix 3, we analyzed the relative participation of each sub-account in the financial account of its directly superior hierarchic level.[8] For example, we are interested in knowing which sub-account has more weight within the portfolio investments account: foreign or Brazilian portfolio investments.

From Table 3.1 (see Appendix 3), we can see that the accounts with more average weight in the total financial account for the first period of analysis were precisely portfolio investments and the other investments series. That is why we will focus our analysis on the sub-accounts of these two accounts, since they are the ones that contributed most to portfolio investments and other investments. That is, the focus underlying this article is on the flows with greater relative participation and with greater volatility values, which are the sub-accounts in foreign portfolio investments and other foreign investments.

Moving on to the analysis of the second period, we verified that high volatility persists, and in seven-digit numbers, and the difference of the degree of volatility between the first level accounts increases (see Figure 3A and B). The portfolio investments account presents high levels of volatility beginning with the impact of the 2008 sub-prime crisis. With that crisis, foreign capital returned to developing economies such as Brazil even more strongly after moments of instability than it did through the international financial crisis that surprised the world. So, the dynamics of flows are still strongly influenced by speculation following the logic of international liquidity. Although volatility levels are smaller when compared to the first period, when we excluded the portfolio

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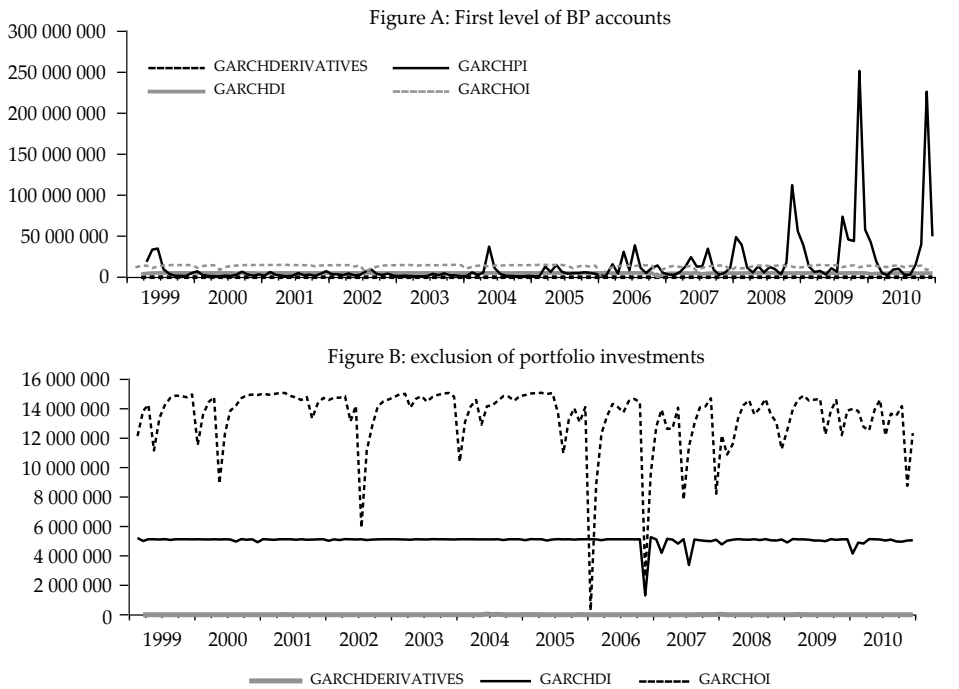
[7] This argument follows the conclusion of Eryar (2005), which applies the residual method to measure capital flight in Brazil.

[8] To calculate the average relative participation (for each period of analysis), the module of each financial sub-account value was used, since the weight of each of these in the financial account would not be possible if the account contributed negatively to the total financial account.

investments in Figure 3B (those that registered equity flows and debt securities), important volatilities occur.

Figure 3
Financial account series volatility
January 1999 to December 2010



The volatility impacts from the capital flow are more strongly adjusted through exchange rates, and interest rate movements become smaller, as do their levels. Furthermore, the trade balance begins to improve, progressively generating positive results in current accounts.

On the financial account side, following the trend in the dynamics of flows toward peripheral countries, a fall in the participation of portfolio investments can be seen; a small supply of bank loans and a greater participation of direct investment, surpassing the relative participation of portfolio investments. In the same way, portfolio investments' volatility is smaller in this second phase until 2006/07, when direct investment flow volatility increases. Next, we will deal with this volatility increase.

After the high instability related to the 1999-2002 interval, a return of portfolio investments flow and bank loans can be noted beginning at the end of 2003. The period between 2003 and 2005 is linked to international liquidity expansion, noting that in the period between these years, trade balance and current account results become very favorable, with a substantive improvement of external accounts. The same has occurred since 2008, after the more recent international crisis.

Table **1**
External debt indicators, 2000-2009

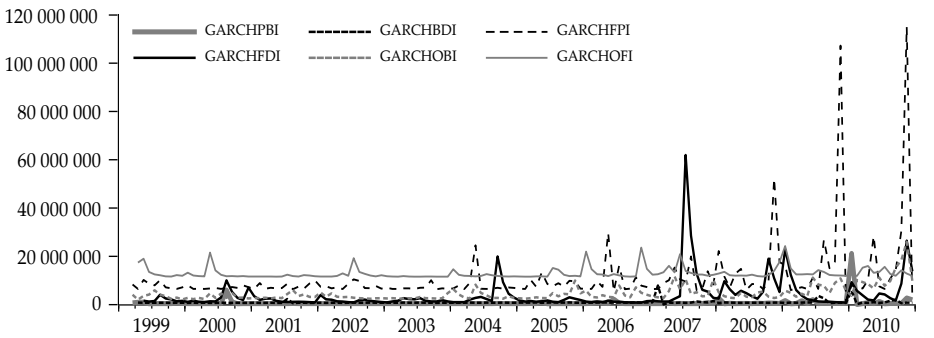
Indicator/Year	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*
Debt service/Exports (%)	88.6	84.9	82.7	72.5	53.7	55.8	41.4	32.3	19	28.6
Debt service/GDP (%)	7.6	8.9	9.9	9.6	7.8	7.5	5.3	4	2.3	2.8
Interest rates/Exports (%) (annual)	29	28	23.6	19.4	14.8	12.2	10.8	9.5	7.9	9.1
Total external debt/GDP (%)	33.6	37.9	41.8	38.8	30.3	19.2	16.2	14.9	12.1	12.6
Net total external debt/GDP (%)	26.5	29.4	32.7	27.3	20.4	11.5	7	–0.8	–1.7	–3.9
Reserves (liquidity)/Total debt (%)	15.2	17.1	18	22.9	26.3	31.7	49.8	93.2	104.3	120.6
Total external debt/Exports (Ratio)	3.9	3.6	3.5	2.9	2.1	1.4	1.3	1.2	1	1.3
Net total external debt/Exports (Ratio)	3.1	2.8	2.7	2.1	1.4	0.9	0.5	–0.1	–0.1	–0.4
Reserves (liquidity)/Debt service (Ratio)	0.7	0.7	0.8	0.9	1	0.8	1.5	3.5	5.5	5.5

Source: Central Bank of Brazil.

From that moment the market began to consider that Brazil was less vulnerable, since the country improved its capacity to pay foreign creditors and investors. This scenario indicates a fall in external vulnerability according to traditional external debt indicators (see Table 1). The total foreign debt has fallen from 41.8% of gross domestic product (GDP) in 2002 to 14.9% in 2007, and the reserves represent to 3.5 times the service of the debt, among other external debt indicator performances. Thus, in the logic of the market, Brazil was less vulnerable to international crises after a series of crises in 1990s. But we want to point out that, although the external debt indicators and the current account have improved, this could be a false hypothesis. The underlying argument is that vulnerability was not manifested during this period, but it never stopped, and it exploded during the last financial crisis in 2008, which we can observe through the huge capital flight.

In this sense, from our point of view, external vulnerability does not follow the traditional interpretation related to the domestic capacity for financing the external accounts. We are referring here to Brazil's capacity to protect itself from external shocks, which involves economic policy instruments used by domestic authorities as a response to shocks and the costs of dealing with these shocks.

Figure 4
Financial account series volatility
January 1999 to December 2010
(second level of BoP openness)



Source: developed by the authors using Central Bank of Brazil data.

So, we argue that external account vulnerability persists in the second period due to the potential reversal of resources. The heavy weight of flexible capital flow on Brazil's balance of payments still remains, and these flows are conditioned by liquidity movements determined in international capital markets. Since they are highly speculative about any changes in expectations, the flows keep showing reversal movement and, consequently, strong volatility in the second period as well. We can see in Figure 4 that foreign portfolio investment instability (GARCHFPI) increased strongly in this second phase.

Related to these movements, we point out that domestic interest rates are still influenced by capital flow dynamics, even after the adoption of a floating exchange rate in January 1999. Furthermore, the quick surge of capital inflows tends to overestimate exchange rates. It is a stimulus to turn debts denominated in domestic currency into foreign currency debts. Domestic obligations require a lower interest rate, but foreign currency obligations require a higher exchange

rate. This creates an "interest rate trap." That is, the volatility of these financial flows generates macroeconomic effects even in non-critical moments, thus being uncontrollable domestically.

Specifically, the high volatility of direct investments during the second period (July 2007) is due to the fact that foreign direct investment inflow had reached a historic record in 2007, particularly in June (Figure 4, in black). According to the United Nations Conference on Trade and Development (UNCTAD, 2008), foreign direct investment flow has been growing regularly over the last 30 years, with a few declines in the beginning of the 1980s, 1990s, and 2000s. This growth, occurring in all regions, is particularly due to the rise of corporate profits all over the world, and is also a result of the higher stock prices that raised the value of mergers and acquisitions beyond domestic frontiers. The recent high volatilities can be explained through the Petrobras capitalization and Pre-Salt oil discoveries and their repercussions.

In turn, the high volatility in other Brazilian investment accounts in June 2007 was impelled by a huge outflow, and then by a huge inflow of money and deposits. This sub-account aggregates the movement of deposits of Brazilian banks and shows movements similar to those observed in foreign investor applications in equities securities.[9] These were the flows that had most influence on financial account volatility over this period, as will be seen when the financial sub-account is further disaggregated. It must be pointed out that, from 2003 onward, international financial markets have been in a phase of higher liquidity compared to the 1999-2002 period. This relative tranquility in financial markets can be explained by the rise of the U.S. prime interest rate in 2004 and its stability since.

Even more important are the recent episodes of crisis, as the U.S. subprime crisis in 2007, showing that the volatility of capital flow toward the Brazilian economy becomes even higher. In the beginning of 2008, we saw that capital had already flowed out of Brazil (mainly via portfolio and other investments), as a consequence of this crisis. By the end of that year, this capital outflow was even more intense, showing that external vulnerability was already in place. Therefore, the most volatile accounts are exactly the ones that show a higher speculative bias.

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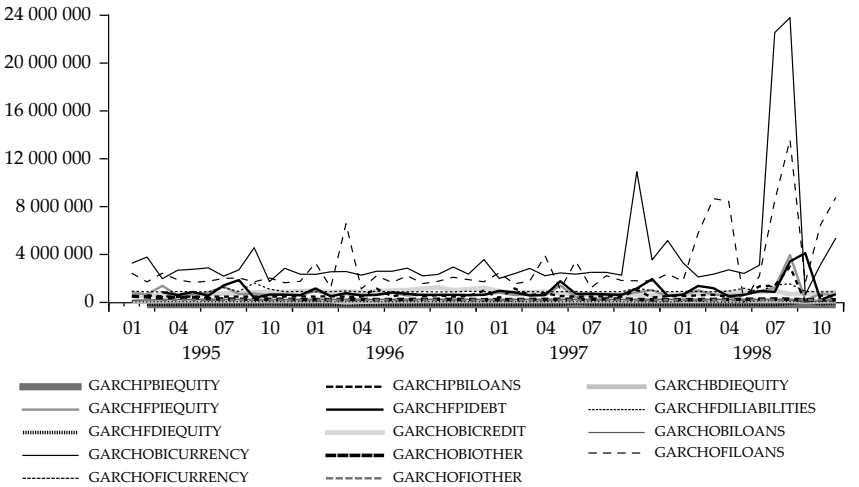
[9] Other investments related to foreigners refers to inflows and outflows related to the CC5 account, which counts foreign resources inflow to apply indirectly in Brazilian debt securities, since direct application in equities securities had strong restrictions for foreign investors (Sicsú, 2006).

Figure **5**
Financial account series volatility
January 1995 to December 1998
(third level of BoP openness)



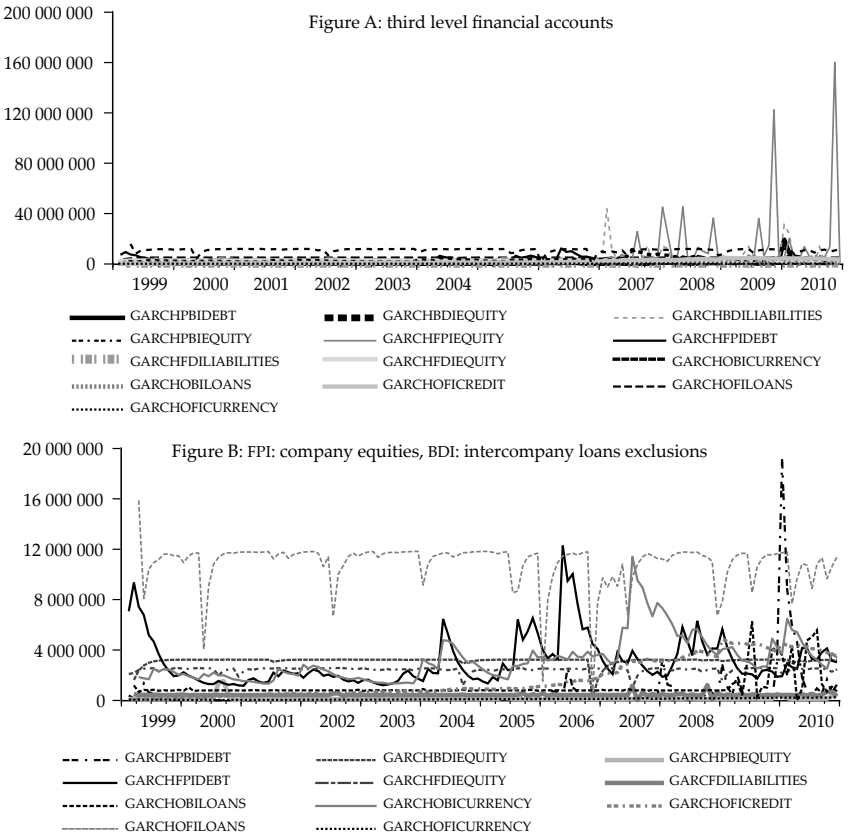
Source: developed by the authors using Central Bank of Brazil data.

Moving to the accounts to the third openness level we can verify that sub-account volatilities are very strong at this hierarchical level, causing constant instability in flows. Looking at Figures 5 and 6, we can see that important volatility movements occur even when there are no restraints to international liquidity, or even when it becomes more abundant in moments of relative tranquility.

The most volatile sub-accounts in the first period were those related to money and deposits (GARCHOBICURRENCY), from other Brazilian investment accounts and those referring to loans and financing, from other foreign investment accounts (GARCHOFILOANS), as we can see in Figure 5. Once again, the most volatile sub-accounts are those with a more significant part on the higher hierarchic level accounts, as we can see on Table 3.3 in Appendix 3. The money and deposits account represents more than 61 and 73 percent of other Brazilian investment accounts in the first and second period, respectively, and this sub-account has greater relative participation in the other investment accounts, showing how important this greater part of other Brazilian investments is for the total financial account. Money and deposits flows refers to movements of Brazilian citizen's deposits kept abroad, thus, being highly flexible and speculative flows, which depend on market "appetite."

Regarding to loans and financing, it can be seen in Figure 5 that there are important volatility movements during stability periods, such as in the beginning of 1995 (the Mexican crisis), during 1997 (the Asian crisis), and in 1998 (the Russian crisis). These movements are due to negative net flows of bank loans, resulting from a smaller supply and from voluntary reduction of debt during uncertain moments. Obviously, reversals in these flows occur during periods of crisis and, therefore, this sub-account volatility is higher than other application types within foreign portfolio investments which did not have any of its sub-accounts distinguished.

Figure **6**
Financial account series volatility
January 1999 to December 2010
(Third Level of BoP Openness)



Source: developed by the authors using Central Bank of Brazil data.

Finally, we must point to the peak volatility of Brazilian portfolio investments in debt securities (GARCHPBIBOND), in black in Figure 6B, during December of 2009. In that month US$888 million in National Treasury sovereign securities held by the Central Bank were cancelled. Thus, the liquid inflows of short-run equities reached a historical point, especially when compared to the performance of these flows in the previous year.

Therefore, it can be observed that the most volatile sub-accounts, even when the accounts are opened to the third level, are exactly the ones that are most speculative and have short-term bias. Consequently, since they are guided by speculation and dependent on international investors' mood, financial resource flows toward the Brazilian economy are susceptible to reversal in moments of crisis and international liquidity restraint, and are thus beyond Brazil's internal control.

Capital flight

The idea that capital account liberalization is beneficial to economic growth and to income distribution can be demystified through a capital flight analysis in developing economies. Here we will analyze this phenomenon for the case of the Brazilian economy. The purpose is to aggregate empirical arguments to the capital-flow volatility analysis that points out that financial flows play an important role as a potential indicator of macroeconomic instability, keeping the focus of this article on Brazilian external vulnerability. To accomplish this, we will apply two different measures of capital flight commonly used in international literature, but little explored in Brazilian literature. From the application of these measures, we aim to conclude which one can be used as a proxy for Brazil's capital flight.

Capital flight is not a directly observable phenomenon, although it is very frequent in developing economies. Consequently, estimations of capital flight vary enormously. Before moving to the exposition of our application and analysis, it must be said that we are defining capital flight[10] as an unregistered net outflow of capital, moving out from developing economies with capital scarcity, like Brazil's. Thus, capital flight refers to the abnormal or illegal outflow of capital

[10] It should be stated that no consensus exists on the definition of capital flight among scholars. Here, we will use one of the most common definitions.

(Beja, Jr. and Edsel, 2005). It must be pointed out that this usually occurs due to speculation. In this sense, capital flight is related to uncertainty and to the risk of keeping certain domestic assets; that is, capital "flees" in an attempt to avoid huge losses in wealth.

It is important to highlight that the application of capital-flight measures is not intended to explore its impact on a measure of external vulnerability. The hypothesis here is that capital flight can coincide with moments of instabilities triggered through capital-flow volatilities analyses. If these moments (of capital flights) do not coincide with a moment of volatility, they can occur at times when external debt indicators improve. In this way, capital flight statistics cannot be a potential indicator of recent external vulnerability determined by international capital reversion. Thus, the aim is to examine the relationship between moments of capital flight and those of instability or crises. The evolution of capital flight will be analyzed to discuss the moments of potential external vulnerability in Brazil.

No less important is the fact that capital flight estimations for each country differ. There can also be deviations depending on data bases, since each institution measures the same indicator differently. Therefore, it is necessary to take sufficient care when comparing results from different estimations. On the whole, we tried to adopt the same variables used in studies about capital flight estimations that were quoted here.

The residual method

We will start with the residual method because this is the most widely used in the literature. The data periodicity for all capital flight methods is quarterly, due to the IMF data base availability (International Financial Statistics, Direction of Trade Statistics, and Balance of Payments Statistics), which will be used to calculate these estimates. The time frame goes from the first quarter of 1990 to the fourth quarter of 2010.

The residual method measures capital flight indirectly, through the residuals between officially registered resources and the use of funds, that is, these are outflows of non-registered capital or "abnormal" capital. Thus, this measure compares the source of capital inflow (net growth of external debt and net inflow of foreign investment) with the use of these inflows (current account deficit and international reserve variation). Capital flight (*KFWB*) can therefore be calculated by residual method as:

$$KFWB = CDET + NFI - CAD - CRES$$

where *CDET* refers to external debt variation, so that $CDET = external\ debt_{period\ t} - external\ debt_{period\ t-1}$. In this calculation, net external debt (both public and private) was registered by the Central Bank of Brazil. It is different, therefore, from gross external debt, which includes non-registered public and private debt. This choice follows some studies on capital flight (Claessens and Naudé, 1993; Chang, Claessens and Cumby, 1997; Hermes, Lensink and Murinde, 2002; Kaufmann, 2004; Beja, Jr, 2005), pointing out that non-registered private debt refers to contingent liabilities and, thus, would be a good measure to use in the residual method. For that, we use the sum of external debt by sector (private) (series 3568 from the Central Bank of Brazil) and external debt by sector (public) (series number 3570 from Central Bank of Brazil). Secondly, *NFI* refers to net foreign investments, where: *NFI = foreign direct investment + portfolio investment + other investments*. In this case the IMF series were used, since this institution releases the net results of foreign direct investment, portfolio investment, and the result of the "other investment assets" account, needed for this calculation. Thirdly, *CAD* refers to current account deficit, with *CAD = negative of net current account*. And finally, *CRES* refers to international reserve variations.[11] For this variable, the IMF series "reserve assets" was used, which is constituted by monetary gold, special drawing rights reserve position in the fund and other claims.

Most of the studies on capital flight, therefore, adopt these variables. However, there are small variations among them. For example, Claessens and Naudé's study (1993), contrasting with many others, considers net acquisitions of equities securities in their foreign direct investment measure. Here we chose the variables described above. A positive value for this measure means an outflow of non-registered capital (capital flight), and a negative value means an inflow of non-registered capital (reverse capital flight).

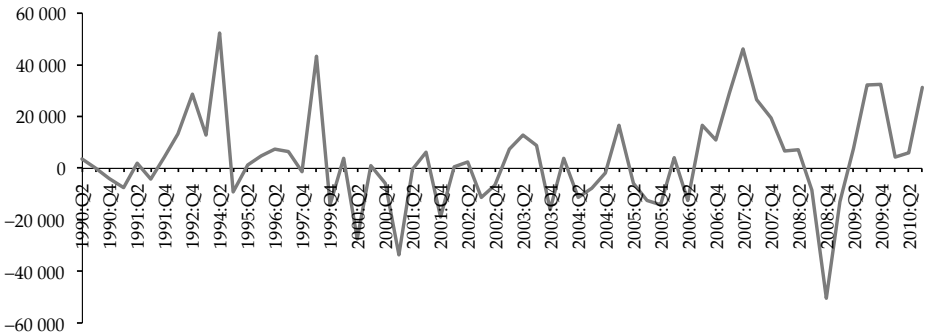
Thus, from the application of this measure, the result displayed in Figure 7 is shown. It can be observed that capital flight peaks coincide with moments of international financial crisis or with some external event, outside domestic

[11] The accumulation of international reserves follows the reverse notation. A negative variation means an accumulation of international reserves or a capital inflow, and a positive variation means a reduction in international reserves or outflows.

control. These peaks were observed in the second quarter of 1994, the fourth quarter of 1998, and second and third quarters of 2007.

The first peak is related to a huge record in foreign portfolio investment, which had no counterpart in current account and international reserve variations. This is due to payments and amortizations from several sources in 1994, specially the refinanced amortization of direct loans. This amortization is a result of the external debt renegotiation process, during the Brady Plan, and was registered in the "long term bonus" sub-account, which belongs to foreign portfolio investment. Thus, external debt renegotiation functioned as capital flight, according to the residual method application, in the second quarter of 1994. Furthermore, it must be pointed out that a huge variation of paper registered in the foreign portfolio investments account, related to the Brazilian debt renegotiation, did not result in a negative variation of the Brazilian external debt, which could reduce capital flight.

Figure 7
Capital flight using residual method
(millions of U.S. dollars)



Source: developed by the authors using Central Bank of Brazil data.

The second capital-flight peak refers to the impact of the Russian crisis in 1998, which affected the Brazilian economy more strongly when compared to those of the Asian crisis the year before and the Mexican crisis at the end of 1994. The Russian crisis caused high foreign outflows from the Brazilian economy resulting from the contagion effect in financial markets.

The third peak, in 2007, was caused by a high outflow of foreign investments and a huge drop in international reserves in Brazil, caused by an explosion of

the subprime crisis in the United States. The impact of this crisis in developing economies, such as Brazil, caused a financial account impact —through the outflows from the Brazilian markets— and also a current account impact, showing that the current account deficit went from US$240 million, in the first quarter of that year to US$2.186 million approximately in the second quarter of the same year.

The subprime crisis, which became an international financial crisis in 2008, also caused a huge reverse in foreign capital flight in the fourth quarter of 2008 (see Figure 7). This is explained by sudden foreign outflows during that period that left the use of funds in a higher proportion than the source of financial flows that made up the capital flight calculation using the residual method. However, when we observed this "reverse flight" as a proportion of GDP, the non-registered inflows decreased because Brazil was one of the countries that suffered least from the impact of the financial crisis compared to other economies in the world.

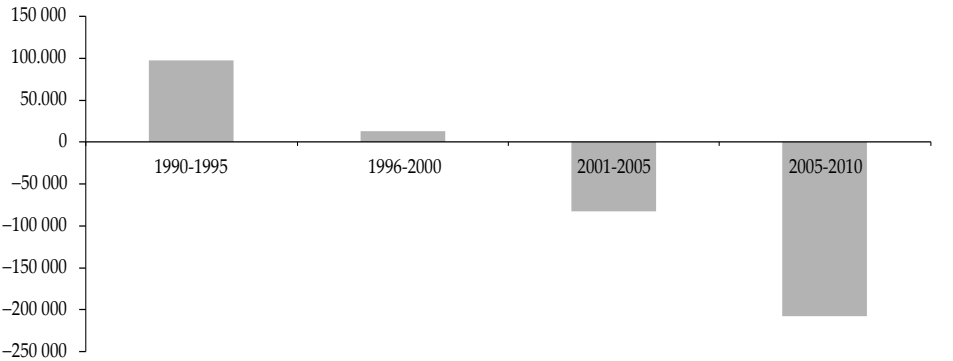
To enlarge the discussion, we can consider the capital flight as a percentage of GDP as a proof of external vulnerability. For us, when capital flight is more than 10% of GDP, capital movement represents an important part of economic activity. In this way, capital flight was extremely important when it exceeded 50% of Brazil's economic activity (see Appendix 4) due to a huge foreign capital inflow, not reflected in the international reserves variation. In terms of percentage of GDP, capital flight reaches a very significant percentage in moments of crisis, as happened in 1994 and 1998 in Mexico and Russia, respectively. Therefore, although between 1990 and 1994 Brazil had attracted foreign capital through privatization and financial deregulation, this capital inflow was followed by a huge contraction in the second quarter of 1994. It is also important to point out that the year 1997, marked by the Asian crisis, does not stand out here due to the unavailability of external debt data for that year. That is why capital flight calculation by the residual method was not possible for some quarters.

To support our empirical argument that capital flight is a good indicator for external vulnerability analysis in Brazil, we also observed the accumulated amount of capital flight in three different periods. We can see in Figure 8 that capital flight is very high during periods of crisis.[12] Meanwhile, during periods

[12] We suspect that the accumulated capital flight between 1996 and 2000 was smaller than that accumulated between 1990 and 1995 due to omissions of a few quarters in important years of financial crisis, like 1997, because of lack of available data.

of favorable international liquidity reverse capital flight is observed. This means that foreign capital both flees and enters the Brazilian economy without being registered. During the periods between 2001 and 2005 and 2005 and 2010, we saw a huge accumulation of international reserves due to the international liquidity cycle in this period as well as strong financial inflow through registered foreign investment.

Figure 8
Capital flight using the residual method (accumulated by period)
(millions of U.S. dollars)



Source: developed by the authors using IMF data.

The hot money method[13]

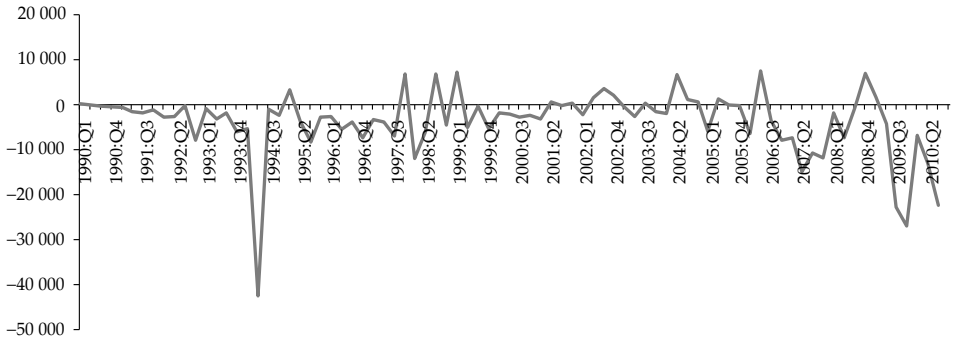
Capital flight measure using the hot money method was originally developed by Cuddington (1986). This measures capital flight through short-term capital outflow. In this case, capital flight would be calculated by the sum (minus) of short-term private capital flows (*SK*) and (minus) of errors and omissions (*EO*), obtained from the balance of payments (BoP). Thus, it also distinguishes

[13] Other measures of capital flight were available in the literature. The Dooley method, based on total amount of outflows minus total registered foreign assets, was omitted here because we could not obtain the data for the necessary adjustments to capital outflows (through non-registered declarations), as in Dooley's definition. The mis-invoicing trade method indicates that export under-invoicing and import over-invoicing can hide capital flight. This proxy for capital flight is also ignored here because the values of our application had generated a low capital flight when compared to the application of the other methods; these were expressive and represented periods of financial crashes. Therefore, we can consider the intense financial capital flight an important indicator of the reversion potential of resources and, therefore, of Brazilian external vulnerability.

between normal and abnormal capital outflows, the latter being shown by net errors and omissions. However, by emphasizing only short-term flows, the hot money method makes an additional assumption about the normal character of medium- and long-term flows.

The measurements to show short-term flows are diverse, but they are usually given by the sum of other assets (SK_1) and portfolio investments (*PORT*), including other bonds and corporate equities. Thus, we have: $KFH = -SK - EO$, with $SK = SK_1 + PORT$, where SK_1 is other assets from other investments; *PORT*, net portfolio investments; *EO*, net errors and omissions. Now, capital flight is represented by a negative value, and a positive value means reverse capital flight.

Figure **9**
Capital flight using the hot money method
(millions of U.S. dollars)



Source: developed by the authors using IMF data.

Again, Figure 9 shows that the greatest capital flight coincides with periods of international instability and financial crisis, such as in 1994, 1998, 2007, and 2009. The moment of strongest capital flight, again in 1994, was due to the strong attraction of portfolio investments, related to Brazilian debt renegotiation during the Brady Plan, as shown in the residual method application (section 3.1). That is, capital flight movements are easily observed when there are destabilizing factors or external shocks.

With the hot money method, the last international financial crisis effects were felt in the third quarter of 2009, when short-term capital was already back in the Brazilian financial market and in huge amounts, that is, stronger than period before the financial crisis.

Compared to the residual method, in the hot money method, capital flight is more moderate, that is, has lower volumes in almost all of the period analyzed. Furthermore, this method restricts capital flight to short-term flows only. This is prejudicial to our analysis, since some long-term flows also have high reversal potential, because they are sold in secondary asset markets. Thus, we consider that capital flight in Brazil is better understood through the residual method.

Finally, capital-flow volatility showed the capital dynamics in moments of stability when capital comes with force to Brazil and in moments of destabilizing factors and external shocks that affect international liquidity and generate huge capital outflows. In turn, capital flight by the residual method indicated a stronger potential of this sensibility when higher amounts of international resource reversals (capital flight) are shown. So, capital flight occurs because Brazil is vulnerable to these external factors. With this, we can conclude that both indicators could represent Brazilian external vulnerability beyond the scope of good (or bad) domestic conditions.

Final remarks

In this article, we observed through two empirical exercises that external events, out of the control of domestic authorities, have made capital flows highly volatile, affecting Brazil's economic performance. This can clearly be seen from the impact of the recent international financial crisis on the domestic economy. Once the crisis was triggered, capital flows in Brazil changed from inflows to outflows, generating impacts on income and employment levels, already by the beginning of 2008. The total flow of foreign capital was negative that year, which had not occurred since 2002. In other words, while the international liquidity cycle remained favorable, between 2002 and 2007, capital flows were strongly directed to Brazil. In face of crisis, the trade balance could not compensate for capital flight.

This volatile capital flow movement is extremely relevant for understanding the dynamics of the Brazilian economy, as it affects domestic variables, such as interest and exchange rates. The exchange rate becomes overestimated when facing the huge inflow of international resources and overshoots during moments of capital flight. The interest rate remains high, which is functional for controlling inflationary impacts from exchange variations and keeping foreign capital attractive. However, not even the higher interest rates can hold back dollar flight in an environment of rising financial instability. Furthermore,

capital flow volatility also affects public debt due to exchange volatility (caused by the intervention of monetary authorities), or high interest rates (which affect debt rollover), or the consequences of changes in debt profile after capital flight shocks that caused the growth of debt securities, sometimes indexed to exchange rates and sometimes to interest rates.

Thus, in a context of uncertainty and the absence of institutions to coordinate liquidity supply worldwide, the horizons for international capital flows are shortened. Consequently, their profiles become even more speculative. In this way, capital flow volatility works as an indicator of Brazil's external vulnerability.

The capital flows that showed higher volatility, through the GARCH model, were exactly the ones of greater reversal potential when facing changes in market expectations: foreign portfolio investments and other foreign investment flows. Therefore, the volatility of these flows is directly related to the country's external vulnerability, since it shows the instability of international resources and its flexible movements. Since it depends on these financial flows and due to the frequent increase in its external liabilities, Brazil remains vulnerable to international events, even when a favorable situation reflects positively on the current account.

The changes in international capital flow and domestic economy structures were important for analyzing capital flight in Brazil. The loss of confidence in the global economy generates capital flight, as we can see by the measures applied. Capital flight can indicate the potential of resource reversal and, in this sense, can be considered another good indicator of Brazil's external vulnerability. However, we must ask whether capital flight results from macroeconomic instability as a consequence of the financial liberalization process. Thus, it would also be important to analyze the causal relationship between macroeconomic instability and capital flight in Brazil. In any case, we can come to the preliminary conclusion that structural changes in Brazil's economy, resulting from capital account liberalization, caused strong capital flight.

It also can be concluded that, of the two methods for measuring capital flight, the residual method is more robust than the hot money method. Through the former, it is possible to overcome the distinction between normal and "abnormal" capital flight, since it focuses on the amount of nonregistered capital outflow resulting from structural macroeconomic problems in Brazil, instead of dealing with specific motives of certain investors or of certain countries for capital flight, as other capital-flight measurement meth-

ods do. Furthermore, through the residual method, it is also possible to avoid the limitation of the analysis of short-term capital outflow, to which the hot money method is subject. This is important because long-term capital outflow contributes even more to the depreciation of the resources necessary for economic growth. When analyzing the relationship between these two indicators (volatility and capital flight), we can say that, while financial-flow volatility can indicate moments in which Brazil turns from recipient to issuer of international resources, capital flight can indicate the sensibility of capital flow toward Brazil when facing destabilizing factors and external shocks. The first indicator shows the flow's behavior and the second indicator captures the degree of outflows. In this sense, strong capital flight (such as that which occurred in 2008) can be an effect of a balance of payments characterized by a great weight of volatile capital flows. Therefore, we were able to show that capital-flow volatility generates highly negative impacts on external vulnerability, since it makes the country dependent on international liquidity cycles; while capital flight raises the country's external vulnerability by impacting international trade and the current account balance, as well as the foreign debt. Thus, financial-flow volatility and capital flight can be considered good indicators of the external vulnerability analysis.

Finally, it should be said that if capital-flow volatility and capital flight are considered fundamental problems, some policy to reverse capital flight must be considered, such as comprehensive capital controls. We think it is necessary to adopt a toolkit to manage capital flows, which would effectively inhibit international investors' speculation. This could be achieved with an inflow control linked to an outflow control. Otherwise, the imposition of an unremunerated reserve requirement could be more effective. Some other possible strategies for the Brazilian economy are heavily taxing financial flows through the imposition of limits and deposits for capital inflows; regulating banking operations in foreign currency; and controlling the Securities, Commodities and Futures Exchange. In short, there is a need for a regular reassessment to ensure capital controls and for the administrative capacity to implement them.

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Appendix

Appendix 1. Financial account series index

Accounts	*Openness*	*Accounts*	*Openness*
1. Direct investment	First level	3. Derivatives	First level
1.1. Brazilian direct investment	Second level	4. Other investment	First level
1.1.1. Equity capital	Third level	4.1. Other Brazilian investments	Second level
1.1.2. Claims on affiliated enterprises	Third level	4.1.1. Loans and finance (short-term and long-term)	Third level
1.2. Foreign direct investment	Second level	4.1.2. Money and deposits	Third level
1.2.1. Equity capital	Third level	4.1.3. Other assets (short-term and long-term)	Third level
1.2.2. Claims on affiliated enterprises	Third level	4.2. Other foreign investments	Second level
2. Portfolio investment	First level	4.2.1. Suppliers' trade credit (short-term and long -term)	Third level
2.1. Portfolio Brazilian investment	Second level	4.2.2. Loans and finance (short-term and long-term)	Third level
2.1.1. Foreign company equity	Third level	4.2.3. Money and deposits	Third level
2.1.2. Short-term and long-term debt securities	Third level	4.2.4. Other assets LP and CP (liquid)	Third level
2.2. Foreign portfolio investment	Second level		
2.2.1. Brazilian company equity	Third level		
2.1.2. Short-term and long-term debt securities	Third level		

Appendix 2. Identification order of the main series of the GARCH application

Table **2.1**
Identification order of GARCH model (first level)

	First period: 1995:01-1998:12	*Second period: 1999:01-2010:12*
Direct investment	ar (2) ma(2); garch (1,1)	ar (2) ma(2); garch (1,1)
Portfolio investment	ar (1) ma(1); garch (1,1)	ar (2) ma(2); garch (2,2)
Derivatives	ar (1) ma(1); garch (1,1)	ar (2) ma(2); garch (2,2)
Other investment	ar (1) ma(1); garch (1,1)	ar (1) ma(1); garch (1,1)

Table **2.2**
Identification order of GARCH model(second level)

	First period: 1995:01-1998:12	*Second period: 1999:01-2010:12*
Brazilian direct investment	ar (1) ma(1); garch (1,1)	ar (1) ma(1); garch (1,1)
Foreign direct investment	ar (1) ma(1); garch (1,1)	ar (4) ma(4); garch (1,1)
Portfolio Brazilian investment	ar (1) ma(1); garch (1,1)	ar (2) ma(2); garch (1,1)
Foreign portfolio investment	ar (1) ma(1); garch (1,1)	ar (2) ma(2); garch (1,1)
Other Brazilian investments	ar (2) ma(2); garch (1,1)	ar (2) ma(2); garch (1,1)
Other foreign investments	ar (1) ma(1); garch (1,1)	ar (1) ma(1); garch (1,1)

Source: developed by the authors.

Appendix 3. Average relative participation and standard deviation of financial account series

Table **3.1**
Average participation of financial account series (first level)

	First period: 1995:01-1998:12	*Second period: 1999:01-2010:12*
Direct investment	0.2436	0.3214
Portfolio investment	0.3977	0.3026
Derivatives	0.0042	0.0099
Other investment	0.3545	0.3661

Table **3.2**
Average participation of financial account series (second level)

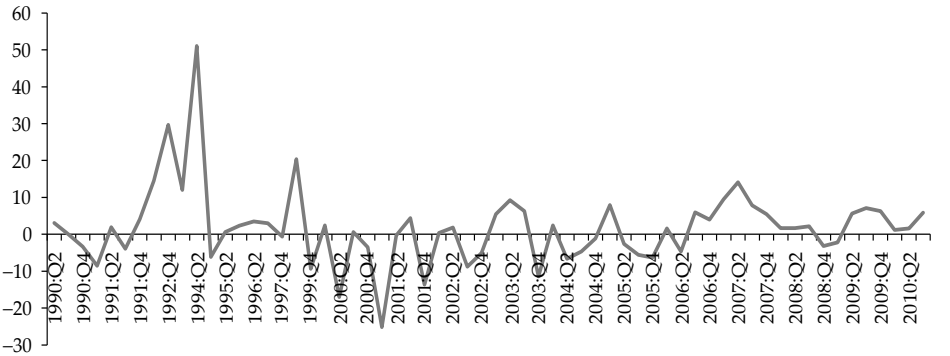
	First period: 1995:01-1998:12	*Second period: 1999:01-2010:12*
Brazilian direct investment	0.1309	0.2144
Foreign Direct investment	0.8690	0.7856
Portfolio Brazilian investment	0.0997	0.1610
Foreign portfolio investment	0.9002	0.8390
Other Brazilian investments	0.3840	0.4393
Other foreign investments	0.6159	0.5607

Table **3.3**
Average participation of financial account series (third level)

	First period: 1995:01-1998:12	*Second period: 1999:01-2010:12*
BDI- Equity capital	1.0000	0.71353
BDI- Claims on affiliated enterprises	0.0000	0.28647
FDI- Claims on affiliated enterprises	0.1232	0.79518
FDI- Equity capital	0.8768	0.20481
PBI- Foreign company equity	0.3067	0.38459
PBI- Debt securities	0.6933	0.61540
FPI- Brazilian company equities	0.4612	0.34252
FPI- Debt securities	0.5388	0.65747
OBI- Loans and financing	0.1326	0.18029
OBI- Money and deposits	0.6132	0.73109
OFI- Loans and financing	0.2980	0.36312
OFI- Money and deposits	0.4080	0.52497
OFI- Trade credits	0.2940	0.11190

Source: own elaboration.

Appendix 4. Capital flight as a percentage of GDP (residual method)



Source: developed by the authors using IMF data.