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Local Debt Expansion…Vulnerability Reduction?

An Assessment for Six Crises-Prone Countries

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Abstract

During the last years, public debt has been reduced and its composition has been evolving toward domestic currency denominated in most emerging markets. This is a remarkable progress in terms of financial vulnerability, which has been underpinned by the favourable financing conditions and the related deepening of local debt markets. In this paper, we assess the vulnerability reduction –conveyed in the ratio of total debt to GDP – achieved in the last years for six selected emerging economies, focusing on the importance of exchange rate evolution relative to the proactive policies of fiscal authorities have implemented to reduce the external exposure of debt. We first disentangle both components in the current structure of debt to show that proactive debt management has been the dominant factor in the reduction of the foreign exchange (forex) debt share; then, a stress test within a debt sustainability analysis framework is performed. The results show that proactive debt management policies have reduced the vulnerability of debt in the case of financial turbulence, although, paradoxically, it has also limited the effective reduction in the debt ratio derived from the observed real exchange rate appreciation.
Keywords: External debt, local debt markets, financial crises, debt sustainability analysis
JEL Classification: H6, E6, F3

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1. Introduction

The ratios of public debt and external debt to GDP constitute crucial indicators to assess the financial and fiscal vulnerability of a country. On the one hand, high ratios of public debt jeopardise its sustainability and the solvency position of the country and, on the other hand, a high proportion of exchange rate exposure in debt composition may abruptly worsen the sustainability position in times of financial stress, characterised by access problems to external markets and/or sharp exchange rate movements.

In emerging countries, external debt and the domestic debt denominated in foreign currency (both conveyed henceforth in under the concept of forex debt) have played an important role in the structure of public sector debt in some emerging markets, because they could not issue locally and/or in local currency, a phenomenon known in the literature as the original sin (Eichengreen and Hausman, 1999). In last years the decreasing trend of public debt over GDP has been accompanied simultaneously and more intensely in many countries by a decrease in the corresponding share of forex debt, coinciding with a period of widespread appreciation of exchange rates[2]. Thus, this evolution has been seen as signalling a breakthrough which improves their financial prospects by reducing their financial vulnerability. Our goal in this paper is to assess quantitatively this vulnerability reduction and its reversibility under financial turbulence.

Chart 1 displays the ratio of public sector debt to GDP for six selected countries in 2005 and in the year of the highest outstanding debt during the last decade which, in most cases, coincides with episodes of financial turmoil (see Manasse and Nouriel (2005) or de Bolle et al. (2006)) for a dating of financial crises). The graph shows both the gross debt holdings and debt net of international reserves (quasi-gross public debt onwards), which will be our preferred measure in the analysis that follows. This type of measure has been chosen in order to reach an homogeneous sample of data across countries and to pick up in the data the effect of the accumulation of reserves in the analysed countries, which is a central consideration, too[3].

The criterion to choose the countries and the concept of debt used –quasi-gross public debt – has been mainly based on data availability among the group of

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[2] See, for instance, IDB (2006) report for a recent general view concerning public debt in emerging countries

[3] The choice between gross debt, net debt or any alternative type of measure of debt is not trivial. As stated in IDB (2007), despite many countries provide measures of net debt, the netting strategies differ across countries, so that net debt does not constitute an homogeneous measure, whereas gross debt doesn't capture the effect of international reserves. See Cowan *et al.* (2006) or *IMF* (2003) "External Debt Statistics: Guide for Compilers and Users" for other alternative debt definitions different from quasi-gross public debt.

countries undergoing crises in the last decade. In any case, the six selected
countries – Brazil, Colombia, Indonesia, Russian Federation, Turkey and Uruguay
– represent a rather adequate sample of emerging regions, trying to emphasize the
generalization of the downward trend of public debt and forex debt. Due to the lack
of existence of an homogeneous database that perfectly suits the period of time and
disaggregation required by this research, data have been collected directly from the
specific debt data release official institutions -except for Russia and Indonesia
where data come from the IMF-. We decompose quasi-*gross debt* and decompose it
into *foreign* (issued in international debt markets) versus *local* (issued in domestic
debt markets) debt. Afterwards we have also distinguished between local *debt
linked to exchange rate* and *local debt linked to local currency* in the cases where
this second data distinction is available. Table 1 shows the sources and respective
links used to create the database.

   Russia is the most outstanding case of debt reduction. Quasi-gross public debt
among the sample shrank about 99 percentage points (p.p.) of GDP between 1999
and 2005 to become negative, due to the large reserve accumulation[4]. In Turkey
and Indonesia the reduction was of 34 p.p. and 24 p.p. of GDP, respectively, from
2001 to 2005[5]. Also Brazil constitutes a good example of these dynamics as in
2002 the quasi-gross public sector debt was 74% of GDP, whereas in 2005 it
decreased to around 68% of GDP. In Uruguay and Colombia, the quasi-gross
public sector debt fell from 2003 to 2005 around 13% and 6%, respectively, in
terms of GDP. It is further remarkable that the reduction in debt has been
accompanied by an overall reduction in the share of forex debt (either external debt
or domestic in foreign currency or linked to the exchange rate). The reduction of
the proportion of forex debt can be stated more clearly in chart 2. This last figure
represents the evolution of the debt composition in terms of external debt,
exchange rate linked domestic debt and domestic debt in local currency, for the
same periods. The decline in the forex debt share is more dramatic in Brazil,
Turkey and Colombia (40%, 28% and 18% respectively), and it is also noticeable
the reduction in exchange rate linked domestic debt in both Latin American
countries[6], to the point that in Brazil by 2006 exchange rate linked domestic debt

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[4] From this point on and only for the case of Russia we will develop the exercise of analysis
   of public debt in terms of gross public debt, instead of quasi-gross public debt.
   Otherwise, since quasi-gross debt is currently negative, the corresponding results for the
   rest of the analysis would be misleading.

[5] In Indonesia, 2001 is considered as the previous peak of public debt, mainly because of
   data availability, although according to other papers (i. e. Bolle et al., 2006) the most
   recent turmoil is traced back to 1998.

[6] See Jeanneau and Tovar (2006) for a recent document on the evolution of domestic
   markets in Latin America and Tovar (2005) for a detailed analysis of debt denominated in
   local currency in the three Latin American countries of the sample (Uruguay, Colombia
   and Brazil).

has been suppressed. Only in Indonesia the proportion of external debt has increased in the last years.

There are several reasons explaining the evolution of both the public debt and the forex debt but they can be summarized in two reasons. First, as observed in the evolution of the nominal exchange rate and the sovereign spreads in chart 3, the developments in public debt have been highly influenced by an international context of *very favourable financial conditions*, and second, the development of *proactive policies to manage public debt*, which is closely related to the first reason, as we will see.

Regarding the favourable international financial context, some aspects are worth qualifying. For instance, just as exchange rate crises makes debt explosive in countries with a large share of forex debt, real exchange rate appreciations can dramatically decrease debt ratios and impact on the structure of debt. This is precisely what happened after the crises. The exchange rate recoveries were generalised, as shown in the real exchange rate evolutions in chart 4, where the magnitude of this appreciation for the Russian ruble (a 64% real appreciation between 1999 and 2005), the Turkish lira and the Brazilian real (27% and 22%, respectively, between 2002 and 2005). The weaker exchange rate evolution of the sample is the Indonesian rupiah, as from 2002 to 2005 is the only currency that depreciated (3%), precisely the only country where the share of forex debt has increased. The positive period for emerging financial markets is also confirmed by the dynamics of sovereign spreads that have narrowed in a context of increasing capital flows. In this sense, the EMBI Global Composite has decreased from January 1999 to October 2006 around 900 basic points and this reduction of sovereign spreads has been especially severe in emerging Europe, where in the same period it has narrowed around 2000 basic points.

Another factor contributing to this benign financial framework is the favourable behaviour of the rates growth of GDP in all emerging regions in a context of propitious world growth. For instance, the annual percent change of growth in 2005 for emerging countries regions as Developing Asia, Central and Eastern Europe and Latin America was 9.0%, 5.4% and 4.3%, well above the advanced economies data for 2005 (2.6%) and higher or similar to world growth (4.9%); see IMF (2006).

Concerning the proactive debt management, the evolution of public debt and forex debt is closely related to the development of local debt markets in local currency, mainly because of the increasing importance that fiscal authorities have recently attached to reduce vulnerability of public finances in a sustainable manner. This encouraged more proactive debt policies in order to manage public debt in this direction. The impulse by fiscal authorities was driven by lessons from the past concerning excessive exchange rate exposure that gave rise to balance sheet mismatches.

Finally, it is important to stress that both factors –benign conditions and proactive policies – are closely linked, since the discretionary change of debt composition by the authorities is facilitated by the favourable financial conditions and the expected behaviour of the exchange rate, which increased the relative demand of local debt and the ability of the authorities to place it in the market.

Nonetheless, the conjunction of both factors has brought a paradox which is worth mentioning. In a context of currency appreciation, authorities attempting to maximise debt reduction focused in short term would have an incentives to maintain or increase the share of forex debt as this would decrease public debt on GDP, getting involved in some sort of "virtuous circles". On the contrary, a reduction of forex debt as such experienced due to active debt management will tend to mitigate debt reduction driven by exchange rate appreciation. But, contingent on a financial turbulence, this "paradox of the local debt bias" is expected to be solved: in such a case, the exchange rate is expected to sharply appreciate and if there has been previously a reduction in the proportion of forex debt on total debt then the country would be able to absorb better the impact of the negative scenario. The comparison between this short term costs of debt reduction and the long-term (contingent) benefits is one of the by-products of our analysis.[7]

In order to assess the effective vulnerability reduction in the debt composition and the precise contribution of proactive debt management we develop in this paper a quantitative approach to analyse the issue. As a first step, in Section 2, the contribution of the exchange rate to the shifts in debt structure is disentangled from other autonomous or genuine composition effects in the structure of debt. These second effects can be roughly attributed to the debt management strategies of the authorities. In Section 3, the theoretical framework of debt dynamics analysis is developed to perform in Section 4 a counterfactual exercise based on calculating public debt dynamics under the previous debt structure. In this way we can assess the change in vulnerability from the difference in p.p. of GDP between the actual debt and the debt resulting from this counterfactual exercise. Then, the scenario of economic and financial turbulence of the previous crises for the period 2006–2008 is replicated in order to perform a stress test analysis on debt sustainability. As a robustness test, alternative criteria to design the stress are used, too. This type analysis accounts for the expected deterioration of debt structure due to the exchange rate depreciation and other factors and is useful in order to check whether vulnerability − contingent on a stress test − has effectively been reduced after proactive debt management. As mentioned above –and the counterfactual may show-, proactive debt management may mitigate vulnerability reduction in good

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[7] This paper is focused on the sustainability-vulnerability assessment concerning the exchange rate linked debt. Other topics on debt composition such as the long term versus short term debt or the nominal versus indexed debt are omitted, even though there is an intense debate on them. See, for instance, Alfaro and Kanczuk (2006).

times but it is expected to engineer more favourable debt dynamics under financial turbulence. Thus, the compounded effect of the counterfactual and the stress test exercises will provide the net impact of the development of proactive policies in the sustainability-vulnerability framework. Finally, Section 5 sums up and concludes.

2. Public Debt Composition: Disentangling Price and Composition Effects

This section is focused on setting a framework for the analysis of the shifts in forex debt (the sum of external and domestic exchange rate indexed debt) on total public debt. The share of forex debt, α_t is defined as

$$\alpha_t = \frac{e_t D_t^*}{(D_t + e_t D_t^*)} \tag{1}$$

where e_t is the nominal exchange rate in the period t, D_t^* is the amount of outstanding forex debt, either external debt and exchange rate linked domestic debt, denominated in dollars in t; and D_t is the outstanding domestic debt denominated in local currency in period t [8].

Within this framework, it is rather straightforward to evaluate the importance of the effect of the exchange rate and the effect due to the composition of debt on total variation of composition. The total variation of the ratios of forex debt on total debt between the final (t=1) and the initial (t=0) periods of reference, that is, ($\alpha_1 - \alpha_0$), can be decomposed in these two effects, as follows,

$$\alpha_1 - \alpha_0 = EE + CE + \varepsilon \tag{2}$$

where the first part of the right hand side of (2) is the Exchange rate Effect (EE onwards) and CE is the composition effect. The residual term ε in the expression will be allocated between both effects as explained below.

The exchange rate effect *EE,* is the variation in the proportion of external debt and indexed to a foreign currency domestic debt due to variations in the exchange rate, obtained by keeping the amount of debt unaltered. Analytically:

$$EE = \frac{e_1 D_0^*}{D_0 + e_1 D_0^*} - \alpha_0, \tag{3}$$

where the first element in the right hand side of EE will be denoted as α_1^E.

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[8] See Calvo *et al.* (2002) for a pioneering paper that analyses fiscal sustainability incorporating the currency composition of debt.

The Composition Effect is the variation of α due to the changes of the relative volumes of the different types of debt, had the exchange rate not changed:

$$CE = \frac{e_0 D_1^*}{D_1 + e_0 D_1^*} - \alpha_0 \qquad (4)$$

where, analogously to (3), the first element in the right hand side of (4) will be denoted as α_1^C.

In this last type of effect, the impact of proactive management policies arises, although other factors such as the relative demand and supply of debt instruments may be prominent.

The allocation of the residual change to each factor is made according to the scheme in chart 5. Notice that, the whole variation in the forex debt share (that is, α_1- α_0), is the area defined by coordinates $e_1 D_1^*$ minus $e_0 D_0^*$ (the area shadowed with vertical lines). The EE as stated in previous notation would be the area comprised by α_L^E- α_0 and the CE would be α_L^C- α_0 (the light grey and dark grey shaded area, respectively). The remaining area should be equally distributed between EE and CE, in order to accurately represent the difference between the vectors α_1 and α_0.

The factorial decomposition of, EE and CE are represented in chart 6 for the six countries in terms of the percentage points which each factor has contributed to the reduction in the share of foreign currency debt, considering that $t=1$ is 2005 and $t=0$ is the year of the corresponding debt crisis for each country. We use as reference for this exercise the public debt net of reserves (quasi-gross public debt), but for the case of Russia, where such magnitude is negative.

In spite of the strong exchange rate appreciation, the composition effect (CE) dominates in all countries but Indonesia, where it contributes to the increase in the share of forex debt. CE is largest in Brazil, in absolute terms (34%of the 40% reduction in the forex debt share is due to CE), but in relative terms it is even more important in Turkey (26% of the 28% reduction is CE); that is, more than 90% of the reduction is due to the composition effect). For the average of the five countries where the share of foreign currency debt is reduced, 85% of the reduction can be attributed to the pure composition effect.

3. The Framework of Analysis: Debt Dynamics

Public debt sustainability analysis (DSA) – is an increasingly widespread tool to assess the vulnerability position of public finances. During the last years there has been an increasing attention paid to this approach in policy analysis, most notably in IMF country assessments. A growing amount of papers also handle DSA analysis – sometimes from a stochastic approach – see, for example, Celasun *et al.* (2006), Hostland and Karan (2006) or Garcia and Rigobon (2004). The main

advantage of this methodology for our objectives, apart from its simplicity, is that it can provide an explicit measure of vulnerability which can be traced throughout time and suits well the stress test analysis.

Debt sustainability analysis focuses on the debt dynamics equations which are determined –in a simplified framework – by a rather limited number of variables. Furthermore, forecasts for most of these variables are readily available in the market. These forecasts allow determining a base scenario of the future evolution of debt. The framework is also useful to see how debt would respond to a situation of stress by changing the forecasts by estimates of the variables under negative shocks. These stress tests compound alternative scenarios, which gives an idea of the resilience of debt and therefore of the vulnerability of the public finance position.

The starting point is the debt dynamics equation expressed as:

$$D_t = -PB_t + \frac{(1+r_t)}{(1+g_t)}(1-\alpha_t)D_{t-1} + \frac{(1+r_t^*)(1+\Delta e_t)}{(1+g_t)}\alpha_t D_{t-1},$$

$$(5)$$

where PB_t is the primary balance and D_t is the stock of public debt at the end of time t, both expressed as a ratio of GDP. The share of debt denominated in foreign exchange is α_t, as we already know, while $(1-\alpha_t)$ is the share of local currency debt; r^*_t and r_t are their corresponding real interest rates. Foreign denominated external debt can be in foreign currency – mostly external debt – or debt indexed to the exchange rate – mostly domestic debt. Finally, Δe_t is the variation in the nominal exchange rate – where a positive Δe_t means an exchange rate depreciation – and g_t is the real rate of growth.

After some algebra, the dynamics of public debt can be expressed as

$$\Delta D_t = -PB_t + \frac{(r_t - g_t)}{(1+g_t)}(1-\alpha_t)D_{t-1} + \frac{(r_t^* + \Delta e_t + r_t^*\Delta e_t)}{(1+g_t)}\alpha_t D_{t-1},$$

$$(6)$$

where, for simplicity, we have dropped the contingent liabilities. This equation is the basis for the sustainability exercises performed in the DSA. Given the current level and composition of debt, for given forecasts of the primary balance, the growth rate, the nominal exchange rate and the real interest rates (domestic and foreign) it is possible to project debt trajectories. Increases in the ratio of debt to GDP derived from these exercises provide a measure of vulnerability, and a decrease in the ratio suggests a reduction in vulnerability.

Expression (6) can be transformed in a more convenient way by separating the effect of the exchange rate from the rest:

$$\Delta D_t = -PB_t + \frac{((1-\alpha_t)r_t + \alpha_t r_t^*)}{(1+g_t)}D_{t-1} - \frac{g_t}{(1+g_t)}(1-\alpha_t)D_{t-1} + \frac{\Delta e_t + r_t^*\Delta e_t}{(1+g_t)}\alpha_t D_{t-1}. (7)$$

For practical purposes, it is important to note that the real interest rates by instrument or currency are not usually available, so that we have to find a way to measure the approximate real cost of local and forex debt. There exists data on interest payments on public debt. IP_t which can be defined as

$$IP_t = ((1 - \alpha_t)r_t + \alpha_t(1 + \Delta e_t)r_t^*)D_{t-1} = \rho_t D_{t-1},$$ (8)

where, for convenience, ρ_t denotes the average cost of debt at time t. ρ_t can be calculated in every country through the data of IP_t from this expression.,

$$\rho_t = \frac{IP_t}{D_{t-1}}$$ (9)

For completeness and further convenience, also note that the implicit local debt real rate can be solved out from the definition of ρ_t

$$r_t = \frac{\rho_t - \alpha_t(1 + \Delta e_t)r_t^*}{(1 - \alpha_t)}.$$ (10)

so that if we are able to proxy the real foreign cost of debt –through the spread, as it turns out – an approximation to the respective real interest rate by currency. Substituting ρ_t in (7) yields the basic equation for the empirical approach

$$\Delta D_t = -PB_t + [\rho_t - (1 - \alpha_t)g_t + \Delta e_t \alpha_t] \frac{D_{t-1}}{(1 + g_t)}$$ (11)

4. Empirics. Debt Evolutions, Debt Structure and Vulnerability Reductions

These expressions provide us with an adequate framework to analyse what has been going on in the considered countries. It is convenient to start with an illustrative example of how the different factors impinge on the evolution of debt and then move to a more detailed analysis of the impact of the shifts in debt structure on vulnerability.

4.1 Contributions to Debt Reduction

Computing the partial derivatives in expression (5) allows to determine the contribution of each factor to the de variation of D_t (ΔD_t) on an annual basis. To focus on the issues we are more interested in, we consider the decomposition of the annual variation of D_t in terms of PB (in this case there is a one-to-one

relationship.$_t$, and the annual variation of the share of forex debt on total public debt, α_t, the exchange rate, e_t and the average cost of debt minus the growth of GDP (ρ_t-g_t).

Chart 7 illustrates the case of Brazil. The substantial magnitude of the primary balance is a powerful debt reduction driver throughout the period. But the interesting results regard the interaction between the exchange rate and the share of forex debt α_t From 2001 to 2002 the currency depreciated, and there was an important positive contribution to debt of 9 p.p of GDP.Thereafter, the appreciation of the exchange rate induced a negative contribution to public debt in terms of GDP has been negative. The accumulative decrease from 2002 to 2005 was of 4% in terms GDP. In parallel, α_t increased in the first, turbulent period; due to the contemporaneous exchange rate depreciation this added up 3 p.p to the debt-to-GDP ratio (the black area in the figure). Both factors together amounted to 12 percentage points of GDP to the increase in debt in 2002. However in the following years of currency appreciation and reduction in forex debt interacted in a different way: the contribution of the dwindling share of forex debt is positive because it mitigates the effect of the exchange rate appreciation on debt reduction. Finally, the last factor, given by the difference of the average real cost of debt and the real rate of growth (ρ_t-g_t) is also changing in sign. It might come as a surprise that this term has a positive contribution in the last years, when the *nominal* cost of debt has decreased and the growth rate has been robust. However, it should be noted that ρ_t is expressed in real terms and it embeds inflation. The large reduction in inflation in the last years turns out to be counterproductive for debt dynamics.

4.2 A Counterfactual Exercise: Debt Reductions without Proactive Management Policies

The Brazilian example highlights that the interaction between exchange rate appreciations and reductions in the forex share can play against debt reduction. This is the '*paradox of the local debt bias'* pointed out in the introduction. But we also noted in section 2, that the changes in debt structure (see chart 6), are in part mechanically driven by the evolution of the exchange rate. Indeed, we showed there that a substantial part of the reduction in forex debt was not due to the exchange rate evolutions but to pure composition effects, where the proactive debt management policies of the authorities has had an central role.

Now, within the debt dynamics framework we can give a quantitative assessment of the (negative) impact of proactive debt management in the reduction of debt. The question is straightforward: Which would be the level of debt today netting out the net composition effect, that is, without proactive debt management?

Obtaining the computations of α_1^E as stated in (3) on a yearly basis, we can determine counterfactual debt paths, for the public debt ratio. This exercise is

carried out for the six considered countries and is represented in chart 8. The black thick line represents the actual public debt trajectory; netting out the pure composition effect delivers the path represented by the thin dotted line. The graph is completed with the opposite exercise – continuous thin line. In this case, we consider the pure composition effect but assuming that the impact brought about by the exchange rate evolutions disappears, that is the current debt level had the real exchange rate been kept constant.

Table 2 summarizes the outcomes of the counterfactual exercise for the six countries. In the case of Brazil, the actual path displays debt falling from 74% to 68% of GDP, but this fall is much wider to around 60% in 2005 when we net out the pure composition effect. The reason is that the dwindling forex debt does not fully capitalise the impact of the real exchange rate appreciation. To sum up, for Brazil, the implicit loss, in terms of percentage points of debt-to-GDP – derived from the proactive debt management of the government, nowadays the level of debt would be a sizable 8 pp of GDP. This can be taken as a measure of the opportunity costs of substituting local debt in local currency for forex debt. On the contrary, if the nominal exchange rate would have remained in the levels of 2002, the quasi-gross public debt would have been in 2005 of around 79% of GDP.

In Turkey, these proactive policies have also been quite pronounced. There, netting the change in composition due to the debt management of the government the public debt would be in 2005 10 pp of GDP lower. In the rest of the countries where the reduction in the share of forex debt on total public debt has been relatively small or has not taken place (Colombia, Indonesia, Russian Federation and Uruguay), the difference between the actual path of public debt and the public debt under constant composition of the year of crisis is also small (this difference represents less than 1 pp of the GDP of each country).

Brazil or Turkey represent a clear example were the "opportunity costs" of diminishing the total amount of forex debt on total public debt are more evident, due both to the intense exchange rate appreciations and to the efforts by the fiscal authorities to recompose debt in favour of local and local currency denominated debt.

Some important caveats are in order, though, which gives a more nuanced view of these opportunity costs of moving out of forex debt. Most important is that this is a partial exercise. We are assuming that nothing else changes, but this is an extremely strong assumption. As mentioned above, the fiscal authorities could have not developed so swiftly the local debt markets under more stringent financial conditions. More importantly, the very same evolution of the exchange rate is not alien to the evolution of debt composition: the reduction in external debt, process deepened by very active policies in Brazil shapes the expectation of agents and it has probably contributed to put higher pressure on the exchange rate and to foster a higher accumulation of reserves (and thus a bigger reduction of quasi-gross debt)

From the second type of exercise, where the exchange rate is kept unaltered, some interesting conclusions also follow. As expected, the numbers show that debt dynamics would have been much less favourable under exchange rates of the year of crises for the six countries – except for Indonesia and Russia, where nominal exchange rate has appreciated with respect to their years of crises. The more damaged country in case of maintaining the same nominal exchange rate would have been Uruguay, that would have increased its debt in 18 pp of GDP.

All in all, under the perspective taken in this section, it might seem that having performed proactive policies in order to reduce the share of forex debt on total GDP has entailed costs in terms of limited debt reduction,. Nevertheless, this short-term cost must be measured up with the prospective benefits derived from a less forex dependent debt structure in the case of financial turbulence.

4.3 Stress Test: The Resilience in Debt Vulnerability

The standard DSA framework based on stress testing consists of designing a situation of turbulence (or stress) comparable with the last crises to check whether vulnerability has effectively been reduced and contrast it with a base scenario.

Therefore, the first step is to define the base scenario. With forecasts from the respective IMF's Article IV reports, LatinFocus and Consensus Forecast on a three year horizon (2006, 2007 and 2008) the raw data to project the debt paths are obtained.[9] This methodology is useful in order to improve homogeneity of the analysis and in order to check out the different outcomes with those provided by IMF. Second, the stress scenario is designed so as to replicate the most recent financial turmoil that these countries have suffered –coinciding as seen above with the previous peak in debt. The data underlying the base and the stress scenarios are displayed in table 3. The changes therein are applied to all variables in the debt dynamics equation (5)[10]

The results for the six countries appear in chart 9 and table 4. Let us take again Brazil as illustrative case. The thick dotted line represents the base scenario, whereas the orange dotted line stands for debt dynamics under the stress scenario. In both debt evolutions it is employed the path of α under debt composition of 2005. As expected under the base scenario –conveying the continuation of favourable conditions – quasi-gross debt gently decreases towards 60% of GDP, while under the stress scenario debt increases and then stabilises above 70%.

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[9] The two last data sources are needed for exchange rates forecast, the rest of forecast are mostly based on the respective Article IV of IMF for each country.

[10] In those punctual cases where there is no data availability for the period of crisis the negative shock was obtained by adding to the data in the base scenario one standard deviation of the available data

What would have been the impact of the turmoil if the debt structure been kept unaltered relative to the year of the crisis? A first – but inadequate – approximation is given by the shadowed line. It represents the impact of the stress test with the debt structure net of the pure composition effect (but letting the exchange rate effect operating) *and the current level of debt*. Notice that the evolution is much more explosive that under the current debt structure (plus the stress scenario-orange line). Had the debt management not been proactive[11], the increase would have been much larger (to over 95%) – shadowed line – and set the debt in an explosive path. The gap between both lines (more than 20 p.p of GDP in a 3-year horizon) is indicative of the importance of a less forex-exposed debt structure in order to reduce vulnerability and reinforce the sustainability of debt.

Why is the shadowed line misguiding? We have seen in the counterfactual exercise, that netting out pure composition effects would have resulted in a lower debt ratio in the case of Brazil because of the sustained real exchange rate appreciation.. Thus, the effective lower reduction in debt due to the proactive debt management policies has to be compared with the prospective gains in the case of a financial crisis. More precisely, the dash dotted line represents the debt dynamics assuming no pure composition effect – as in the shadowed line – *plus* the level of debt resulting from the counterfactual exercise. This, in our view, is the right gauge to measure vulnerability reduction due to proactive debt management. In practical terms, this amounts to take the end-point of the thin dotted line as reference and project if forward under the stress scenario.

The so-extended thin dotted line has a similar path compared with the dash dotted line, but it starts from a lower level. As a consequence, the difference in the ratio of debt is very small in the first year, and then widens up to around 10 p.p. of GDP. This figure can be taken as the net gain from the debt management policy by Brazil. In other words the "short-term cost" of implementing proactive policies in order to decrease the share of forex debt on total debt, is more than compensated by "long-term gains" of implementing them.

For the other five countries the forecasts under the base scenario are as follows. Colombia, Turkey and Uruguay decrease its debt towards 40%, 45% and 60% of GDP, respectively (thick dotted line). Despite the evolution of its currency and the composition of its debt, Indonesia also reduces its debt to 25% of GDP. Finally, the forecast for Russia is especially favourable, as the forecast for the gross debt decreases sharply to –25% of GDP – that means that not only quasi-gross debt is negative, but also gross debt!

The stress scenario for rest of the countries can also be analysed in the same manner as Brazil, although the results are less clearcut. Recall that the more interesting conclusions arrive from the comparison of the evolution of debt under

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[11] To be more precise the '2002 debt composition' lets the exchange rate effect impact on the structure but nets out the pure composition effect.

the debt composition of the year of crisis (thin dotted line) and under the debt composition of 2005 (orange line). The comparison only favours the case of debt recomposition in Russia –where the debt level is not currently a problem and Uruguay, to a lesser extent than in Brazil (gap 5 pp of GDP, see table 4). Nevertheless, in some countries as Colombia, the benefit of the performed proactive policies until 2005 gives rise to an scant average decrease of debt of 1 pp of GDP accumulated in the forecasted period, and in the case of Turkey the accumulated differences after three years are negative (–1 p.p. GDP) although they are previously positive. In the case of Indonesia the gap is negligible, throughout the forecast scenario.

Here underscoring the caveats is even more relevant because the direct inference from these results is that, with the exception of Brazil, the debt recomposition effort, do not seem to pay off in terms of vulnerability reduction under stress. Again, the caveats are based on the impact of these debt trajectories on expectations. It is difficult to assume that the reaction of the markets would be the same comparing the mild deterioration implied by the orange line with the sharp increase in debt under a less favourable debt structure. As a consequence, the evolution of the financial variables is reasonably expected to be worse in the second case. This endogeneity implies that the computation of net gains is rather a floor than a mid-point estimate.

In order to check the robustness of the stress test, the exercise is repeated considering two alternative assumptions for the design of the stress scenarios. First, following the methodology employed in most IMF's Article IV, 2 standard deviations on the sample series are added to the corresponding data of the base scenario–this is denoted as 2SD in the table[12]; second, a scenario is built on the average stress scenario (average stress, for short) for each variable of the six countries based on the historical criterion of previous subsection.

Table 4 shows the outcomes corresponding to these two new criteria. The results in general are quite robust under the three different alternatives, both in terms of size of the shock and direction to the two new stress scenarios designed. Two are the main exceptions: Indonesia and Turkey. In the case of Indonesia the exercise is not robust under the assumption of two standard deviations, as public debt on GDP is lower under the stress scenario than under the base scenario. In the case of Turkey, under these two new assumptions, the gap between the stress under the debt structure of the year of crisis – that is, the counterfactual – and the stress under the debt structure of 2005 becomes negative, implying less resilience to a negative shock. For the other simulations results are almost equivalent, and even in some cases, such as the results of the scenario based on averages for Colombia

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[12] It is added to each variable from 2006 to 2008 (both inclusive) two standard deviations of the sample of each variable from the year of the crisis to 2005.

gives rise to a lower debt under current composition than under previous composition.

5. Conclusions

In this paper we have evaluated the impact of the shift of public debt away from foreign currency on the vulnerability of a group of selected emerging countries which, not so long ago, underwent deep financial turbulences.

We have first underscored that, the ratio of public debt to GDP and, even more dramatically, the share of forex debt have been reduced in emerging markets in a context of favourable financial conditions. The exchange rate appreciations in this context have helped to reduce both ratios. However, the proactive debt management strategies of the authorities – aimed at reducing the vulnerability of the debt composition – has been the dominant factor in quantitative terms in most countries. Clearly, a favourable external environment and exchange rate evolutions have facilitated this process, since expected exchange rate appreciation favours issuing debt in domestic currency. The development of local debt markets has both benefited from and facilitated this proactive debt management.

The changes in the structure of debt are expected to have important implications for the reduction of financial vulnerability in public finances. However, our approach to this issue has first uncovered a paradox related to the recent bias towards local debt. By reducing forex debt through proactive policies governments have not taken full advantage of the real exchange appreciation enjoyed by their economies after the crises. Otherwise, the debt ratios in the analysed countries would have been lower than they currently are, and the difference is sizable in certain cases.

This short term "opportunity cost" of shifting towards local debt has to be taken into account in order to assess the *net* benefits of the proactive debt management policies. The stress tests suggests that even after controlling these short-term costs there is a reduction in vulnerability derived from the proactive shift towards local debt-measured by the difference in the ratio of debt to GDP in a situation of stress – in most cases, although the magnitude is some of them is small.

One important caveat reinforces these results. A central assumption of the exercise is taken into account: the evolution of the variables which drive the debt to GDP ratio is independent of the ratio or structure of debt. However, the behaviour of the financial variables is very much influenced by perceptions on debt vulnerability. This applies both in the counterfactual and in the stress tests. More precisely, with a higher share of forex debt the exchange rate appreciations would have presumably been lower in the recent years and the deterioration of the financial variables in the stress would have been higher. Finally, the probability of a turbulence is expected to increase under a debt structure very sensitive to financial volatility. These caveats taken together imply that the estimated reduction

in vulnerability is a minimum bound, and therefore the effective vulnerability reduction is higher.

All in all, the move to local debt has been shown to be positive from the point of view of the vulnerability reduction. This can be considered an important breakthrough of emerging markets in order to improve their resilience in the face of eventual financial shocks and also to reduce their occurrence.

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Chart 1: Gross and Quasi-Gross Public Sector Debt for Six Selected Countries
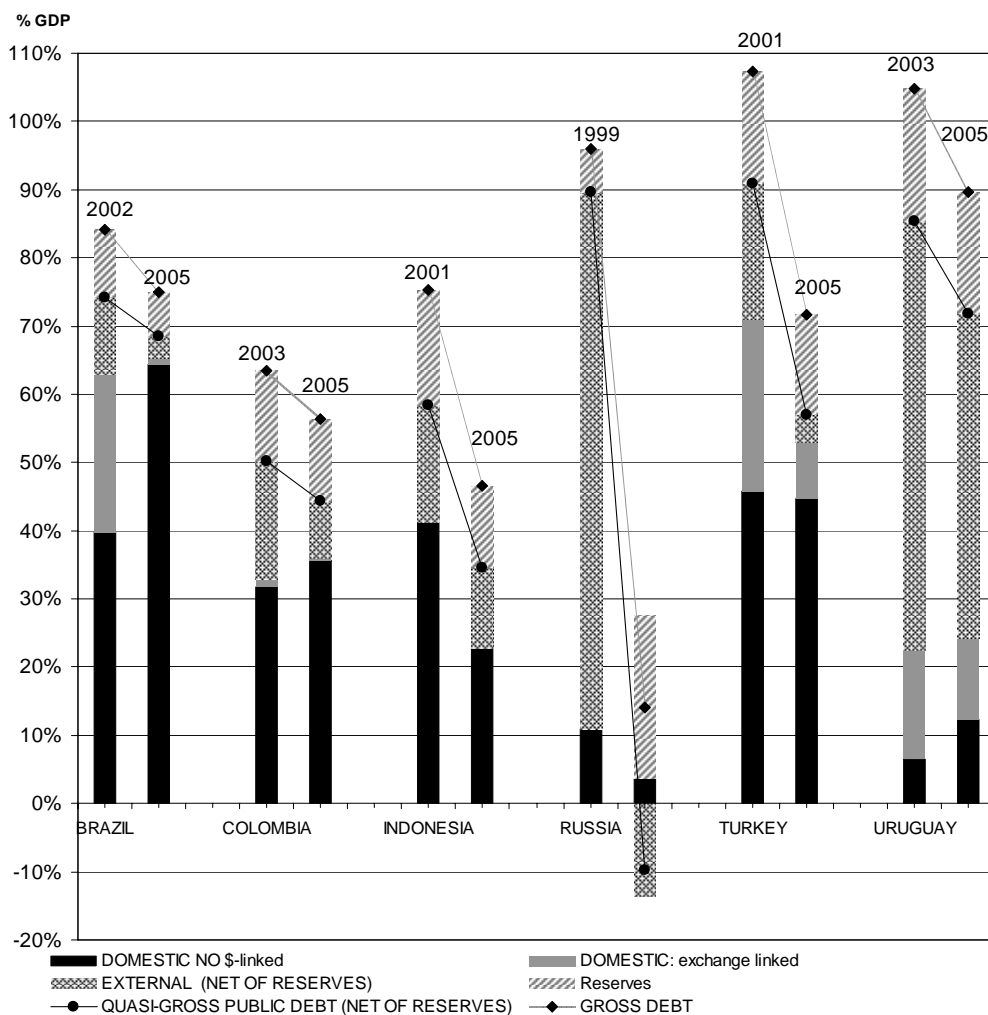
Source: National statistics and authors' calculations.

Chart 2: Public Debt Composition (Quasi-Gross Public Debt) in Six Selected Countries

% of public debt-

EXTERNAL (NET OF RESERVES)   DOMESTIC $-linked   DOMESTIC NO $-linked
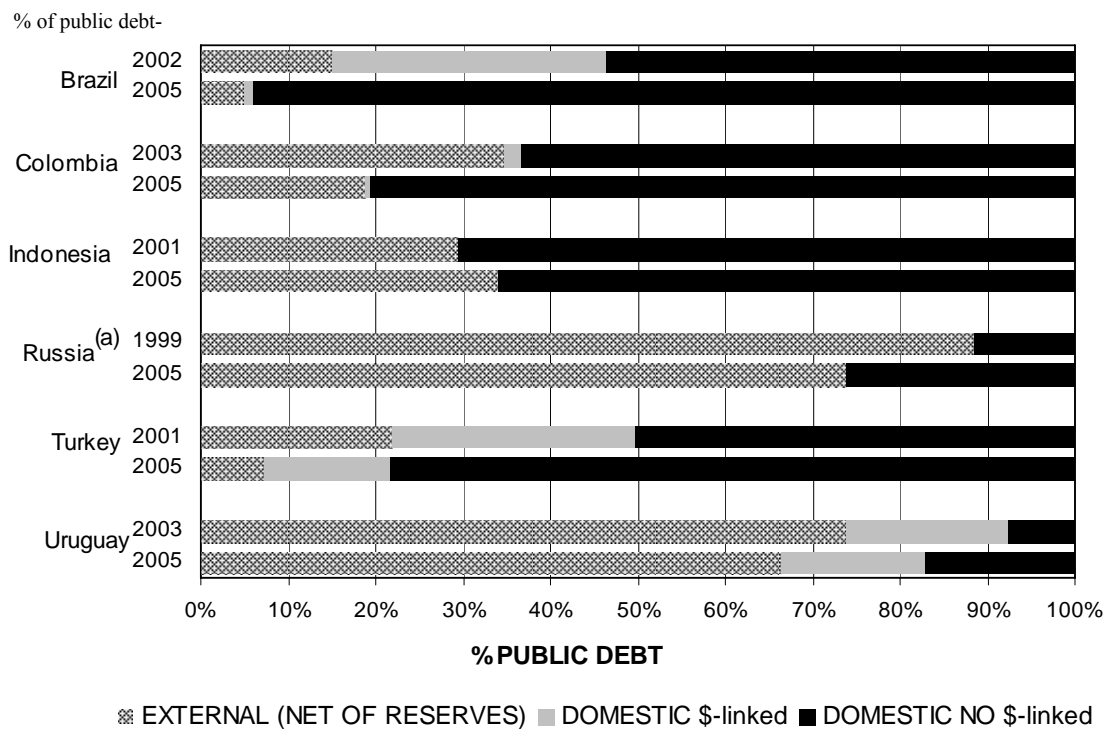
(a) Reserves not excluded.

Source: National statistics and authors' calculations.

Chart 3: Identification of Sovereign Crisis Episodes in Selected Countries
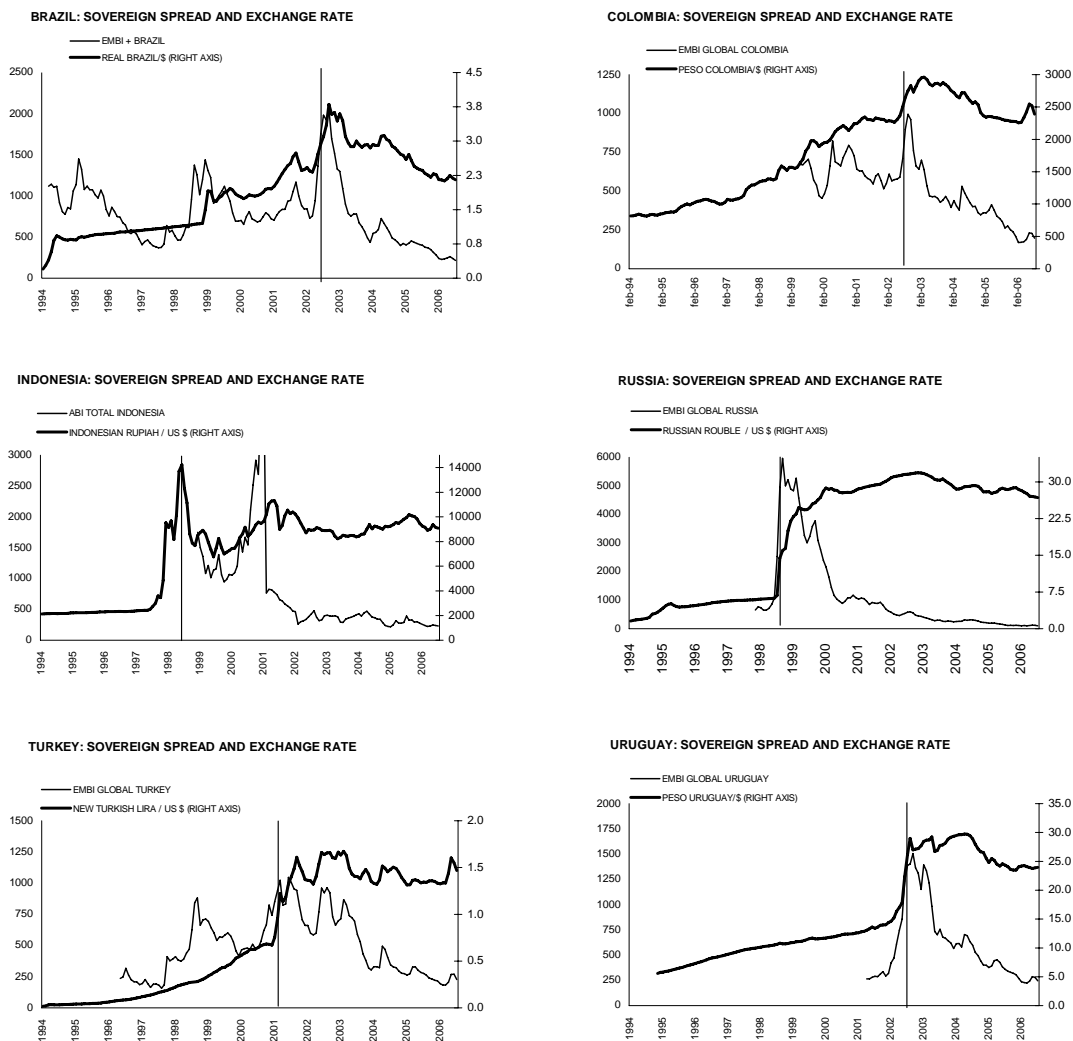
(Together with Sovereign Spreads and Nominal Exchange Rates)

Source: Datastream.

Chart 4: Real Exchange Rates for Six Selected Countries (a)
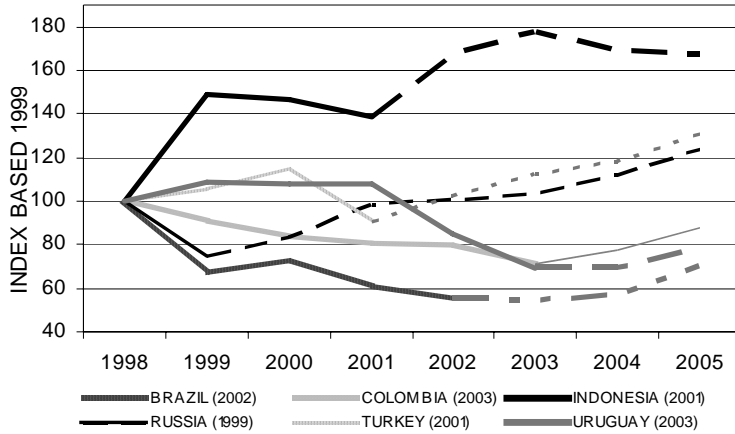
(a) Year of major outstanding debt in barckets and dotted line from this year.

Source: Economist Intelligence Unit (EIU).

Chart 5: Public Debt Decomposition
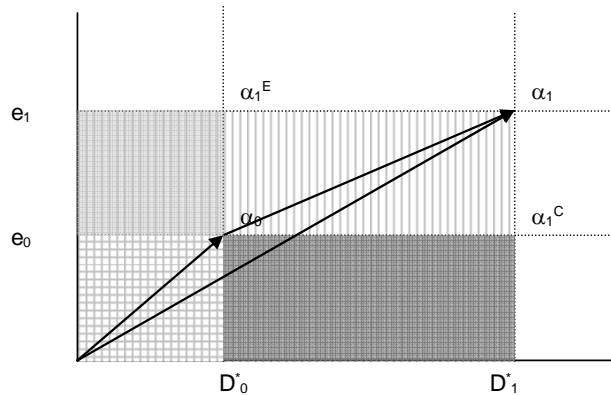
Chart 6: EE and CE (Quasi-Gross Public Debt) in Six Selected Countries
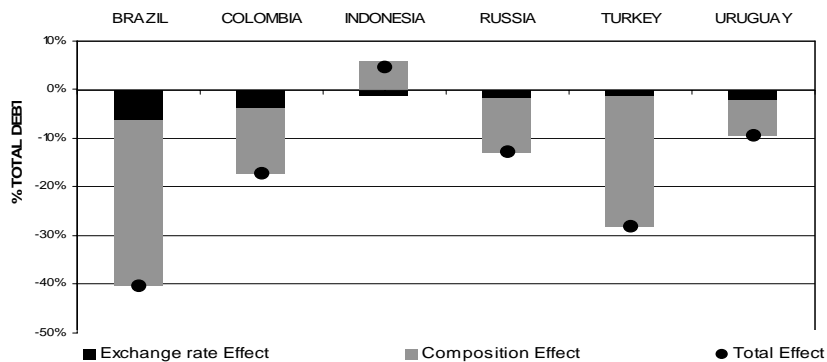
Source: National Statistics and authors' calculations.

Chart 7: Brazil: Annual Variation of Public Debt on GDP Disaggregated in Terms of Contributions
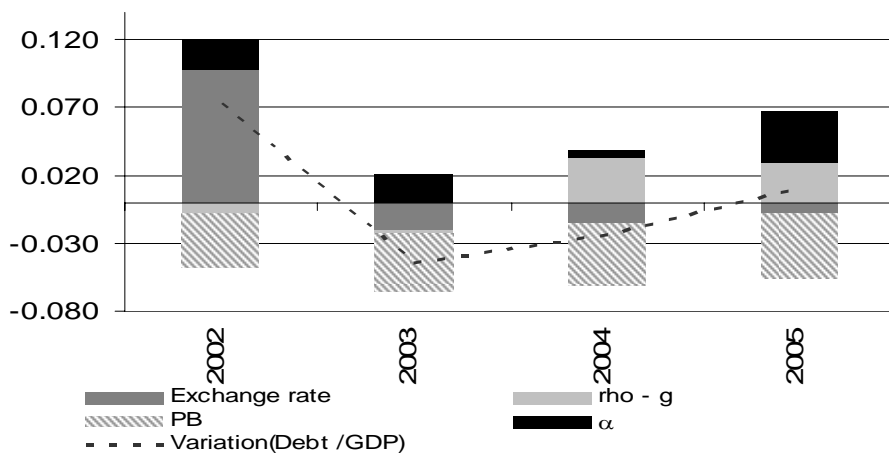
Source: Authors' calculations.

Chart 8: Actual vs. Counterfactual in Six Selected Countries
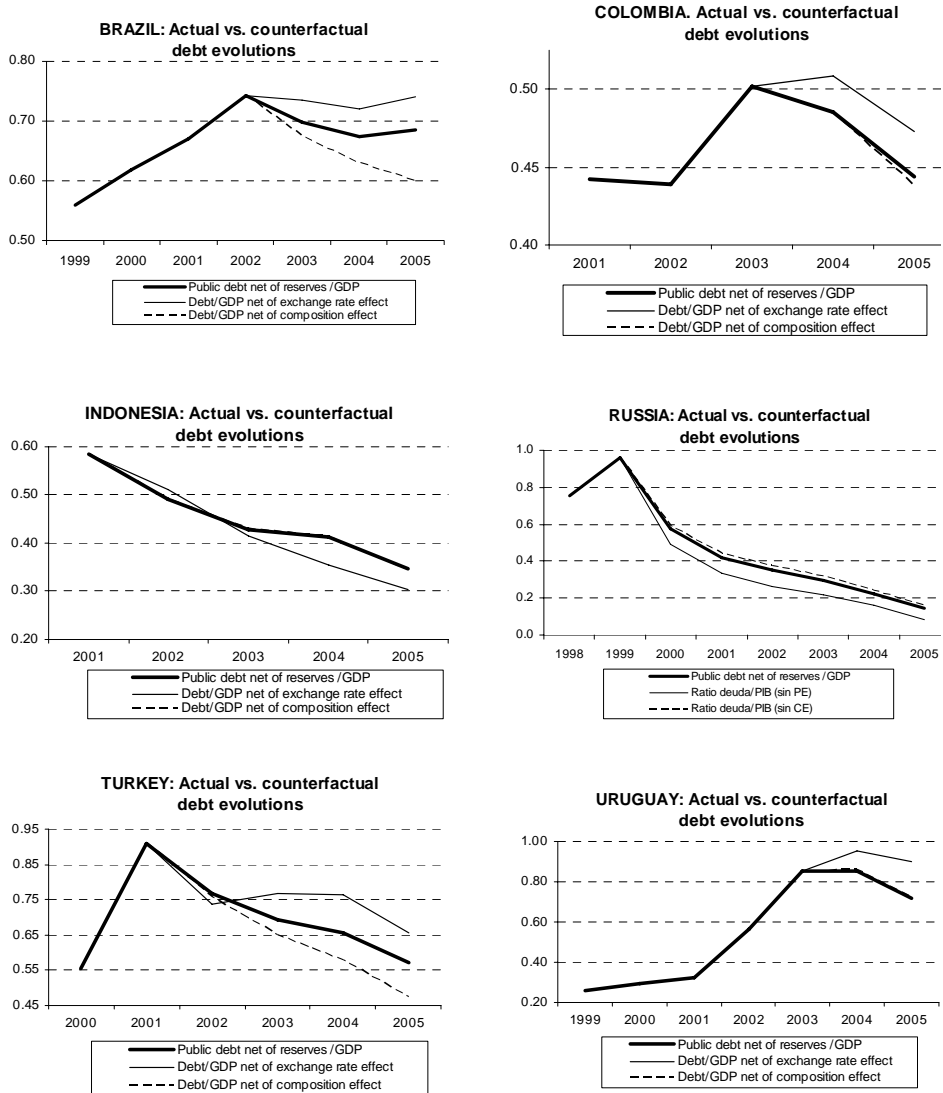
Source: Authors' calculations

Chart 9: Base and Stress Scenario in Six Selected Countries

BRAZIL: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt net of reserves /GDP
- Stress under 2002 debt composition (counterfactual)

COLOMBIA: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt net of reserves /GDP
- Stress under 2003 debt composition (counterfactual)

INDONESIA: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt net of reserves /GDP

RUSSIA: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt /GDP

TURKEY: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt net of reserves /GDP

Uruguay: Base and stress scenario

- Base scenario under current structure
- Stress with debt composition net of CE
- Stress under current debt composition
- Public debt net of reserves /GDP
- Stress under 2003 debt composition (counterfactual)

Source: Authors' calculations

Table 1: Database Construction

Country	Year of the Debt crisis	Availability of data	Description	Source	Web link
Brazil	**2002**	**1999**	General Government Gross Debt [a]	Banco Central do Brasil	http://www.bcb.gov.br
			Public Sector Domestic Debt [b]	Ministerio de Fazenda	http://www.stn.fazenda.gov.br/estatistica/est_divida.asp
Colombia	**2003**	**2001**	Public Sector Debt [a]	Banco de la República	http://www.banrep.gov.co/economia/deuda/BoletinDePu18.pdf
			National Government Domestic Debt [b]	Ministerio de Hacienda	http://www.minhacienda.gov.co/
Indonesia	**2001**	**2001**	Central Government Gross Debt	Art.IV	
Russia	**1999**	**1998**	General Government Gross Debt	Art.IV	
Turkey	**2001**	**1998**	Public Sector Debt [a]	Turkish Treasury	http://www.treasury.gov.tr/
Uruguay	**2003**	**1999**	Public Sector Debt [a]	Banco Central de Uruguay	http://www.bcu.gub.uy/autoriza/pepmaf/deudapublica/dbspg2.xls

[a] Domestic and External

[b] Used to do the brakedown of the Domestic Public Debt

Table 2: Counterfactual Exercise Results for 2005

COUNTERFACTUAL (2005)	BRAZIL	COLOMBIA	INDONESIA	RUSSIA	TURKEY	URUGUAY
Public debt net of reserves /GDP	68.5%	44.4%	34.6%	14.5%	57.1%	71.9%
Debt/GDP net of exchange rate effect	74.0%	47.3%	30.4%	54.6%	65.7%	90.3%
Debt/GDP net of composition effect	60.0%	43.8%	34.4%	14.7%	47.3%	72.3%
Points of Debt/GDP due to composition effect	5.5	2.9	-4.2	40.1	8.6	18.4
Points of Debt/GDP due to exchange rate effect	-8.5	-0.5	-0.2	0.2	-9.7	0.5

Source: Authors' calculations.

Table 3: Base Scenario and the Stress Scenario for the Simulation of Debt Dynamics

BRAZIL

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (real/dollar)	-12.2%	-4.3%	3.6%	0.0%
Real GDP growth	2.3%	3.5%	4.0%	3.5%
GDP deflator	7.2%	4.0%	4.2%	4.4%
Nominal domestic interest rate (i)	13.5%	14.3%	12.9%	12.4%
Nominal external interest rate (i*)	7.5%	7.5%	7.5%	7.5%
Primary Balance / GDP	4.8%	4.3%	4.3%	4.2%
Recognition of implicit or contingent liabilities /GDP	-0.5%	3.0%	3.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (real/dollar)	-12.2%	50.3%	7.9%	18.5%
Real GDP growth	2.3%	-0.8%	-0.3%	3.3%
GDP deflator	7.2%	7.5%	7.7%	7.9%
Nominal domestic interest rate (i)	13.5%	14.9%	15.5%	12.3%
Nominal external interest rate (i*)	7.5%	11.6%	11.6%	11.6%
Primary Balance / GDP	4.8%	0.0%	3.2%	3.5%
Recognition of implicit or contingent liabilities / GDP	-0.5%	3.0%	3.0%	0.0%

INDONESIA

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (rupee/dollar)	6.0%	0.0%	0.0%	0.0%
Real GDP growth	5.6%	5.2%	6.0%	6.5%
GDP deflator	13.7%	13.2%	6.5%	6.5%
Nominal domestic interest rate (i)	6.1%	5.7%	5.5%	5.7%
Nominal external interest rate (i*)	7.4%	7.4%	7.4%	7.4%
Primary Balance / GDP	2.2%	1.2%	1.3%	1.1%
Recognition of implicit or contingent liabilities /GDP	0.3%	0.0%	0.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (rupee/dollar)	6.0%	15.6%	-3.1%	2.2%
Real GDP growth	5.6%	4.5%	4.9%	5.7%
GDP deflator	13.7%	16.7%	6.0%	4.4%
Nominal domestic interest rate (i)	6.1%	-3.1%	3.4%	5.6%
Nominal external interest rate (i*)	7.4%	25.8%	16.6%	7.4%
Primary Balance / GDP	2.2%	0.4%	0.5%	0.3%
Recognition of implicit or contingent liabilities / GDP	0.0%	0.0%	0.0%	0.0%

TURKEY

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (lira/dollar)	0.7%	0.0%	0.0%	0.0%
Real GDP growth	7.4%	5.0%	5.0%	5.0%
GDP deflator	5.4%	7.0%	5.0%	5.0%
Nominal domestic interest rate (i)	24.6%	22.9%	22.2%	22.4%
Nominal external interest rate (i*)	6.6%	6.6%	6.6%	6.6%
Primary Balance / GDP	6.5%	6.5%	6.5%	6.5%
Recognition of implicit or contingent liabilities /GDP	-0.5%	3.0%	3.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (lira/dollar)	0.7%	116.4%	13.1%	-14.6%
Real GDP growth	7.4%	-7.4%	8.0%	5.9%
GDP deflator	5.4%	26.8%	42.2%	56.8%
Nominal domestic interest rate (i)	24.6%	90.1%	112.4%	122.9%
Nominal external interest rate (i*)	6.6%	9.5%	9.5%	9.5%
Primary Balance / GDP	6.5%	5.5%	5.5%	5.5%
Recognition of implicit or contingent liabilities / GDP	-0.5%	3.0%	3.0%	0.0%

COLOMBIA

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (peso/dollar)	-5.4%	6.5%	3.4%	0.0%
Real GDP growth	5.2%	5.2%	4.5%	4.0%
GDP deflator	5.5%	4.7%	4.1%	3.5%
Nominal domestic interest rate (i)	8.6%	12.2%	11.6%	10.2%
Nominal external interest rate (i*)	6.8%	6.8%	6.8%	6.8%
Primary Balance / GDP	3.5%	3.1%	2.4%	2.2%
Recognition of implicit or contingent liabilities /GDP	0.3%	0.0%	0.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (peso/dollar)	-5.4%	24.0%	-2.6%	-13.3%
Real GDP growth	5.2%	2.3%	-2.4%	4.7%
GDP deflator	5.5%	5.3%	7.4%	6.4%
Nominal domestic interest rate (i)	8.6%	13.1%	12.7%	11.2%
Nominal external interest rate (i*)	6.8%	8.8%	8.8%	8.8%
Primary Balance / GDP	3.5%	0.9%	0.9%	-0.3%
Recognition of implicit or contingent liabilities / GDP	0.0%	0.0%	0.0%	0.0%

RUSIA

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (ruble/dollar)	-1.8%	0.0%	0.0%	0.0%
Real GDP growth	6.4%	6.5%	6.5%	6.1%
GDP deflator	19.6%	15.6%	8.9%	6.2%
Nominal domestic interest rate (i)	7.7%	10.8%	9.2%	17.4%
Nominal external interest rate (i*)	5.6%	5.6%	5.6%	5.6%
Primary Balance / GDP	9.2%	10.0%	8.7%	7.8%
Recognition of implicit or contingent liabilities /GDP	-0.5%	3.0%	3.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (ruble/dollar)	-1.8%	153.3%	14.4%	3.7%
Real GDP growth	6.4%	-0.3%	11.4%	15.0%
GDP deflator	19.6%	32.5%	27.8%	25.1%
Nominal domestic interest rate (i)	7.7%	38.8%	19.9%	22.8%
Nominal external interest rate (i*)	5.6%	23.5%	13.9%	7.6%
Primary Balance / GDP	9.2%	-3.6%	2.9%	7.5%
Recognition of implicit or contingent liabilities / GDP	0.0%	0.0%	0.0%	0.0%

URUGUAY

BASE SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (peso/dollar)	-10.2%	2.7%	2.8%	0.0%
Real GDP growth	6.6%	4.6%	4.2%	2.8%
GDP deflator	1.7%	5.1%	3.8%	4.0%
Nominal domestic interest rate (i)	-6.9%	6.5%	6.3%	8.6%
Nominal external interest rate (i*)	7.4%	7.4%	7.4%	7.4%
Primary Balance / GDP	3.9%	3.7%	4.0%	4.0%
Recognition of implicit or contingent liabilities /GDP	0.0%	0.0%	0.0%	0.0%

STRESS SCENARIO	dic-05	dic-06	dic-07	dic-08
Variation Exchange rate (peso/dollar)	-10.2%	84.2%	7.8%	-9.9%
Real GDP growth	6.6%	-1.1%	0.2%	1.2%
GDP deflator	1.7%	15.0%	14.8%	3.8%
Nominal domestic interest rate (i)	-6.9%	9.9%	9.5%	19.8%
Nominal external interest rate (i*)	7.4%	15.0%	15.0%	15.0%
Primary Balance / GDP	3.9%	0.1%	2.7%	3.8%
Recognition of implicit or contingent liabilities / GDP	0.0%	0.0%	0.0%	0.0%

Source: IMF and authors' calculations.

Table 4: Comparison of Stress Scenarios

		SCENARIO	dic-05	dic-06	dic-07	dic-08
BRAZIL		Base scenario under current structure (blue)	0.69	0.65	0.61	0.59
	Replica	Stress scenario under current structure (orange)	0.69	0.74	0.74	0.73
		Stress scenario under counterfactual (green)	0.60	0.76	0.79	0.83
		Gap (counterfactual and stress) [1]	**-0.09**	**0.02**	**0.04**	**0.10**
	2 SD	Stress scenario under current structure (orange)	0.69	0.73	0.69	0.68
		Stress scenario under counterfactual (green)	0.60	0.76	0.74	0.73
		Gap (counterfactual and stress) [1]	**-0.09**	**0.04**	**0.04**	**0.05**
	Aggregated stress	Stress scenario under current structure (orange)	0.69	0.81	0.84	0.83
		Stress scenario under counterfactual (green)	0.60	0.89	0.95	0.93
		Gap (counterfactual and stress) [1]	**-0.09**	**0.08**	**0.11**	**0.10**
COLOMBIA		Base scenario under current structure (blue)	0.44	0.42	0.41	0.40
	Replica	Stress scenario under current structure (orange)	0.44	0.48	0.50	0.49
		Stress scenario under counterfactual (green)	0.44	0.49	0.51	0.49
		Gap (counterfactual and stress) [1]	**-0.01**	**0.01**	**0.01**	**0.00**
	2 SD	Stress scenario under current structure (orange)	0.44	0.48	0.50	0.53
		Stress scenario under counterfactual (green)	0.44	0.50	0.52	0.55
		Gap (counterfactual and stress) [1]	**-0.01**	**0.01**	**0.02**	**0.02**
	Aggregated stress	Stress scenario under current structure (orange)	0.44	0.55	0.54	0.51
		Stress scenario under counterfactual (green)	0.44	0.59	0.59	0.56
		Gap (counterfactual and stress) [1]	**-0.01**	**0.04**	**0.05**	**0.05**
INDONESIA		Base scenario under current structure (blue)	0.35	0.29	0.26	0.24
	Replica	Stress scenario under current structure (orange)	0.35	0.32	0.30	0.29
		Stress scenario under counterfactual (green)	0.34	0.31	0.30	0.28
		Gap (counterfactual and stress) [1]	**0.00**	**0.00**	**0.00**	**0.00**
	2 SD	Stress scenario under current structure (orange)	0.35	0.29	0.23	0.19
		Stress scenario under counterfactual (green)	0.34	0.28	0.23	0.19
		Gap (counterfactual and stress) [1]	**0.00**	**0.00**	**0.00**	**0.00**
	Aggregated stress	Stress scenario under current structure (orange)	0.35	0.43	0.37	0.29
		Stress scenario under counterfactual (green)	0.34	0.41	0.35	0.28
		Gap (counterfactual and stress) [1]	**0.00**	**-0.02**	**-0.02**	**-0.02**
RUSSIA		Base scenario under current structure (blue)	0.15	-0.01	-0.12	-0.20
	Replica	Stress scenario under current structure (orange)	0.15	0.35	0.28	0.13
		Stress scenario under counterfactual (green)	0.16	0.41	0.33	0.18
		Gap (counterfactual and stress) [1]	**0.02**	**0.06**	**0.05**	**0.04**
	2 SD	Stress scenario under current structure (orange)	0.15	0.18	0.09	-0.01
		Stress scenario under counterfactual (green)	0.16	0.21	0.11	0.00
		Gap (counterfactual and stress) [1]	**0.02**	**0.03**	**0.02**	**0.01**
	Aggregated stress	Stress scenario under current structure (orange)	0.15	0.25	0.18	0.06
		Stress scenario under counterfactual (green)	0.16	0.29	0.22	0.09
		Gap (counterfactual and stress) [1]	**0.02**	**0.04**	**0.03**	**0.03**
TURKEY		Base scenario under current structure (blue)	0.57	0.52	0.46	0.44
	Replica	Stress scenario under current structure (orange)	0.57	0.96	1.09	1.20
		Stress scenario under counterfactual (green)	0.47	0.95	1.11	1.18
		Gap (counterfactual and stress) [1]	**-0.10**	**0.00**	**0.03**	**-0.01**
	2 SD	Stress scenario under current structure (orange)	0.57	0.82	1.18	1.77
		Stress scenario under counterfactual (green)	0.47	0.69	0.99	1.47
		Gap (counterfactual and stress) [1]	**-0.10**	**-0.13**	**-0.19**	**-0.30**
	Aggregated stress	Stress scenario under current structure (orange)	0.57	0.72	0.69	0.12
		Stress scenario under counterfactual (green)	0.47	0.68	0.66	0.11
		Gap (counterfactual and stress) [1]	**-0.10**	**-0.04**	**-0.03**	**-0.01**
URUGUAY		Base scenario under current structure (blue)	0.72	0.68	0.65	0.62
	Replica	Stress scenario under current structure (orange)	0.72	1.27	1.33	1.30
		Stress scenario under counterfactual (green)	0.72	1.31	1.37	1.34
		Gap (counterfactual and stress) [1]	**0.00**	**0.04**	**0.05**	**0.04**
	2 SD	Stress scenario under current structure (orange)	0.72	0.93	1.01	1.09
		Stress scenario under counterfactual (green)	0.72	0.95	1.03	1.11
		Gap (counterfactual and stress) [1]	**0.00**	**0.02**	**0.02**	**0.03**
	Aggregated stress	Stress scenario under current structure (orange)	0.72	1.18	1.14	0.98
		Stress scenario under counterfactual (green)	0.72	1.21	1.18	1.01
		Gap (counterfactual and stress) [1]	**0.00**	**0.03**	**0.04**	**0.03**

(1) Represents the difference between the stress under 2002 debt composition (counterfactual) and the stress under current debt composition.

Source: own calculations

Source: Authors' calculations.