External Debt and Debt Intolerance: An Empirical Analysis

MÁRCIO HOLLAND*

INTRODUCTION

Even though programs of debt restructuring took place in the late 1980s and in the early 1990s, the total external debt has increased in most developing regions. Figure 1 shows the sizeable increase of the public and publicly guaranteed debt in all developing economies around the world. From 1990 to 2003, the total external debt (public and publicly guaranteed) increased by 40%, while low income countries experienced an increase of 47% and middle income countries debt increased by 25%. Key debt indicators can be very contradictory and for many developing economies, mainly for middle

117

income economies, one may find relieving situations. Actually, these debt indicators can show decreases in the external debt scaled to exports, and the reason is closely associated with increasing exports led by domestic currency devaluation. As currency crises took place a few years ago one could barely predict some real effect of exchange rate competitiveness on exports to some time ahead. Concerns are addressed about both the rising in the total amount and the way the debt has risen in the last decades.

Let us consider three canonical examples of external debt problems, that is, Brazil, Argentina and Mexico. In Brazil, the external debt increased even though several components of debt had been restructured for a total of US$48 billion, and in Mexico the agreement restructured a total of US$48.2 billion.[1] In terms of total debt service to exports, Argentina experienced a significant increase since the Brady deal, from 35 to 71 per cent, in 2001, one year before the default.[2] Brazilian indicators presented similar behavior, changing from 36% (1995) to 93% (2000). However, the Brazilian external debt problem has been strongly alleviated since 2004 led by increases in commodities price in the international markets. Since then, even under nominal and real appreciation of the Real, the exports have grown in extraordinary rates, reaching US$118 billion, in 2005. Foreign reserves increased from a critical level, in 2002, to US$70 billion, in 2005. Central Government successfully used foreign reserves to reduce external debt. However, internal debt remains a great concern, especially because of difficulties to lengthen it. Reserves were used to reduce external debt, but sterilization process increased both domestic debt and concentrated short-term real interest denominated debt. It seems like even when external

---

[1] In Mexico, in addition to new money, US$1 billion, the agreement provided for the exchange of US$20.5 billion of debt bonds at a 35 per cent discount, an exchange of US$22.4 of debt at par to reduced interest rate bonds, and conversion bonds totalizing US$5.3 billion.

[2] In Argentina, January 2002, the local currency bonds were exchanged for new debt, which carried covenants less favorable than the original debt. Bonds maturing before 2010 were extended by three years and the coupon was reduced to 7 per cent or less. As of January 2003 the foreign currency bonds were still to be restructured. Stand-by credit facility (US$2.8 billion) by the International Monetary Fund (IMF) for transitional financial support until August 2003.

debt problems are overcome, internal debt remains a concern. Moreover, as exports in such countries can be increased due to rises in commodity prices, sudden stop in such markets might take place. Then, all efforts to alleviate external constraints can fall back shortly.

According to Reinhart, Rogoff and Savastano (2003), default became a rule rather than an exception in countries with weak financial intermediation and high tax avoidance. In a very different perspective, Eichengreen, Hausmann and Panizza (2003) associate the problem of the external debt in developing countries with the global imbalance or more properly speaking emerging market economies suffer from the original sin, because they are incapable of borrowing abroad in their own currency, even domestically in long-term interest rate.

Section two summarizes why some countries borrow so much, according to the standpoint of the "debt intolerance" hypothesis. The third section presents a model to analyze sustainability models in a critical condition of external indebtedness. Econometric evidence will be summed up in the fourth section.

FIGURE 1
Developing countries:
public and publicly guaranteed debt, 1990-2003
US$

Source: World Bank (2004a).
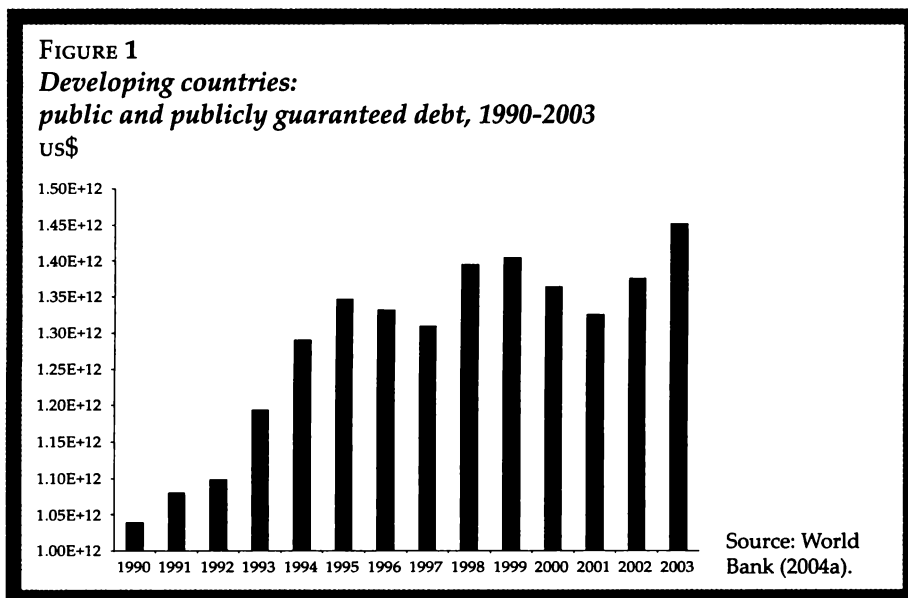
Throughout the paper the analysis is conducted towards supporting the idea that external debt dynamics in developing countries remains the same well-known theoretical derivation associated with its profile. This argument is rather associated with the "original sin" than with the debt intolerance approach. Even though the sustainability assessments provided by International Monetary Fund (IMF) are worthy, they need to take into account specific attributes of the debt dynamics.

WHY SOME COUNTRIES BORROW SO MUCH?

According to Reinhart, Rogoff and Savastano (2003), the concept of debt intolerance manifests itself under the extreme circumstances many emerging market economies experience in terms of debt level that would seem manageable by advanced country standards. They argue that safe external debt-to-GNP (Gross National Product) thresholds for debt intolerant countries are low and that these thresholds depend on the history of default and inflation. The key finding is that the debt intolerance showed by some countries can be explained by a very small number of variables related to their repayments and inflation history.[3]

Why does the market repeatedly lend to debt-intolerant countries to a point where the credit risk becomes significant, if serial default is such a pervasive phenomenon? "Part of the reason may have to do with the pro-cyclical nature of the capital market, which has repeatedly lent vast sums to emerging market economies in boom periods (which are often associated with low returns in the industrial countries) only to retrench when adverse shocks occur, producing painful 'sudden stops'" (Reinhart, Rogoff and Savastano, 2003, p. 7). But, the other part of their answer is associated with the shortsightedness and complacence of both domestic governments and

---

[3] From historical perspective, default can become a way of life, and, from 1824 to 2001, countries like Brazil and Argentina were either in default or undergoing restructuring a quarter of the time, Venezuela and Colombia almost 40 percent of the time, and Mexico for almost half of all the years since its independence.

multilateral institutions. In other words, during periods of international liquidity "governments have often been too short-sighted (or too corrupt) to internalize the significant risks that over borrowing produces over the longer term" and "the multilateral institutions have been too complacent (or have had too little leverage) when loans were pouring in" (Reinhart, Rogoff and Savastano, 2003, p. 7).

According to the debt intolerance approach some countries always borrow more than they should and will then suffer domestic fiscal imbalance; as a consequence, if a sudden stop occurs, they will default. And they do this because they do not protect their domestic financial system.[4]

In order to make practical the debt intolerance measurement, Reinhart, Rogoff and Savastano (2003) focused on the indicator of sovereign debt called "Institutional Investor's Country Credit Ratings" (henceforth IIR) prepared by the Institutional Investor.[5] However, according to figure 2, it is hard to pinpoint the relationship between the key indicator of external debt (PVD_GNI[6]) and IIR. The correlation coefficient[7] between PVD_GNI and IIR is 0.017. But, the correlation between PVD_XGS and IIR is negative and relatively high (–0.23), which definitely does not make sense. That is, it is not expected that low debt indicator is associated with high probability of default on government debt obligation. Consequently, it indicates that it is not easy to define debtor's club and external debt intolerance regions through only those two variables. Conversely, figure 3 shows the other way

---

[4] The authors of the "original sin" approach (Eichengreen, Hausmann and Panizza, 2003) question that the debt-intolerance approach suggests that default on external debt may weaken a country's tax system by encouraging capital flight and tax avoidance. However, they report no regressions relating these facts.

[5] The Institutional Investor Rating (IIR) is compiled twice a year and is based on information provided by economists and sovereign risk analysts at leading global banks and securities firms. The ratings grade each country on a scale from 0 to 100, with a rating of 100 given to those countries perceived as having the lowest change of defaulting on their government debt obligations.

[6] PVD_GNI is the Prevent Value of Debt Service to GNI (Gross National Income) and PVD_XGS is the Present Value of Debt Service to Exports.

[7] We calculated Pearson's correlation coefficient and in this case the value of the correlation does not depend on the specific measurement units used.

the investors can analyze the country's sovereign debt focusing on external vulnerability and it is reasonable to think about the positive relationship between high debt and strong external imbalances.

According to the debt intolerance approach, the inflation history is used to predict default. But, the inflation of the last eight years (from 1995 to 2002) is not associated with the IIR. At first glance, there is a very practical reason to believe that there is some relationship between inflation and sovereign risk. Certainly, countries suffering unrelieved inflation show frequently high interest rates and then they become more domestically indebted. Conversely, there is another reason to believe that this has been a phenomenon, at least since 1990s, with low likelihood to be related to increases in the external debt. Figure 4 shows the inflation across regions, and they were reduced to low levels even in developing countries where inflation is more difficult to be controlled.

FIGURE 2
Cross-plot between external debt and IIR for developing economies
Average 2000-2002

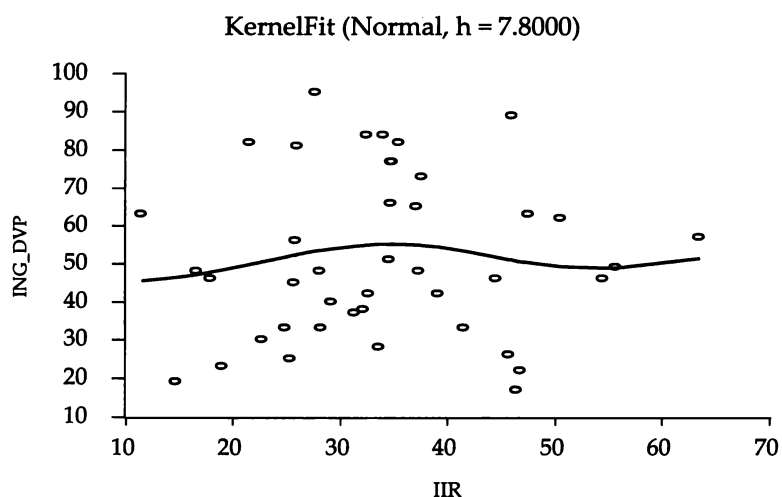KernelFit (Normal, h = 7.8000)

FIGURE 3
Cross-plot between current account and IIR *for developing economies*
Average 2000-2002
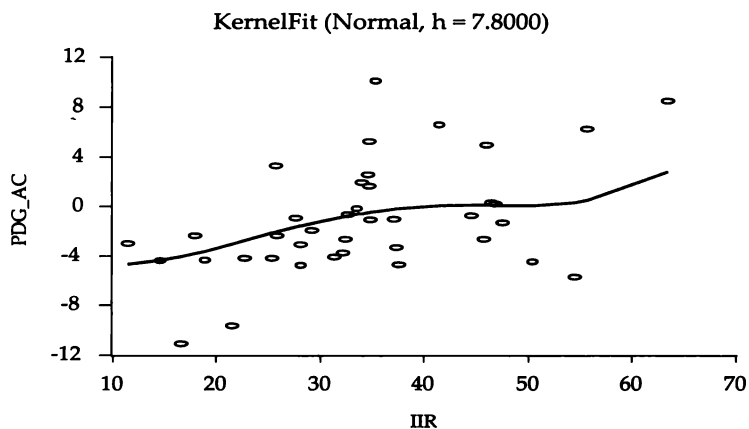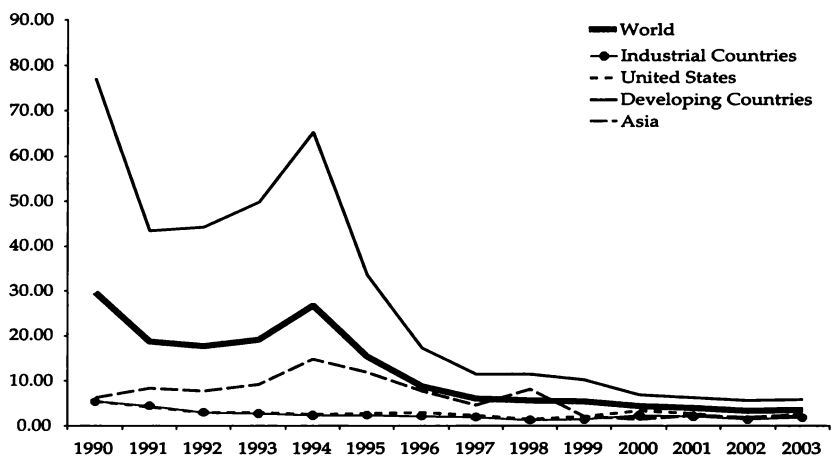

KernelFit (Normal, h = 7.8000)

FIGURE 4
Inflation by regions
% annual of CPI, 1992-2002

Source: Worl Bank (2004a).

But, why do countries without history of default attempt to avoid default for such a long period of time? The authors' answer of the debt intolerance approach is associated with the interest that countries have in protecting their banking and financing system. It means that weak financial intermediation in many serial defaulters is associated with low penalty for defaulting. So, "The lower costs of financial intermediation disruption that these countries face may induce them to default at lower thresholds, further weakening their financial systems and perpetuating the cycle"(p. 13).[8]

Additionally, do debt-intolerant countries really borrow too much? According to those authors, at least from 1980s and 1990s, evidence shows that external borrowing was often driven by shortsighted governments that were willing to take significant risks to raise consumption temporarily, rather than to foster high-return investment projects. "The fact that the gains from borrowing come quickly, whereas the increased risks of default is borne only in the future, tilts shortsighted governments towards excessive debt"(p. 13).

Summing up, some countries borrow more than they should, and they borrow more because they are unable to find an alternative domestic source to support their imbalance. They also can live borrowing and defaulting as a way of life without focusing attention on protecting their weak banking and financial system. The external debt dynamics over time, specially indexed to foreign currency and international interest rates, is only the expression of the way they can borrow more; international investors lend more during exuberant financial cycles and earn higher returns than they would earn in developed economies.

Reinhart, Rogoff and Savastano (2003) are probably right when they emphasize the fact that default is a cyclical phenomenon and most likely serial defaulters are more prone to default during "sudden stops" in capital

---

[8] The mechanism also takes into account the tax system in a capital flight context. Countries where tax avoidance is high tend to have greater difficulty to fulfill debt payments, "forcing governments to seek more revenue from relatively inelastic tax sources, in turn exaggerating flight and avoidance. Default amplifies and ingrains this cycle" (Reinhart, Rogoff and Savastano, 2003, p. 13).

flows than the non-defaulters. The perception of the international investors is an important variable and can be expressed in ratings and credit risk measurements. It is also important that the history of inflation matters to build foreign investors' perceptions.

But, what can be said about the role played by other factors such as the degree of dollarization and the maturity structure of the debt? Do these factors help to build the perception of foreign investors? That is, not only the degree of the external debt, but also its profile can be important to grade countries according to credit risk measurements. Is it fair to relate a country's debt profile to domestic institutional weakness? In other words, why do some countries borrow the way they borrow?

DEBT SUSTAINABILITY ANALYSIS

Now it is important to understand the situation that emerging market economies can experience when they are considered debt-intolerant countries and analyze the way they can deal with their debt in order to avoid default.

According to the standard debt sustainability analysis:

$$D(t + 1) = [1 + r(t)]D(t) - TB(t) \qquad [1]$$

where D(t) is the country's external debt at time t, TB is its trade balance; r is the interest paid by the country on its external debt; g is the economic growth rate. In steady-state one can express the following relationship:

$$TB/Y = (r - g) \qquad [2]$$

where TB/Y is the steady-state ratio of the trade balance to output needed to stabilize the external debt ratio at D/Y.

To be closer to the recent movement of the external debt, three different changes in the expression [1] can be proposed. First of all, the current account instead of trade balance; second, as the majority of external debts

in developing countries are US Dollars denominated, the debt denomination is incorporated in the model. Hence, not only the interest rate matters, but also the United States (US) dollar variability is taken into account in the expression; and, finally, the model weighs the participation of the US Dollar-denominated external debt. Then, the equation [1] can be expressed as:

$$D(t + 1) = [1 + r(t) \cdot e(t)](w_{USD})D(t) - CA(t) \qquad [1a]$$

where e is the US exchange rate in terms of an international basket of currencies; w_{USD} is the weight of the US Dollar-Denominated external debt in the total debt, and CA is the Current Account. Figure 5 shows the important role played by this component of the external debt when, in the early 1990s, the US Dollar-denominated debt averaged 40% of the total external debt in developing economies and in 2002 represented more than 60 per cent.

FIGURE 5
Developing countries: currency composition of the long-term external debt, 1990-2002
% us dollar-donominated debt

Source: World Bank (2004a).
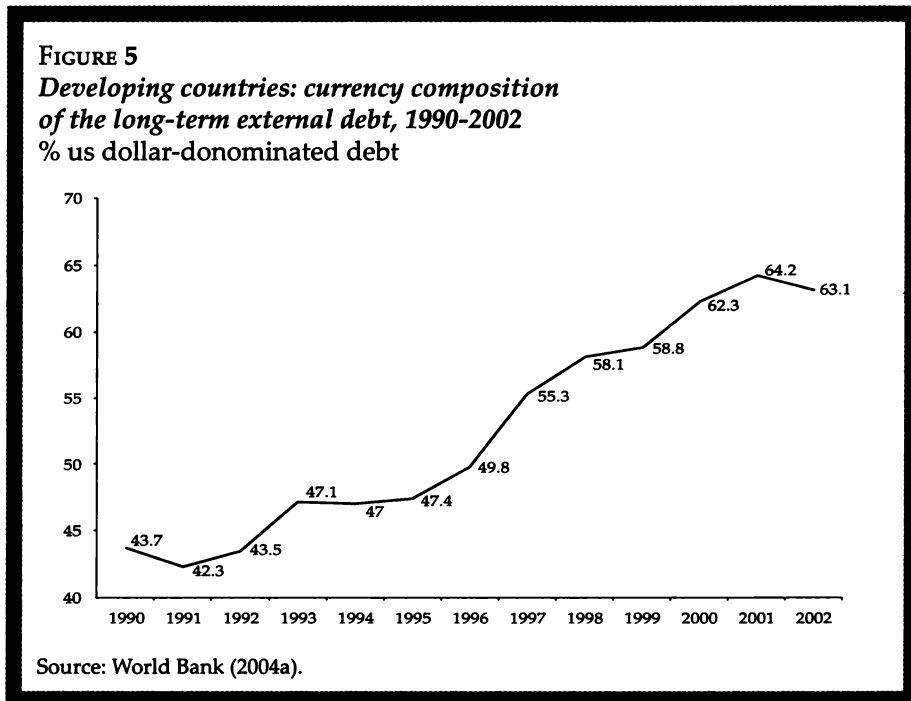
After simple manipulation, the steady-state expression [2] can be written as follows:

$$CA/Y = [(r + e - g) (1 + w)] (D/Y)$$ [2a]

Taking into account the exogenous shocks, such as confidence, political and terms-of-trade shocks, $\zeta(t)$, [2a] can be expressed as a stochastic process as follows:[9]

$$CA/Y = [(r + e - g) (1 + w)] (D/Y) + \zeta(t)$$ [2b]

Figure 6 illustrates both situations for the "standard approach" of the external debt sustainability analysis and the other one added with the problem of foreign currency denomination of the external debt. According to expression [2] some countries can manage their external debt by implementing sustainable current account surplus (relative to Gross Domestic Product, GDP), as shown in the initial equilibrium A. But, once the interest rate is an endogenous variable (the higher the external debt, scaled to GDP or to exports, the higher the interest rate for future debt renegotiations),[10] the model states that after the equilibrium A, the higher the debt-to-GDP (or debt-to-exports) is, the higher the interest rate for future payments will be.

The consequence is straightforward: the country must present very high current account surplus related to GDP. However, even if the country can increase its current account to GDP, it will not be insulated from more

---

[9] As previously discussed, Reinhart, Rogoff and Savastano (2003) measure the debt intolerance focusing on two indicators: the sovereign debt rating, reported by Institutional Investors, and the external debt-to-GNP ratio (or alternatively, the external debt-to-exports ratio). "Other factors", such as dollarization, indexation and maturity of the country's debt are different aspects of the same underlying institutional weaknesses. Therefore, the sustainability assessment could not be worth.

[10] "Because the interest rate on debt to private creditors can rise very sharply with the level of debt, a trajectory that may seem marginally sustainable according to standard calculations may in fact be much more problematic when debt intolerance is taken into account" (Reinhart, Rogoff and Savastano, 2003, p. 41).

increases in its external debt, once most of its external debt can be foreign-currency denominated. In this context, there are many mechanisms to be revealed. First, if a country has elasticity to increase the current account,[11] maybe because of either trade performance associated with depreciation in the domestic currency, or because the external income has increased faster than the domestic income. Second, and consequently, the international currency denominated external debt would have increased.
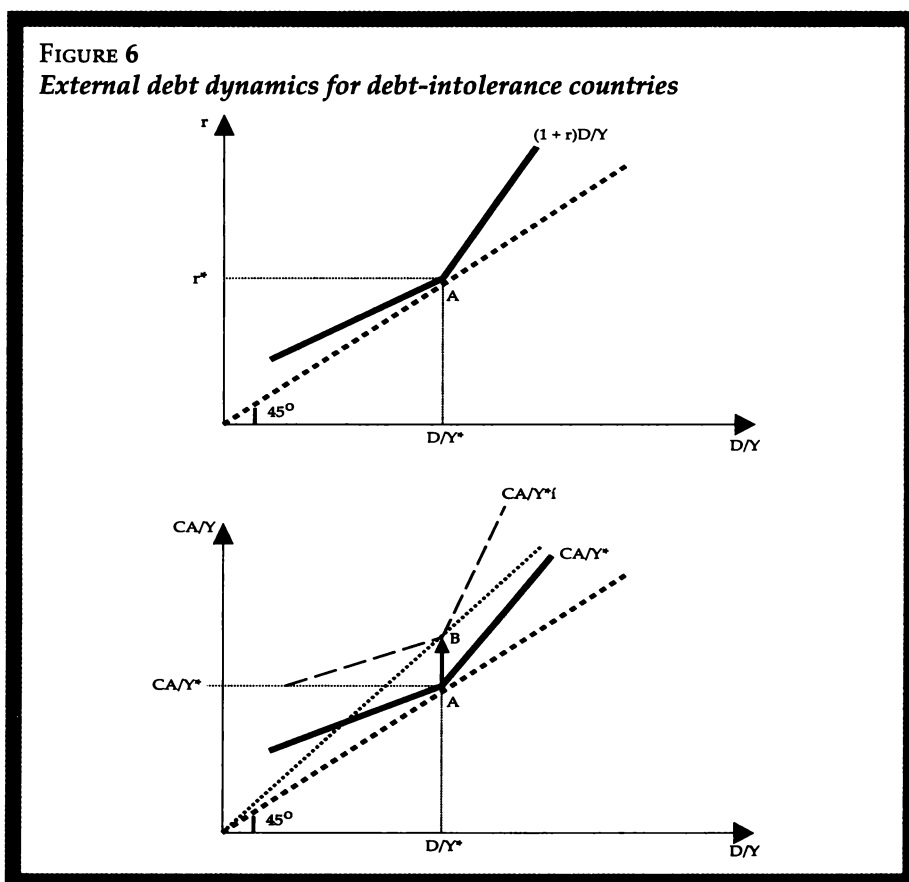
FIGURE 6
External debt dynamics for debt-intolerance countries

This especially dramatic dynamics of the external debt might take place only because the country's initial level of debt (scaled by GDP or exports) may already have exceeded, or be close to exceeding the D/Y* level. Needless to say, non-anticipated external shocks in the foreign exchange rate and the international interest rate, besides the shocks in term-of-trade and domestic inflation, cause changes in the steady-state equilibrium, from CA/Y* to CA/Y*', as shown in figure 5. On the CA/Y*' curve, with the same initial value of the external debt (D/Y*), the country must have a higher current account surplus, and, it is very likely to move on a steep curve and it therefore has to obtain a much higher current account surplus over time. However, some countries, mainly developing ones, seek more revenue from inelastic sources and they, therefore, borrow more abroad in foreign currency. During periods of exuberating capital flight they can probably finance their external imbalance, but when "sudden stop" takes place they default.

Finally, it is important to consider the rapid growth of the domestic government debt in the 1990s. It is fair to say, according to the experience in Brazil, Argentina and Turkey, that the domestic government debts are denominated either in foreign currencies or in some short-term interest rates. "These trends suggest that domestic debt intolerance can manifest itself in a manner similar to external debt intolerance" (Reinhart, Rogoff and Savastano, 2003, p. 50).

Discussing the effects of debt intolerance for debt sustainability analysis, it is necessary to recognize that the interest rate paid on debt is an endogenous variable, which depends on the debt-to-output (or debt-to-exports) ratio. The interest rate on debt to private creditors can increase with the debt level. Additionally, sustainability analyses need to take into account that the initial level of debt may already have exceeded.

According to this standard debt sustainability model, emerging market economies can experience difficulties in overcoming external imbalances and therefore they default. However, they default not exactly because of their history of default and inflation. They default because of the way they borrow. In a prospective analysis even if they borrow less they can default; even if they present commitment to keep inflation at low levels, they can

default; and, finally, even if they defend low exchange rate volatility,[12] default can be their destiny.

ECONOMETRIC FINDINGS: A PANEL MODEL

The panel approach allows for two basic models: fixed and random effect models, both of which admit static and dynamic specifications. The fixed effect model, also known as Least Square Dummy Variable (LSDV), is a generalization of an intercept-slope-constant model for panel analysis, introducing a dummy variable to capture the effects of omitted variables that are constant over time.

In this specification, the individual-effects can be freely correlated with the regressors. Their estimation is, in fact, the own estimation of the model of multiple regressions with binary variables for each one of the n units of the analysis, in such a way that their introduction will cause the intercept of the regression to be different for each one of these variables and pick up the heterogeneity among them. The ordinary least square (OLS) estimator known as LSDV will be consistent and efficient. On the other hand, the random-effect model specification considers the individual-specific effects as random variables, assuming no correlation between the individual effects and the other random variables, where the estimation was pursued by using the Generalized Least Square (GLS).

As first step, the econometric procedures take the following general expression:

$$\hat{y}_{it} = \alpha_i + \beta_0 X_{it} + \beta_1 Z_{it} + \varepsilon_{it} \qquad [3]$$

where: $\hat{y}_{it}$ is the external debt measured by Public and Publicly Guaranteed Debt (PPGD), sometimes in absolute values, or in terms of growth rates, or

---

[12] According to Calvo and Reinhart (2002), the exchange rate volatility might be lower than the interest rate volatility because emerging market economies suffer from the fear of floating.

related to GDP;[13] X_{it} is the vector of explanatory variables that might express size and development level of the monetary and financial sector,[14] such as domestic credit, market capitalization, besides inflation, monetary policy (five-year moving average of the inflation), monetary base to GDP ratio and consequently the credibility of monetary policy;[15] Z_{it} is the vector of explanatory variables that can express the debt profile, such as the maturity structure,[16] the average interest rate[17] and the currency-denomination[18] of the debt, as well as variables to control the external vulnerability problems and foreign liquidity, such as current account deficit (or relative to GDP), foreign exchange reserves to imports, real exchange rate misalignment and exchange rate regimes[19] and external debt interest payments to exports.

---

[13] It is very important to highlight that in order to avoid the dependence problem between explanatory and dependent variables, when the total external debt (herein Public and Publicly Guaranteed Debt) is related to GDP, the explanatory variables are used in their absolute values, such as Domestic Credit, Money M2 and Quasi-Money, Current Account, as well as combinations using these variables were calculated from their absolute values.

[14] According to Reinhart, Rogoff and Savastano (2003, p. 13) "weak financial intermediation in many serial defaulters lowers their penalty to default". Then, domestic credit provided by banking system and/or market capitalization can actually offer us a proxy of financial intermediation in domestic monetary and financial systems.

[15] It is expected that low inflation and tight monetary policy is symptom of credible central banks.

[16] Average maturity represents the average maturity for all new public and publicly guaranteed loans contracted during the year. To obtain the average, the maturity for all public and publicly guaranteed loans has been weighted by the amounts of the loans. Public debt is an external obligation of a public debtor, including the national government, a political subdivision (or an agency of either), and autonomous public bodies. Publicly guaranteed debt is an external obligation of a private debtor that is guaranteed for repayment by a public entity (World Bank, 2004a).

[17] Interest rate represents the average interest rate on all new public and publicly guaranteed loans contracted during the year. To obtain the average, the interest rates for all public and publicly guaranteed loans have been weighted by the amounts of the loans (World Bank, 2004a).

[18] The percentage of external long-term debt contracted in US dollars for the low- and middle-income countries. Long-term external debt is defined as debt that has an original or extended maturity of more than one year and that is owed to nonresidents and repayable in foreign currency, goods, or services (World Bank, 2004a).

[19] It was used de facto Exchange Rate Regimes classification provided by Bubula and Ókter-Robert (2002). According to this classification a country can be ranked from 1 (another currency as legal tender) to 13 (independently floating). As the dataset ends in 2001, estimations with the variable exchange rate regimes used data from 1990 to 2001.

Almost all variables in the data set (see table 1) were obtained from World Bank's databases (*World Economic Indicators* and *Global Development Finance* on line).[20]

Table 2 shows the first empirical results by within transformation, or alternatively called as fixed effects model. The important thing about equation [3] is that the unobserved effect α_i has disappeared. It means that equation [3] was estimated by OLS using the time variation in y and x within each cross-sectional observation. Hence, the unobserved α_i is a parameter to be estimated for each country i, that is, to be estimated along with the β_i.[21] We run several variants of equation [3].

First of all, there is strong cross-country evidence, for the period 1990-2002, that high GDP is positively correlated with high external debt; second, even statistically non significant, high growth rates in external debt are related with lowers growth rates in GDP; third, there is no evidence proving any sort of reasonable relation between growth of the external debt and either inflation or the size of the monetary and financial system.[22]

It is very important to highlight that the same equations were run using different measurements that express the same reasonable idea of monetary policy credibility: the inflation measured by CPI and the variance of inflation measured by five-year moving average and only the best results in terms of t-test statistics and/or coefficient signal were reported. We also preceded

---

[20] Annex 2 shows box-plot of the main variables used in our estimations.

[21] The R-squared from the LSDV (dummy variable regression) is usually rather high because dummy variables are included for each cross-sectional unit; however, it gives the same estimates of β_i that would be obtained from the regression on time-demeaned data, and the standard errors and other major statistics are identical (Wooldridge, 2000, p. 446).

[22] Three different data were collected in order to catch on the size and the development level (financial intermediation) of the monetary-financial systems across countries. On one hand, concerning with the monetary system, there are the variables: the domestic credit (or scaled to GDP) and the M2 to GDP ratio (or only M2); on the other hand, to take into account the financial system level there is the market capitalization (or scaled to GDP) provided by Standard and Poor's. Afterwards, the mixed variable "Monetary and Financial System" was calculated by multiplying domestic credit with market capitalization. The author believes that the variable M2 to GDP (or only M2) can also be used as the proxy of monetary policy, but we would rather use only inflation (or variance of inflation) because monetary market equilibrium can be fairly expressed by inflation.

exclusion and restrictions tests to evaluate a restrict model against an irrestrict one, according to F-statistic. Variance of inflation was tested because some countries can mantain the high interest rate longer with the intention to build credibility because they recently had undergone hyper-inflation episodes.

Fourth, high current account deficit to GDP ratio is statistically related to changes in the external debt, which suggests that there is some evidence in favor of the external vulnerability as an important sign of highly indebted countries. Taking the debt to GDP ratio, were ran other set of equations. Once more, inflation (or variance of inflation) and the size of the monetary system were not statistically significant at all, what means that countries that have experienced high inflation are not the same as those with high external debt; additionally, the size of the monetary system is not statistically significant, even the negative sign can convey the idea that the country with large monetary system is less indebted.

It was tested if severely indebted countries have experienced pegged exchange regimes and there is no empirical evidence in favor of this idea. It means that the choice of the pegged exchange rate regimes and the subsequent collapse in the developing economies did not help to predict the external debt dynamics, even though it can be narrowly associated with domestic federal debt and default of this debt. Finally, considering the variables that can express the debt profile (maturity structure, interest rate and currency-denomination), it is absolutely fair to say that all those explanatory variables are statistically significant to explain the external debt dynamics during the 1990s in developing countries.

Of course, the within transformation could not be the best estimator, especially when the unobserved effect is uncorrelated with all the dependent variables. In this case, random effect estimators might be more attractive. Then, it is important to know which is the most appropriate model. According to Frees (2003), it depends on the available information and the estimation goals. If, for example, the main concern of the analysis will be to test the effect of the variables where the individuals are classified in groups, then the random effect specification is more appropriate. In Hsiao (1999, p. 42): "The fixed-effects model is viewed as one in which investigators

make inferences conditional on the effects that are in the sample. The random-effects model is considered as the one in which one can make unconditional or marginal inferences with respect to the population of all effect." One way to decide whether to use a fixed effects or random effects model is to test for misspecification according to ratio F or, alternatively, the Hausman Test (see Hsiao, 1999, p. 48).

Thus, the set of equations already reported in table 2 was run according to a random-effect model[23] and the relevant results remained almost the same (see table 3), except in instance:[24] the size and development of the monetary and financial system became statistically significant and with positive signals and these results contradict the debt intolerance approach because it believes in a certain indisposition of the developing countries' governments to protect their monetary and financial system. That is, the most indebted developing countries are the same with the largest domestic credit provided by banks and the largest market capitalization.

Consequently, it is fair to remark that:[25]

1. If the debt intolerance approach were right, it would be able to see some significant and negative estimated parameters for the inflation, variance of inflation, domestic credit (or scaled by GDP), market capitalization (or scaled by GDP), or interactions of these variables such as the Monetary and Financial System. We know that

---

[23] This means that the parameters of our main equation are estimated by FGLS, that is, a weighted average of the between-group and within-group estimators.

[24] Of course, there are differences between fixed-effect and random-effect models in the coefficients and the standard errors.

[25] The more difficult issue with these estimations is in considering the problem of causality mainly when involving variables such as debt, maturity structure, denomination and interest rate. There is a natural tendency to believe that high interest rates (low maturity or foreign-currency-denominated debt) paid as debt obligations is caused by the debt amount and, at the same time, high interest rates (low maturity or foreign-currency-denominated debt) cause enlargement in the debt. This discussion became popular in several economies that default their domestic debt or had presented high defaulting probability, such as Brazil and Argentina. Some authors could prove that each hit in the interest rate in order to smooth the capital inflows caused enlargement in domestic debt and hence stressed the investors to ask for a higher interest rate to keep domestic t-bills in their portfolios. See, for the Brazilian case, Bresser-Pereira and Nakano (2002), Holland and Vieira (2003) and Blanchard (2004).

debt intolerance cannot be reduced to this analysis, but it supports the ideas that debt intolerant countries operate under weak monetary and financial system and under inflation, and that their governments have no concerns about probability to default.

2. It was not reported any evidence regarding tax systems and most importantly, the debt intolerance approach can be correct about the fact that countries where tax system avoidance is high tend to have greater difficulty to pay the debt. However, if the profile of the external debt is so important, according to the empirical findings, even if the government faces relatively elastic tax sources to honor debt payments, it would not be enough once the developing countries' debts face high foreign currency volatility and higher international interest rate to pay debts than their domestic interest rate.

3. So, even with intense effort from domestic authorities of the developing countries in order to improve output growth, building credible monetary policy and/or strengthening the tax system, the external debt dynamics associated with foreign-currency denomination and also concentrated in small number of currencies in short-tem maturity structures may cause default.

4. Even if we have not directly tested the main original sin hypothesis, that explains why some countries cannot borrow abroad in domestic currency, even domestically for the short term we presented a lot of empirical inquiries concerned with the way developing countries borrow abroad and how important this is for the debt dynamics. It seems that some countries default because of the way they borrow and according to the original sin arguments the way they borrow is strongly associated with the global imbalance and causes, therefore, currency mismatches. In other words, the original sin hypothesis can be considered the alternative to the null hypothesis (debt intolerance).

5. Finally, Reinhart, Rogoff and Savastano (2003) are apparently right when they argue that there are some critical shortcomings in the standard sustainability exercises

---

At first glance, the simple way to test the potential bi-directional causality is to run the equations by OLS taking all variables as endogenous and using lagged variables as regressors. This could allow us to test whether, after by controlling for past y, past x helps to forecast y_t, which is widely known as Granger causality. However, Finkel (1995) indicated the limits of OLS regression and because of the problem of reciprocal causation it would be highly recommended to use instrumental variables or Two Stage Least Squares analysis, even panel designs are a powerful means of estimating reciprocal causal effects. Other problems come up while it comes to decide about the "instrumental variables" (Wooldridge, 2002). But, most importantly, even dynamic panel designs are concerned only with taking into account the lagged dependent variable, but our problem when we are talking about causality is not definitely addressed to estimate autocorrelation models (see Hsiao, 1999, chapter 4).

and the recognition of other factor, such as the degree of dollarization, short-term interest rates and the maturity structure of a country's debt are actually different manifestations of the same underlying institutional weaknesses. However, these authors are concerned only about the domestic institutions and differently this article believes that international institutions matter as well.

FINAL REMARKS

The empirical evidence presented in this work is comprehensive and straightforward in order to show reservations about the hypothesis supported by Reinhart, Rogoff and Savastano (2003). The inflation (or variance of inflation) and the size of the monetary-financial system barely explain the sovereign debt dynamics since 1990. There is no evidence in favor of the idea that debt intolerant countries are not concerned about their financial system and they are not the same living with high inflation rates, even though developing countries show higher inflation rates than developed ones.

The external debt dynamics preserve the traditional foundations associated with the maturity structure (predominantly short-term debts), interest rates paid to the obligations (most of them are higher than the domestic interest rates) and, last but not least, the foreign-currency denominated debt. As we know the US dollar-denominated debt can reach 80% of the total debt. From this last feature derives the idea that the external debt can not be manageable only by domestic governments. That means directly that even under extraordinary economic growth rates and credible monetary and fiscal policies, developing economies can not avoid US dollar volatility. More than symptoms of the history of default and inflation, the way the developing economies borrow abroad is remarkable. They definitely suffer from the "original sin" since they have inability to borrow abroad in their own currencies.

TABLE 1
Variables, descriptions and sources

Name of the variable	Description	Source
PPGD	Public and Publicly Guaranteed Debt, current, US$	Global Development Finance
GDP	Gross Domestic Product, constant, 1995, US$	World Economic Indicators
GDPgrowth	Growth rate of Gross Domestic Product (constant, 1995, US$)	World Economic Indicators
Inflation	Growth rate of Consumer Index Price (1995 = 100)	World Economic Indicators
Var inflation	Variance of Inflation measured by the moving average of the Inflation	World Economic Indicators
Domestic credit	Domestic Credit Provided by Banking Sector (US Dollar Total or % of GDP).	World Economic Indicators
Money	Money and Quasi Money (US Dollar Total or as % of GDP)	World Economic Indicators
Monetary system	Monetary System measured by multiplication of Domestic Credit and Money and Quasi Money (US Dollar Total or as % of GDP)	World Economic Indicators
Financial system	Size and development of the financial system measured by market capitalization (also known as market value) that is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year.	Standard & Poor's, Emerging Stock Markets Fact book and supplemental S&P data.

Name of the variable	Description	Source
Mon and financial system	Measured by the common factor between the variables monetary system and financial system.	World Bank and Standard & Poor's, Emerging Stock Markets Fact book and supplemental S&P data.
Current account	Current Account Balance, current, us$	World Economic Indicators
Res_imports	Total Reserves in Months of Imports	World Economic Indicators
Exchange rate regimes	Measures of exchange rate regimes (*De facto* Exchange Rate Regimes Classification, 1990-2001)	Bubula and Ókter-Robert (2002)
Reer	Real and Effective Exchange Rate Index (1995 = 100)	World Economic Indicators
Interest rate	Average Interest Rate (annual %)	Global Development Finance
Maturity	Average Maturity (years)	Global Development Finance
Denomination	Currency Composition of Long Term Debt (us Dollars %)	Global Development Finance

TABLE 2
Empirical results, 1990-2002[1]
Fixed effect model

Dependent variable [2]	PPGD	PPGDgrowth				
GDP	0.054 (5.54)					
GDPgrowth		−0.0001 (−1.38)				
Inflation			252 (0.517)		285 (0.582)	290 (0.602)
Mon and financial system[3]				−4 081 (−1.13)	−4 178 (−1.15)	−4 603 (−1.30)
Current account deficit						0.262 (2.42)
R2	0.20	0.004	0.0001	0.005	0.006	0.007
RSS	1.199	3.528	4.464	4.313	4.311	4.251
N[3]	702	686	694	689	685	665
No. of parameters	58	58	58	58	59	60
Wald (joint)[5]	30.67 [0.000]	1.910 [0.167]	0.267 [0.605]	1.272 [0.259]	1.767 [0.413]	441.9 [0.000]
AR (1) test[6]	2.206 [0.027]	1.113 [0.452]	1.007 [0.314]	0.704 [0.481]	0.697 [0.485]	0.201 [0.840]

TABLE 2, continues...

Dependent variable [2]	PPGD_GDP					
Inflation	0.0006 (0.672)					0.0006 (0.750)
Domestic credit		−0.0004 (−0.344)				
Money			−0.001 (−0.525)			
Mon and financial system				0.0004 (−0.035)		−0.0001 (−0.163)
Current account deficit					0.0007 (1.16)	
R2	0.0001	0.0001	0.0003	0.0001	0.0002	0.0004
RSS	244.78	245.17	245.05	245.10	245.02	4.435
N[4]	689	693	683	682	676	676
No. of parameters	58	58	58	58	58	59
Wald (joint)[5]	0.451 [0.502]	0.118 [0.731]	0.275 [0.600]	0.0012 [0.972]	1.339 [0.24]	0.6011 [0.740]
AR (1) test[6]	−0.958 [0.338]	−0.9522 [0.341]	−0.951 [0.341]	−0.954 [0.340]	−0.95 [0.32]	−0.959 [0.337]

Dependent variable [2]	PPGD_GDP					
Inflation			0.0004 (0.614)		0.0002 (0.385)	0.003 (0.547)
Money						0.001 (0.976)
Mon and financial system			0.0009 (1.32)			

TABLE 2, continues...

Dependent variable [2]	PPGD_GDP					
Reserves	0.0028 (1.05)			0.002 (0.913)		
Current account				−0.002 (−1.60)		
Exchange rate regime		0.0003 (0.544)				
Interest rate				0.0126 (2.63)	0.127 (2.79)	0.013 (2.91)
Maturity				0.0015 (1.03)	0.0023 (1.78)	0.0021 (1.91)
Denomination				0.0016 (2.10)	0.0013 (2.23)	0.001 (1.99)
R2	0.004	0.0003	0.05	0.48	0.66	0.69
RSS	4.055	242.94	3.32	5.552	5.139	5.018
N [4]	618	451	587	681	668	656
No. of parameters	54	38	56	59	59	60
Wald (joint) [5]	1.097 [0.295]	0.295 [0.586]	3.808 [0.433]	10.35 [0.016]	11.59 [0.09]	12.58 [0.014]
AR (1) test [6]	3.316 [0.001]	−0.977 [0.338]	3.525 [0.000]	3.920 [0.000]	3.536 [0.000]	3.481 [0.000]

Notes: 1/ Even though we ran other equations using different methods, only the best results in terms of t-test and/or expected signal are shown. 2/ All estimations were run by using robust standard error. T-test statistics in parentheses. 3/ We reported only Monetary and Financial System, instead of reporting Monetary System and/or Financial System because it was our better result. 4/ Unbalanced panel with 57 individuals, longest time series with 13 and shortest time series with 8 (1990-2002). 5/ Wald (joint) $X^2(2)$. 6/ AR(1) test N(0,1).

TABLE 3
Empirical results, 1990-2002[1]
Random effect model

Dependent variable [2]	PPGD	DPPGD				
GDP	0.068 (16.8)					
GDPgrowth		−0.0001 (−0.69)				
Inflation			224 (0.37)		251 (0.40)	249 (0.39)
Mon and Financial System[3]				6 966 (0.726)	7 205 (0.746)	6 999 (0.706)
Current account deficit						0.039 (0.054)
R2	0.28	0.06	0.02	0.09	0.10	0.15
RSS	1.38	3.286	4.27	4.16	4.15	4.14
N[3]	689	673	681	676	672	652
No. of parameters	2	2	2	2	3	4
Wald (joint)[5]	213.7 [0.000]	0.483 [0.487]	0.138 [0.708]	0.528 [0.467]	0.703 [0.704]	0.6469 [0.886]
AR (1) test[6]	29.14 [0.000]	0.880 [0.375]	0.699 [0.484]	0.5756 [0.565]	0.577 [0.564]	0.187 [0.851]

TABLE 3, continues...

Dependent variable [2]	PPGD_GDP					
Inflation	0.0006 (0.758)					0.0006 (0.801)
Domestic credit		0.0008 (3.30)				
Money			0.0016 (3.88)			
Mon and Financial System[3]				0.0002 (4.46)		0.0001 (4.02)
Current account deficit					0.0001 (5.65)	
R2	0.010	0.013	0.018	0.025	0.048	0.021
RSS	6.08	6.34	6.28	6.16	5.94	5.71
N[4]	669	673	663	662	656	656
No. of parameters	2	2	2	2	2	3
Wald (joint)[5]	0.5744 [0.449]	10.86 [0.001]	15.05 [0.000]	19.91 [0.000]	31.94 [0.00]	16.82 [0.000]
AR (1) test[6]	20.25 [0.000]	20.25 [0.000]	31.81 [0.000]	31.52 [0.000]	30.5 [0.00]	30.70 [0.000]

Dependent variable [2]	PPGD_GDP					
Inflation			0.0003 (0.579)		0.00001 (0.241)	0.012 (0.701)
Money						0.001 (2.73)
Mon and Financial System[3]			0.0004 (4.24)			

Dependent variable [2]			PPGD_GDP			
Reserves	0.0016 (0.974)		0.0016 (0.106)			
Current acount			−0.0028 (−3.70)			
Exchange rate		−0.0001 (−1.09)				
Interest rate				0.011 (4.28)	0.011 (4.60)	0.012 (4.70)
Maturity				0.001 (2.66)	0.001 (2.80)	0.001 (2.88)
Denomination				0.001 (5.25)	0.001 (4.30)	0.001 (2.83)
R2	0.05	0.01	0.05	0.47	0.56	0.57
RSS	4.42	3.989	3.64	6.05	5.54	5.42
N[4]	605	444	587	681	668	656
No. of parameters	2	2	5	4	5	6
Wald (joint)[5]	0.949 [0.33]	1.199 [0.274]	29.68 [0.000]	51.90 [0.000]	46.95 [0.00]	52.11 [0.000]
AR (1) test[6]	33.63 [0.000]	24.07 [0.000]	30.28 [0.000]	29.55 [0.000]	28.84 [0.00]	28.40 [0.000]

Notes: 1/ Even though we ran other equations using different methods, only the best results in terms of t-test and/or expected signal are shown. 2/ All estimations were run by using robust standard error. T-test statistics are in parentheses. 3/ We reported only Monetary and Financial System, instead of reporting Monetary System and/or Financial System because it was our better result. 4/ Unbalanced panel with 57 individuals, longest time series with 13 and shortest time series with 8 (1990-2002). 5/ Wald (joint) $X^2(2)$. 6/ AR(1) test $N(0,1)$.

REFERENCES

Blanchard, O., *Fiscal Dominance and Inflation Targeting: Lessons from Brazil*, Brasília, Ministério da Fazenda do Brasil, 2004, (unpublished manuscript).

Bresser-Pereira, L.C. and Y. Nakano, *Uma estratégia de desenvolvimento com estabilidade*, São Paulo, Jan 2002, (unpublished manuscript).

Bubula, A. and I. Ótker-Robert, "The Evolution of Exchange Rate Regimes Since 1990: Evidence from *de facto* Policies", IMF *Working Paper* 02/155, Washington, International Monetary Fund, 2002.

Calvo, G. and C. Reinhart, "Fear of Floating", *Quarterly Journal of Economics*, vol. 113(3), 2002.

Eichengreen, B., R. Hausmann and U. Panizza, *Original Sin: The Pain, the Mystery*, Berkeley, University of California, August 2003, (unpublished manuscript).

Finkel, S., *Causal Analysis with Panel Data*, London, Sage Publications, 1995.

Frees, E.W., <http://www.instruction.bus.wisc.edu/jfrees/gb806.htm>, 2003.

Holland, M. and F. Vieira, "Country Risk Endogeneity, Capital Flows and Capital Controls in Brazil", *Revista de Economia Política (Brazilian Journal of Political Economy)*, São Paulo, Getulio Vargas Foundation, vol. 23-1(89), January-March 2003.

Hsiao, C., "Analysis of Panel Data", *Econometric Society Monographs*, Cambridge, UP, no. 11, 1999.

Reinhart, C., K. Rogoff and M. Savastano, *Debt Intolerance*, NBER *Working Paper* 9908, Cambridge, NBER, August 2003.

Wooldridge, J., *Econometrics Analysis of Cross Section and Panel Data*, United States, The MIT Press, 2002.

————, *Introductory Econometrics: A Modern Approach*, The South-Western College Publishing, 2000.

World Bank, *Global Development Finance: Harnessing Cyclical for Development*, Washington DC, World Bank, 2004a.

————, *World Economic Indicators* (on line), Washington DC, World Bank, 2004b.

ANNEX 1
Countries used in the estimations and their classification per region,
income and indebtedness

Economy	Region	Income group	Indebtedness
Albania	Europe and Central Asia	Lower middle income	Less indebted
Algeria	Middle East and North Africa	Lower middle income	Less indebted
Argentina	Latin America and Caribbean	Upper middle income	Severely indebted
Armenia	Europe and Central Asia	Lower middle income	Less indebted
Azerbaijan	Europe and Central Asia	Lower middle income	Less indebted
Belarus	Europe and Central Asia	Lower middle income	Less indebted
Belize	Latin America and Caribbean	Upper middle income	Severely indebted
Bosnia and Herzegovina	Europe and Central Asia	Lower middle income	Less indebted
Botswana	Sub-Saharan Africa	Upper middle income	Less indebted
Brazil	Latin America and Caribbean	Lower middle income	Severely indebted
Bulgaria	Europe and Central Asia	Lower middle income	Moderately indebted
Cape Verde	Sub-Saharan Africa	Lower middle income	Less indebted
Chile	Latin America and Caribbean	Upper middle income	Moderately indebted
China	East Asia and Pacific	Lower middle income	Less indebted
Colombia	Latin America and Caribbean	Lower middle income	Moderately indebted
Costa Rica	Latin America and Caribbean	Upper middle income	Less indebted
Croatia	Europe and Central Asia	Upper middle income	Moderately indebted
Czech Republic	Europe and Central Asia	Upper middle income	Less indebted
Djibouti	Middle East and North Africa	Lower middle income	Less indebted

ANNEX 1, continues...

Economy	Region	Income group	Indebtedness
Dominica	Latin America and Caribbean	Upper middle income	Severely indebted
Dominican Republic	Latin America and Caribbean	Lower middle income	Less indebted
Ecuador	Latin America and Caribbean	Lower middle income	Severely indebted
Egypt, Arab Republic	Middle East and North Africa	Lower middle income	Less indebted
El Salvador	Latin America and Caribbean	Lower middle income	Less indebted
Estonia	Europe and Central Asia	Upper middle income	Severely indebted
Fiji	East Asia and Pacific	Lower middle income	Less indebted
Gabon	Sub-Saharan Africa	Upper middle income	Severely indebted
Georgia	Europe and Central Asia	Lower middle income	Moderately indebted
Grenada	Latin America and Caribbean	Upper middle income	Moderately indebted
Guatemala	Latin America and Caribbean	Lower middle income	Less indebted
Hungary	Europe and Central Asia	Upper middle income	Moderately indebted
Indonesia	East Asia and Pacific	Lower middle income	Severely indebted
Iran, Islamic Republic	Middle East and North Africa	Lower middle income	Less indebted
Jamaica	Latin America and Caribbean	Lower middle income	Severely indebted
Jordan	Middle East and North Africa	Lower middle income	Severely indebted
Kazakhstan	Europe and Central Asia	Lower middle income	Moderately indebted
Latvia	Europe and Central Asia	Upper middle income	Severely indebted
Lebanon	Middle East and North Africa	Upper middle income	Severely indebted
Lithuania	Europe and Central Asia	Upper middle income	Moderately indebted
Macedonia, FYR	Europe and Central Asia	Lower middle income	Less indebted

ANNEX 1, continues...

Economy	Region	Income group	Indebtedness
Malaysia	East Asia and Pacific	Upper middle income	Moderately indebted
Maldives	South Asia	Lower middle income	Less indebted
Mauritius	Sub-Saharan Africa	Upper middle income	Less indebted
Mexico	Latin America and Caribbean	Upper middle income	Less indebted
Morocco	Middle East and North Africa	Lower middle income	Moderately indebted
Oman	Middle East and North Africa	Upper middle income	Less indebted
Panama	Latin America and Caribbean	Upper middle income	Severely indebted
Paraguay	Latin America and Caribbean	Lower middle income	Less indebted
Peru	Latin America and Caribbean	Lower middle income	Severely indebted
Philippines	East Asia and Pacific	Lower middle income	Moderately indebted
Poland	Europe and Central Asia	Upper middle income	Less indebted
Romania	Europe and Central Asia	Lower middle income	Less indebted
Russian Federation	Europe and Central Asia	Lower middle income	Moderately indebted
Samoa	East Asia and Pacific	Lower middle income	Moderately indebted
Serbia and Montenegro	Europe and Central Asia	Upper middle income	Severely indebted
Seychelles	Sub-Saharan Africa	Upper middle income	Less indebted
Slovak Republic	Europe and Central Asia	Upper middle income	Moderately indebted
South Africa	Sub-Saharan Africa	Lower middle income	Less indebted
Sri Lánka	South Asia	Lower middle income	Moderately indebted
St. Kitts and Nevis	Latin America and Caribbean	Upper middle income	Moderately indebted
St. Lucia	Latin America and Caribbean	Upper middle income	Moderately indebted

Economy	Region	Income group	Indebtedness
St. Vincent and the Grenadines	Latin America and Caribbean	Upper middle income	Moderately indebted
Swaziland	Sub-Saharan Africa	Lower middle income	Less indebted
Syrian Arab Republic	Middle East and North Africa	Lower middle income	Severely indebted
Thailand	East Asia and Pacific	Lower middle income	Moderately indebted
Tonga	East Asia and Pacific	Lower middle income	Less indebted
Trinidad and Tobago	Latin America and Caribbean	Upper middle income	Less indebted
Tunisia	Middle East and North Africa	Lower middle income	Moderately indebted
Turkey	Europe and Central Asia	Lower middle income	Severely indebted
Turkmenistan	Europe and Central Asia	Lower middle income	Moderately indebted
Ukraine	Europe and Central Asia	Lower middle income	Less indebted
Uruguay	Latin America and Caribbean	Upper middle income	Severely indebted
Vanuatu	East Asia and Pacific	Lower middle income	Less indebted
Venezuela, RB	Latin America and Caribbean	Upper middle income	Less indebted

Notes: 1/ For operational and analytical purposes, economies are divided among income groups according to 2003 Gross National Income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: lower middle income, $766–3 035 and upper middle income, $3 036–9 385. Other analytical groups, based on geographic regions and levels of external debt, are also used. 2/ Standard World Bank definitions of severe and moderate indebtedness are used to classify economies by levels of external debt. Severely indebted means either: present value of debt service to GNI exceeds 80 percent or present value of debt service to exports exceeds 220 percent. Moderately indebted means either of the two key ratios exceeds 60 percent of, but does not reach, the critical levels. For economies that do not report detailed debt statistics to the World Bank Debtor Reporting System (DRS), present-value calculation is not possible. Instead, the following methodology is used to classify the non-DRS economies. Severely indebted means three of four key ratios (averaged over 2000-2002) are above critical levels: debt to GNI (50 percent); debt to exports (275 percent); debt service to exports (30 percent); and interest to exports (20 percent). Moderately indebted means three of the four key ratios exceed 60 percent of, but do not reach, the critical levels. All other classified low-income and middle-income economies are listed as less indebted. 3/ Region and income classifications are in effect until 1 July 2005. Indebtedness classifications were revised in April 2004. Taiwan, China is also included in high income.
Source: World Bank (2004b).

Box-Plot of the selected variables used in the estimations