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CONVERGENCE AND DIVERGENCE OF SOVEREIGN BOND SPREADS: LESSONS FROM LATIN AMERICA

by

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PREFACE

Heightened volatility in financial markets and sudden reversals in investor sentiment have left emerging countries more vulnerable to external shocks and domestic structural weaknesses. Successive currency crises over the last eight years testify to this. Widening sovereign bond spreads in turn made finance costs higher and fairly unpredictable, even more so in a world context of increasing risk aversion. True, many countries coped with the financial turmoil through implementing relatively sound policies based on good governance criteria. On the other hand, other countries failed to complete reform, resulting in unsustainable debt dynamics. These dynamics were indeed chiefly endogenous to the binding foreign exchange constraint, higher interest rates and weak domestic public finances.

The Latin American sovereign bond market has been the main mover, both in terms of debt stocks and return indexes. Martin Grandes, from DELTA (EHESS/ENS, Paris), investigates the factors explaining regional sovereign risk premia considering extremely opposite experiences, namely Mexico and Chile on one side and Argentina on the other. The paper provides important lessons for other Latin American countries such as Brazil, in terms of what issues need to be addressed in order to bring bond spreads down and render the debt equation more sustainable. Grandes finds that good fundamentals — especially their permanent components — matter in spite of contagion effects and market volatility. In addition, very different debt dynamics can be shaped depending on economic growth and bond spreads; fiscal discipline is not enough *per se* to get the spreads narrowed.

This paper is part of activity one, Governing Finance and Enterprises: Global, Regional, and National in the Development Centre’s 2001/2002 work programme. It contributes to the investigation of the potential benefits and costs of different monetary policy regimes in developing countries, with a view to lowering capital costs on a sustained basis to stimulate investment and growth.

Jorge Braga de Macedo
President
OECD Development Centre
31 October 2002

RÉSUMÉ

Les obligations émises par les pouvoirs publics latino-américains représentent une proportion importante de la dette des pays émergents (50 pour cent début 2001) et influent donc de manière significative sur les dynamiques de ce marché. La récente tempête financière, les phénomènes de contagion et les inquiétudes nouvelles des investisseurs quant au risque de non-remboursement de la dette exigent d'approfondir les mécanismes de déterminations du cours des obligations souveraines (*spreads*) : paramètres macro-économiques fondamentaux, contagion ou autres variables externes. Ce Document technique examine deux points pas suffisamment traités jusque-là : *i)* dans quelle mesure les évolutions permanentes ou conjoncturelles des fondamentaux affectent-ils la perception du risque souverain, c'est-à-dire le risque de défaut de paiement, une fois tenu compte des phénomènes de contagion ? ; *ii)* comment des primes de risque relativement élevées et volatiles peuvent-elles provoquer l'accumulation d'une dette publique non viable ?

Pour répondre à ces questions, nous avons estimé des équations structurelles sur le long terme afin d'en extraire les déterminants du risque, dans le cas de l'Argentine, du Chili et du Mexique, sur la base de séries temporelles couvrant la période 1994-2000. A la différence de travaux empiriques antérieurs, nous avons décomposé les variables fondamentales en éléments permanents ou temporaires. Ensuite, à l'aide d'un modèle vectoriel de correction des erreurs, nous avons exploré les dynamiques à court et long terme de l'équation de viabilité de la dette en Argentine et au Mexique afin d'évaluer l'ampleur du rôle déstabilisant joué par des *spreads* élevés. Nos principaux résultats sont les suivants : *i)* ce sont les modifications permanentes des variables fondamentales qui sont les plus influentes, bien que les effets de contagion restent importants ; *ii)* les déficits excessifs du secteur public (parce que la charge des intérêts augmente) doublés d'une croissance économique insuffisante et de primes de risque trop élevées sont responsables d'une évolution explosive de l'endettement.

SUMMARY

Latin American sovereign bonds represent a significant share of the emerging debt class (50 per cent by early 2001) and so have considerably shaped the dynamics of this market. Recent financial turmoil, contagion episodes and investors' renewed concerns with debt default call for a better understanding of sovereign bond pricing (spreads) and its determinants, either macro fundamentals, contagion or other external variables. This paper addresses two important questions not fully tackled in the existing literature: *i)* to what extent do permanent or transitory changes in fundamentals affect sovereign risk perception, i.e. default risk, once contagion is controlled for? *ii)* how can a relatively high and volatile spread be the cause of unsustainable public debt accumulation? In order to answer these questions, we estimate long-term structural equations to pin down country risk determinants for Argentina, Chile and Mexico, using a time series framework spanning 1994-2000. Unlike former empirical work, we split fundamental variables into permanent and transitory components. Second, we explore through a vector error correction model (VECM) the short-term and long-term dynamics of the debt sustainability equation in Argentina and Mexico in order to assess how large the destabilising role of comparatively high spreads has been. Our main findings boil down to *i)* permanent changes in fundamental variables weigh most while contagion effects remain significant; *ii)* non-sustainable public sector deficits (increasing interest burden) plus insufficient economic growth and excessive risk premia are shown to have triggered explosive debt dynamics.

I. INTRODUCTION

"Markets can remain irrational longer than you can remain solvent" — J.M. Keynes

Bond finance is a cheap and important funding source in industrial countries, but too shaky for supporting development, even in advanced emerging market economies where Latin America excels. In fact, Latin American bonds amounted to half of the emerging sovereign debt by March 2001 (Table I.1 below) so their weight in riskier assets within global portfolios is important indeed. Moreover, according to JP Morgan's indexes, the Latin sovereign bonds have had a weight of 71 and 60 per cent in the EMBI+ and Euro EMBI Global, respectively (International Monetary Fund, 2001), which renders them "market movers".

Table I.1. **Outstanding Bonds and Notes**

	Developing Countries ($ billion)	Latin America & Caribbean ($ billion)	Latin America & Caribbean (% points)	Argentina (%)[a]	Brazil (%)[a]	Chile (%)[a]	Mexico (%)[a]	Others (%)[a]
Dec-93	107.4	41.1	38	17.3	20.9	1.9	46.5	13.4
Mar-01	450.7	224	50	29.5	24.8	3.2	29.6	12.9

a) Percentage of Latin America & Caribbean totals.

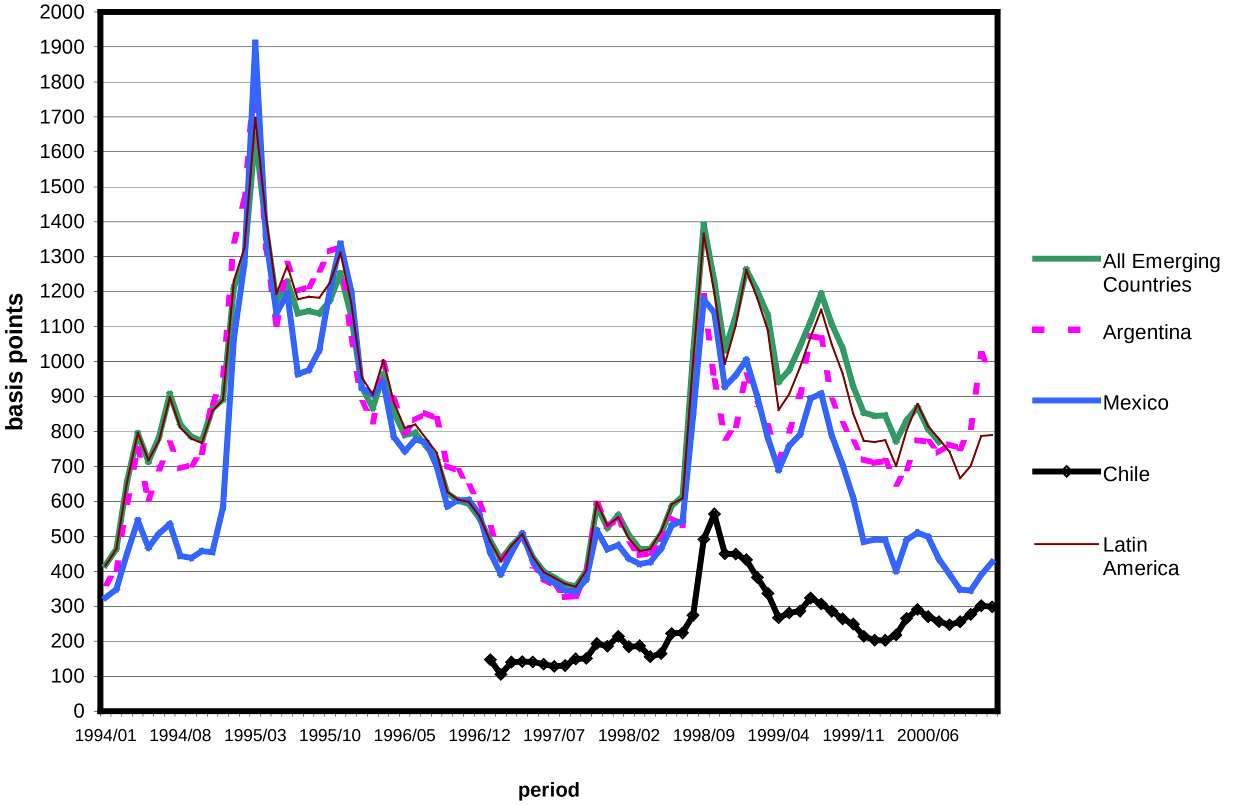
Source: Bank of International Settlements (2001).

Beginning with the initial boom triggered by the Brady rescheduling agreement in the late 1980s, the rising share of bond flows in total capital inflows has been an issue of concern for many reasons. On the one side, they have added a source of volatility and speculation in terms of short-term oriented investors seeking quick and juicy returns from diversifying portfolios. On the other side, they have also opened up a window of opportunity for providing an alternative longer-maturity funding source to the government and the private sector. Of course, an increasing dependence on debt finance has been called into question, particularly after the Asian financial crisis in 1997.

The financial turmoil, which has taken place in the emerging bond markets since the Asian crisis, has undoubtedly shaped a critical need for new empirical and theoretical studies in order to determine the underpinnings of differentiated performances. Some literature has contributed to uncovering the bond pricing on the one hand, and the interaction between bond finance, the real economy and external shocks on the other[1]. The paucity of existing literature dealing with regional features[2] other than specific contagion episodes, single-country cases or panel-data approaches has left the door open for exploring sovereign debt pricing and its implications for Latin American countries, as will be explained in detail below.

Contagion episodes notwithstanding, Figure 1 suggests there can be good governance practices to stabilise bond flows and bring sovereign spreads down. Examples are Mexico's progress in terms of bond market access and risk premia, or the Chilean maintenance of the lowest regional spread levels.

Figure 1. **J.P. Morgan's Emerging Market Bond Index + Spreads in Latin America** (monthly averages 1994-2000)



This paper intends to answer two questions as yet answered only very narrowly in the former literature: *i)* to what extent do permanent or transitory changes in fundamentals affect sovereign risk perception, i.e. default risk, once contagion is controlled for? *ii)* how can relatively high and volatile spreads be the cause of unsustainable public debt accumulation? In other words, we look into the theoretical and empirical link between sovereign risk premia, intertemporal solvency and debt dynamics based on the evidence of Argentina, Chile and Mexico — the major Latin-market movers. Unlike the former literature, we offer a regionally focused study and some policy-oriented insights derived from extremely different experiences. We also provide a larger sample (1994-2000) all across the financial crisis episodes, a breakdown between permanent and transitory effects from fundamental variables through Hoddrik-Prescott filtering and a special emphasis on a comparative perspective. On the other hand, we tackle the public-debt dynamics problem through a vector error correction model (VECM) which provides a first-hand empirical analysis of Argentina and Mexico, two largely contrasting experiences.

The results suggest that the solvency crisis experienced by Argentina has been predictably reflected in widening, more volatile and unsustainable sovereign spreads which have mirrored deteriorated fundamentals — in particular their permanent components — once other factors are controlled for. Remarkably, the loss of competitiveness following the peso overvaluation, alongside other negative external shocks and fiscal misperformance, contributed to that deterioration leading to higher spreads. Accordingly, we demonstrate how non-sustainable public sector deficits (increasing interest burden) plus insufficient economic growth and an excessive risk premia trigger explosive debt dynamics in the Argentine case, as opposed to the Mexican one.

The paper is organised as follows. Section II introduces the stylised facts dealing with intertemporal solvency and macroeconomic fundamentals and also explores how spreads affect business cycles. In Section III we review the literature on the determinants of country risk premia. Then we propose new Latin American econometric estimations in order to ascertain which empirical determinants are relevant. In other words, we aim at disentangling the main factors that account for sovereign risk fluctuations; to what extent intertemporal solvency weighs; and, in that sense, whether permanent changes in fundamentals are more important than transitory shocks. Finally, in Section IV we investigate the dynamics of public-debt and sovereign risk, both empirically and theoretically. A comparison with Mexico, a rather successful story, provides useful insights. The last section concludes and offers some policy recommendations.

II. STYLISED FACTS AND PRELIMINARY RESULTS

Throughout this section we introduce a comparative analysis in terms of sovereign risk behaviour, intertemporal solvency and/or liquidity issues and economic growth. Basically, we aim to outline a number of stylised facts in order to uncover preliminary trends for each country, and to draw upon some elements that allow us to prepare the ground for the econometric study of the Latin American country risk determinants.

II.1. Country Risk “Awards”: When the Market Prizes…

From Figure 1 above we see that after the Mexican crisis (December 1994), the sovereign spreads (measured by the EMBI + Bradies index, except for Chile[3]) move down to 350 basis points (henceforth bps) on average around mid-1997. It is worthwhile to note that the gap (max-min) among countries did not exceed 200 bps. Chile, the less risky sovereign, kept well below 200 bps. Then the Asian crisis hit and a peak at 500-700 bps was observed though the gap remained fairly constant until the Russian default (August 1998).

In the wake of the Russian default another convergence story begins. Mexico brings the spread down to 350-400 bps on average (gets upgraded by Moody’s in early 2000, by Standards & Poor’s in early 2002), outperforming Argentina, as before its own balance of payment crisis in late 1994. Chile remains far below but with a slight “structural” increase, oscillating between 250 and 300 bps (maintaining the investment grade status).

What about the spread volatility? Based on daily data, we calculated an intramonthly spread variance for all the countries but Chile (only monthly data was available). Then a relative variance of country j to the variance of the Latin American Global Index was computed for the whole period (January 1994-December 2000). Afterwards, standard statistics were computed for each country (Table II.1). As a result, Argentina displays superior average volatility relative to Mexico. However the variability coefficient is higher for Mexico than Argentina, but this figure is much explained by the fact that the Mexican crisis is included.

Table II.1. **Spread Volatilities**, 1994-2000

	Argentina	Mexico
Mean	1.24	1.09
Maximum	3.09	2.31
Minimum	0.48	0.32
Standard deviation	0.47	0.45
Variability coefficient 1994-2000	0.38	0.417
Observations	79	79

Summing up, Mexico turns out to be the "winner" catching up to Chile's spreads level while Argentina appears as the net loser. Moreover, Chile and Mexico have made headway toward the investment grade whereas Argentina has been downgraded several times over the last three years (now in selective default in the view of Standards & Poor's).

This had much to do with the extent to which solvency and liquidity problems entered the markets or agencies' assessments about the prospects of the Latin American economies. In the remaining part of this section, we will introduce the basic figures in a comparative perspective to grasp the main trends accounting for those facts.

II.2. Solvency and Liquidity Indicators: Are the Patterns So Different?

As noted above, part of the input into sovereign risk perceptions or ratings relies on indicators which mainly deal with external payments and debt, fiscal stance or monetary and liquidity issues (see, for example, Moody's, 2001). Even though they are necessarily backward looking, the delay to produce and release the information or the forecast errors (not uncommon in volatile, unpredictable markets) makes them relevant for current assessments. Table II.2 displays some selected indicators picturing broad patterns of the four economies.

Table II.2. **Some Selected Solvency Indicators**

Indicator	Year	Argentina	Chile	Mexico
Total external debt over GDP (EDGDP)	1994	0.33	0.42	0.32
	1997	0.43	0.35	0.35
	2000	0.51	0.53	0.26
Total external debt over exports of goods and services (ED XGS)	1994	4.41	1.49	1.9
	1996	3.86	1.21	1.34
	2000	4.72	1.67	0.83
Total external debt service over exports (EDS XGS)	1994	0.69	0.20	1.38
	1996	0.61	0.32	0.7
	1999	1.22	0.17	0.46
Current account in GDP percentage (%)	1994	-4.36	-3.11	-7.03
	1997	-4.24	-4.95	-1.86
	2000	-3.15	-1.41	-3.17
Fiscal deficit in GDP percentage (%)	1994	-0.86	2.10	-0.12
	1996	-2.84	1.79	0.01
	1999	-3.08	-0.98	-1.23

Source: See Data Appendix.

Total gross external debt over GDP (EDGDP): this is one of the most widely used indicators to predict likely debt-repayment troubles. A stable ratio would mean that the economy is growing sufficiently in order to meet its obligations (debt servicing). All countries but Mexico display an upward tendency though Argentina even more sharply (highest ratio). Chile keeps higher levels than the base year although private liabilities account mostly for that[4].

— Total external debt over exports of goods and services (ED XGS): a crucial indicator comparing the external liabilities size to the export capacity, reveals the magnitude of the external constraint in terms of the country's ability to transfer foreign exchange abroad. Argentina has the highest ratio, three or four times Mexico and Chile's value in 1999, respectively, worsening since 1996 (less than four to more than five). Mexico goes the other way round from two to one over the same period. It is worth noting that Argentina is less open than Chile and Mexico, their export share in GDP being higher by a factor of two or three.

— Debt service over exports of goods and services (EDS XGS): another important indicator, in turn linked to the former. Even a low ED XGS ratio can be compatible with debt servicing problems if the interest cost is high or the principal amortisations are somewhat concentrated within the short term. It computes from a shorter-term perspective the liquidity burden of the external debt in terms of exports units. Once again, Argentina and Mexico present an inverse correlated path. Chile always displays very low ratios.

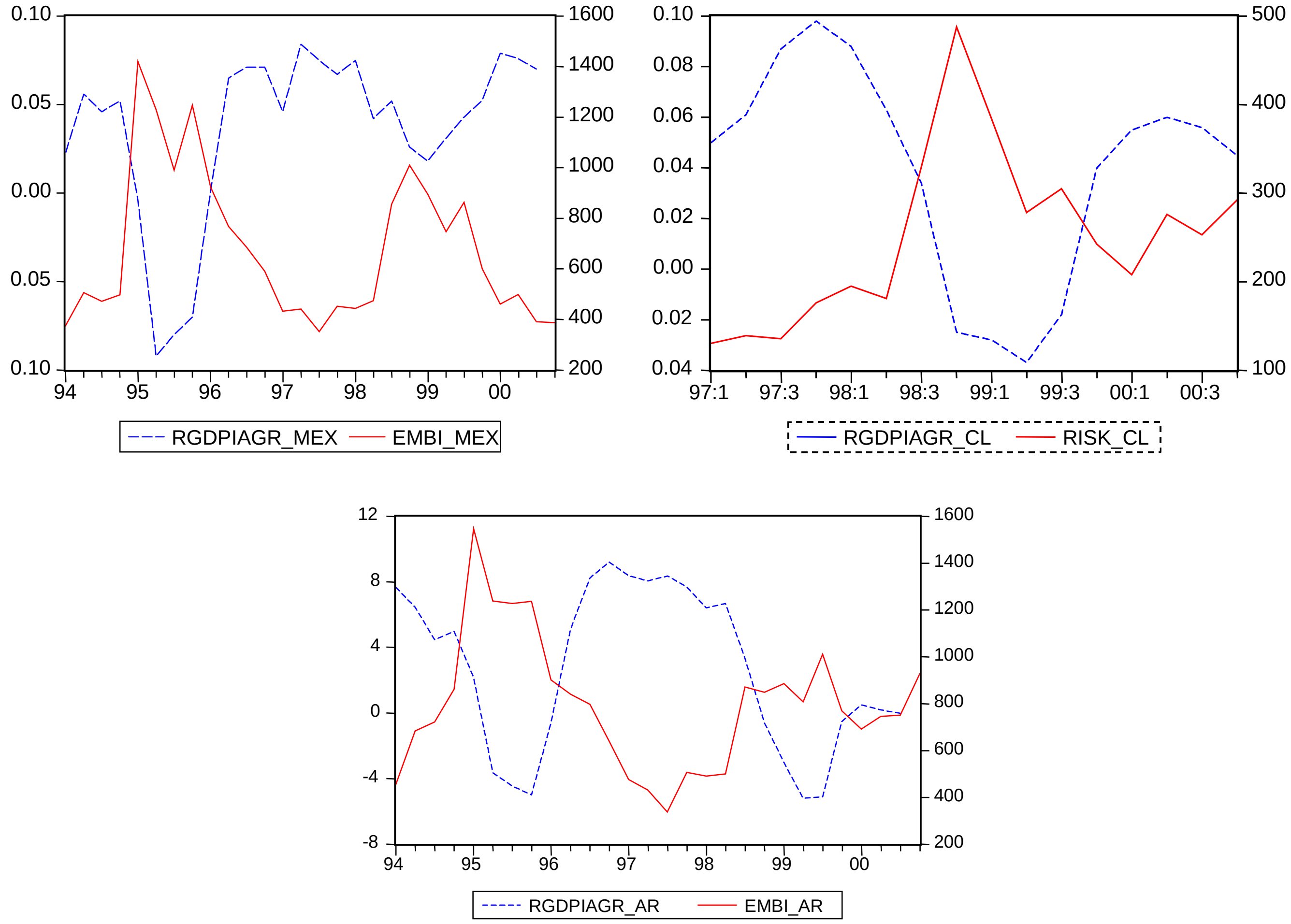
— Current account over GDP (CCGDP): large and persistent deficits can lead to a build up of foreign debt, unless the inflows are financed by flows of direct investment or equity positions in local companies. In addition, rapidly growing countries with high investment rates can sustain large deficits for many years if the investments are effective in creating a growing export capacity which can generate the flows of foreign earnings needed to service a growing debt (see Moody's, 2001). All these countries have reduced their ratios.

— Fiscal deficit over GDP (FDGDP): this solvency indicator shows the public sector gap in terms of GDP and gives a raw idea of its intertemporal disequilibrium. Again, Argentina keeps going the downside, from a near budgetary equilibrium in 1994 to –3.1 per cent in 1999. This suggests that for a currency board regime to operate smoothly, strong fiscal discipline is required; and also that a large deficit could mean a loss of competitiveness, high domestic interest rates and crowding-out effects in consequence (see Section IV). Meanwhile, Chile ran a surplus until 1997, but has had slight deficits since then. Mexico has done better than in the past and had less than 1 per cent on average, though banking bailout costs (FOBAPROA) are not included.

II.3. Country Risk and GDP Growth: A Striking Procyclicality

One common feature of the countries under study is the remarkable inverse correlation between the GDP growth rate and the sovereign risk premia. In good times when output is growing, spreads (and interest rates) narrow; however, spreads skyrocket when output declines. This correlation might be exacerbated if, as Calvo and Reinhart (2000) argues, a procyclical interest rate policy reflects the so-called phenomenon of fear of floating. Indeed, in countries like Mexico, central banks do seem to intervene to prevent the exchange rate from further depreciation if an external shock was to hit their balance of payment equilibrium. But the same held for Argentina, with its currency board scheme. Figure 2 plots the GDP growth rates vis-à-vis the sovereign spreads[5].

Figure 2. **Output Growth and Sovereign Risk**



Note: RGDPIAGR_AR, RGDPIAGR_CL and RGDPIAGR_Mex are the interannual real GDP growth rates for Argentina, Chile and Mexico, respectively.

Accordingly, one would argue that spread fluctuations account for business cycles through their effect on the domestic-currency interest rates and their subsequent impact on consumption/investment decisions. In turn, as will be seen in Section III, changes in output growth expectations can alter the spreads as well.

It is possible to conclude from the evidence presented thus far that there exists a straightforward correlation between the indicators performance and the sovereign risk premia behaviour. In Section III we will return to this when we estimate spread functions.

III. SOVEREIGN SPREAD FUNCTIONS: DISENTANGLING THE DETERMINANTS OF COUNTRY RISK

This section looks into those components that characterise the sovereign-risk functions in Latin America, emphasising the role of intertemporal solvency and fundamental variables, which we decompose into permanent and transitory shocks. We will first survey earlier empirical evidence highlighting those contributions referred to as the Latin American case. Finally, we move on to carry out new econometric estimations and interpret the corresponding results.

III.1. Earlier Empirical Evidence on Sovereign Risk Functions: A Literature Review

Only a handful of research has run time-series or even pooled-data econometric models to find the determinants of the sovereign risk premia, either in a single country or in a cross-country framework. In this critical revision, models where the dependent variable is either the country credit rating or the implicit probability of default will be excluded on purpose because they are beyond the scope of this work (primarily referred to sovereign spreads). For evidence about that strand of the literature see Cantor and Packer (1996), Haque *et al.* (1998), Reisen and Von Maltzan (1999), or Kiguel and Lopetegui (1997), among others.

At the time-series level, one of the first landmark contributions was Edwards (1986) who carefully studied the determinants of the bank loan and bond spreads for a group of emerging countries. The article was written soon after the Mexican debt crisis in 1982-83, when the default/country risk literature was flourishing (see Eaton *et al*., 1987, for a survey). Setting the bank loan equations aside, Edwards (1986) estimated two equations: the first was a panel data regression spanning 1976-1980 based on primary markets-yields on the initial auction process; the second dealt with secondary market data but focused on the Mexican case (also comprising the default period). The most significant explanatory variables — with their respective sign — as suggested by his first estimation output were: *i)* the debt to GNP ratio (+); *ii)* the gross investment to GNP ratio (–); *iii)* the debt service to exports ratio (–, contrary to expectations); *iv)* the maturity (–) and a set of dummies reflecting the date of the issue. By contrast, the Mexican spreads were meaningfully fitted by: *i)* the debt to exports ratio (+); *ii)* the reserves to imports ratio (–); *iii)* the manufactures production growth rate (–); *iv)* the real effective exchange rate (+); *v)* the price of oil (+ but expecting –); and *vi)* the spread lagged one period. The US treasury bonds or bills (henceforth USTB) interest rate was captured through a time-specific effect in the pooled model, but it was not explicitly included in the Mexican equation.

A second and more exhaustive recent work by Eichengreen and Mody (1998), carries out a three-fold estimation procedure, depending on the chosen dependent variable: *i)* the probability of a bond issue (probit regression); *ii)* spreads level or differences; and *iii)* credit ratings. As already mentioned, only the second type is of interest to this paper. Using the same period (1991-95) although with a larger bond database, they split up the sample and ran regressions for several regions considering a different degree of aggregation (Asia + Latin America, Asia alone, etc.). In particular, they reported interesting results at the spreads level. They add a dummy to the Latin America's equation, for example for debt rescheduling (+), an amount control variable ("bond supply" dimension) (–), a credit rating residual (–, derived from the ratings equation) and the GDP growth rate (–), besides other dummies controlling for private or public placement, maturity and so on. Unlike other contributions (e.g. Min, 1998), the USTB rate (10 years) yields negative meaningful coefficients in all but the Latin American equation. Debt over GNP and debt service to exports ratios were always significant and with the proper signs (+).

At the country specific level, two kinds of work have been done. The first focused on the link of country risk to currency risk and/or USTB rates shocks — i.e. test of monetary policy independence (see Domowitz *et al.,* 1998; Frankel, 1999; Kamin and von Kleist, 1999; Frankel *et al*., 2000; Ahumada and Garegnani, 2000; Powell and Sturzenneger, 2000; Borensztein *et al.*, 2001). On the other hand, the second research line suggested a more comprehensive approach that generally entails those factors stressed in the first type of literature. Notwithstanding, there is still scarce evidence on comprehensive country-specific spread functions or even a comparison between the estimated idiosyncratic determinants.

Since the estimates for Mexico by Edwards (1986), the subsequent contributions on the "comprehensive" approach are attributed to Aronovich (1999) who included the Argentine, Brazilian and Mexican cases; or Wong (2000) and Jostova (2001)[6] who framed a multi-Latin American country analysis; and Nogues and Grandes (2001), who focused on the Argentine case. This vein of the literature has drawn heavily on secondary-market data.

Aronovich (1999) took daily data running from June 1997 to September 1998 for Argentina, Brazil and Mexico, in order to assess the response of sovereign spreads variations to a three first-difference variable set (allowing lagged values): the implicit probability of default (circumventing simultaneity problems), the USTB 30 years rate and the spread between the last and a 6-months maturity USTB (term-structure effect). He found positive current-spreads overreaction in respect to USTB 30 years yields, significant positive default probability coefficients and irrelevant term-structure effects. Besides colinearity problems that come up when lagging the same variable, it is not clear why the USTB 30 years lags could have any effect on current spreads if markets are expected to be efficient. Another problem is the likely existence of an ARCH structure in the residual component not explicitly treated, given the frequency of the data adopted by the author. Finally, the sample size excludes an important precedent period (Mexican crisis) and his model does not control for other solvency/liquidity variables, or for contagion effects. On the other hand, the study by Nogues and Grandes (2001) concentrated on the 1994-98 Argentine case. A negative effect of the USTB 30 years on the spreads was found and other solvency or contagion variables were significant as well (fiscal deficit (–), debt service to exports ratio (+), political noise (+)). In any event, endogeneity problems remained.

III.2. Econometric Implementation

Assuming that *i)* lenders are risk neutral; *ii)* a zero recovery rate in case of default; and *iii)* a logistic probability distribution, the rate of return rate on an emerging-market sovereign bond can be written as follows (see Edwards, 1986 or Nogues and Grandes, 2001):

$$\text{Log } \phi = \log(1+ r^*) + \sum_{i=1}^{n} \beta_i X_i \qquad (1)$$

Equation (1) establishes a log-linear functional form that links the log of the sovereign spreads (ϕ) to the log of the risk-free rate (r*) and the level of the other spread determinants (X_i). When possible, these X_i variables will also be taken in logs in order to get elasticities from the estimations and make the analysis more intuitive. The next sub-section discusses the empirical aspects of the variables generally chosen as explanatory of the sovereign risk premia.

III.3. New Latin American Estimates

According to (1), we carry out new estimations to shed light on the first question this paper aims at answering. Based upon Argentine, Chilean[7] and Mexican monthly spreads data over 1994-2000 — extracted from the JP Morgan EMBI + Bradies index — we regressed long-run structural equations for each country (see methodology below).

The econometric estimations look appealing for many different reasons. Firstly, they serve to check what Section II's stylised facts had already shown in terms of the solvency/fundamentals story. Indeed, the estimates are intended to highlight that sound intertemporal solvency variables driven by healthy fundamentals can make the difference in bringing spreads down. In that sense, permanent components are expected to have a stronger effect than cyclical fluctuations. Secondly, as Chile had always been an out-of-the-sample country in the previous literature, this work is intended to perform, to our knowledge, its first ever-estimated country-risk function. Lastly, it also offers estimates for the spread responsiveness to the US rates [Federal (FED) Funds and USTB 30 years].

In order to make our econometric approach operational, we chose a group of variables connected with those factors implicitly involved in equation (1), namely: *i)* domestic production; *ii)* competitiveness effect (through current account to GDP ratio or terms of trade indexes)[8]; *iii)* fiscal deficits; and *iv)* foreign interest rate shocks. Besides this fundamentals variable set and the US interest rates, we included other controls accounting for contagion effects or volatility. The full explanatory variables set for each country j, together with their expected signs, are the following:

Fundamentals/Solvency Variables

— *Seasonally-adjusted production index* (–): an improvement in the expected output growth rate may bolster a better outlook for intertemporal solvency; as current spreads level affect investment/consumption decisions, hence present GDP, contemporaneous variables were omitted to avoid simultaneity problems (first differences and lagged level values were considered)[9]; diverse global or industrial sector indexes were employed as a proxy of GDP (log(EMISA), log(IMACECSA) and log(IAGLOBSA) for Argentina, Chile and Mexico, respectively).

— *Current account to GDP ratio* (CCGDP_j (–/+)): a larger deficit may have some negative effect on intertemporal solvency perceptions as long as it is not expected to be a transitory shock. As the current account is the counterpart of the net external liabilities accumulation, a deficit increase might signal future financing trouble inasmuch as the debt build-up is not associated with more direct investment. If the last is mainly addressed toward traded goods production that allows a future reversal (in this case we would expect a positive sign). Furthermore, in economies pegging the exchange rate, an increasing deficit might suggest a weakened competitiveness (real effective exchange rate appreciation) that could set the stage for a currency crisis, if that deficit is not perceived as sustainable. Thus, we disregarded the real exchange rate to avoid eventual colinearity problems.

— *Three-month (seasonally-adjusted) accumulated fiscal deficit (surplus)* (FISC3MSA_j (–/+)): the extent to which the fiscal deficit brings about an increasing and unsustainable public debt path might imply that investors call for a higher risk premia to make up for the higher default probability. Although we assume that investors look at quarterly figures, we also try with a one-year accumulated estimate[10].

— *Terms of trade variation* (log (TI_j) (–)): the deterioration of the relative price of exports with respect to imports is often seen as a vulnerability indicator, even more so when such deterioration becomes permanent or not fully reversible. This seems to be the case in those countries predominantly exporting primary goods (hence price takers in the world markets)[11].

Permanent or Transitory Effects?

According to our preceding discussion, it becomes clear that a permanent change in a fundamental variable should bring about a higher response in sovereign spreads given that it modifies “for ever” the intertemporal profile of the debt repayment possibilities. Either a permanent increase in fiscal deficits, a deterioration of the terms of trade or a lower real output or exports growth can, *ceteris paribus*, compromise the solvency path of the economy pushing up the perceived default likelihood and therefore the implied spread.

Using the Hoddrik-Prescott filter, each solvency or fundamental indicator variable (GDP growth, fiscal deficit, and terms of trade) was split into permanent and transitory components, calculating the cyclical variation as the percentage change of the last respect to the trend filtered value.

Control Variables (Volatility, Contagion, External Shocks)

— *FED Funds rate* (log (FEDFRATE) (+)): to measure the impact of the US monetary policy on the emerging market bond yields. A tight move in US monetary policy can push spreads up if, other things being equal, higher interest rates imply a decline in expected domestic investment and consumption, or a gloomy export outlook in view of a US slowdown. On the financial side, it could get things complicate matters in terms of the international capital market access. In consequence, a higher risk premia would be needed to compensate investors for a deteriorated solvency profile.

— *USTB 30* years *yield* (log (USTB 30 years)): tests the "portfolio substitution" (+) or flight to quality and other wealth effects associated (–). Through a substitution effect, it is expected that increases in the 30 years bond interest rate make the investment in these bonds more attractive, so that the supply of loanable funds for emerging countries would diminish and, therefore, the country risk would increase. On the other hand, in periods of extreme crises — which is a frequent observation over the period under analysis — the flight-to-quality effect seems to prevail. A more risk-averse behaviour can push US bond rates down (excess demand of USTB) 30 years and increase country risk of emerging markets. Hence, the expected sign of this variable is ambiguous.

— *Contagion variable* (log (EMBI_Nonlat) (+)): does Argentina get a cold when Russia sneezes? To answer this question, the non-Latin American EMBI + index was performed in order to discover how other emerging markets have impinged on the Latin American spreads.

— *Spread volatility lagged one month* (log (varembi_j): this is the intramonthly spread variance. A highly volatile market during the most recent trading days might create further uncertainty that can in turn push spreads up even more;

— Dummy variables: *Tequila,* which adopts a value equal to one in 1994/12-1995/5 and zero otherwise, attempts to capture a structural shift in the sovereign spread functions subsequent to the Mexican crisis. The Russian default is already captured by the contagion variable Log (EMBI_Nonlat). Another variable, Brazil, with a value equal to one in 1999/1-1999/2 and zero otherwise is catching the overshooting effect of the Brazilian devaluation on bond markets.

Once the variable set was determined, OLS equations were estimated following a specific to general methodology allowing for lagged values and/or first differences in the explanatory variables. The inverse was not done because parsimony would have been compromised. We argue that investors do not only look at levels but also at variations, particularly when these imply large swings[12]. Pesaran *et al.* (1999) long-term relationships were tested to ensure that structural equations were correctly specified, irrespective of the integration order of the variables (Appendix E). Complementary tests — checking the absence of autocorrelation, heteroskedasticity, and instability — were carried out in each stage of the estimations though only the last results are displayed (Appendix F). Restricted models in Table III.1 show the definite significant variables. All variables are in logs unless the contrary is indicated.

Table III.1

Variable	Argentina (T=76)	Chile (T=43)	Mexico (T=78)
FED Funds rate	0.18	-0.23	-0.03
USTB 30 years	-0.69***	-0.81	-0.62*
Permanent GDP	-11.351** 1st diff.T-2	-42.21 1st diff.T-1	-10.54*** 1st diff T-1
GDP cyclical deviation	-2.32***	-4.97***	-0.80
Permanent fiscal deficit	-0.053*** 1st diff.	0.001	2.02*** Public debt over GDP growth rate
Fiscal deficit cyclical deviation	-0.000183***	-0.02**	-8.08E-07
Permanent terms of trade	32.6***	-1.83	-105.57*** 1st diff. T-3
Terms of trade cyclical deviations	-0.102	0.23	-1.48*
CCGDP	-97*** 1st diff	-2.79***	146***
Recent volatility	0.11***	--------	-0.007
Contagion (EMBI_NonLat)	0.37*** 1st diff	0.49***	0.79***
Tequila	0.28***	--------	0.055
Brazil	0.024	0.19*	0.047
Constant	-145.17***	12.93	3.03***
R-squared	0.92	0.94	0.95
Adjusted R squared	0.90	0.92	0.93
Prob. (F-statistic)	0.00	0.00	0.00
Durbin-Watson stat	1.78	1.98	1.90 Residuals MA(1)

Note: The variables are expressed in logs, except for fiscal deficits and current account to GDP ratios. The coefficients are significant at the 1 per cent level when denoted with ***, * * (5 per cent level) or * (10 per cent level). Otherwise, they are non-significant at the individual level. 1st diff mean first difference which in logs becomes the growth rate. Dashed lines represent omitted or not available variables.

What do the Regression Results Suggest?

On the whole, the regressions give satisfactory results both at the individual and global level according to the significance tests. We did not find problems of serial correlation, heteroskedasticity or instability through the diagnostic tests performed (Appendix F)[13]. Overall, the results in Table III.1 confirm the higher and more meaningful responses of the fundamental permanent components on sovereign risk. Therefore, these results would suggest that there is scope for getting a lower spread, contagion or volatility aside, since healthy fundamentals and “good” policies targeting them.

One relevant caveat is in order when interpreting the results. For those independent variables X expressed other than logs, the estimated coefficients should be read as semielasticities. Put differently, the latter refers to the percentage change in the dependent variable when relatively small absolute changes in the independent occur. How small should this change be? Basically our non-linear functional relations are of an exponential-type, so that the linear approximation is just as good since we are in the neighbourhood of X before it moves up/down. When country j grows at 4.1 instead of 4 per cent, the approximation will be fairly reasonable irrespective of the sovereign risk values. However, growing at 5 instead of 4 per cent can make things different depending on the spread of country j.

Estimates Yielded by OLS-Pesaran Equations

Permanent production levels and/or their growth rates are very significant in all cases but Chile, with the expected negative sign. Argentina's and Mexico's equations display meaningful coefficients in first differences, suggesting somehow that spread responses to a permanent output shock have been more important in these countries. For instance, for each additional 1 per cent point (+0.01) in the Argentine industrial or Mexican global production index *growth rate*, sovereign risk falls nearly 11.3 and 10.5 per cent respectively, the higher the depart spread level. As for the cyclical deviation from the trend — i.e. a rate of variation around the permanent value — only Mexico's estimates turn out insignificant. The cyclical effects are nevertheless lower, –4.97 and –2.32 per cent of spread reduction for a 1 per cent (0.01) increase in cyclical fluctuations in Chile, and Argentina, respectively. Again, the higher the initial risk premia, the bigger the gains are obtained. These results confirm once again the "procyclicality" hypothesis raised in Section II but suggest that huge changes in spreads can stem mostly from permanent output changes.

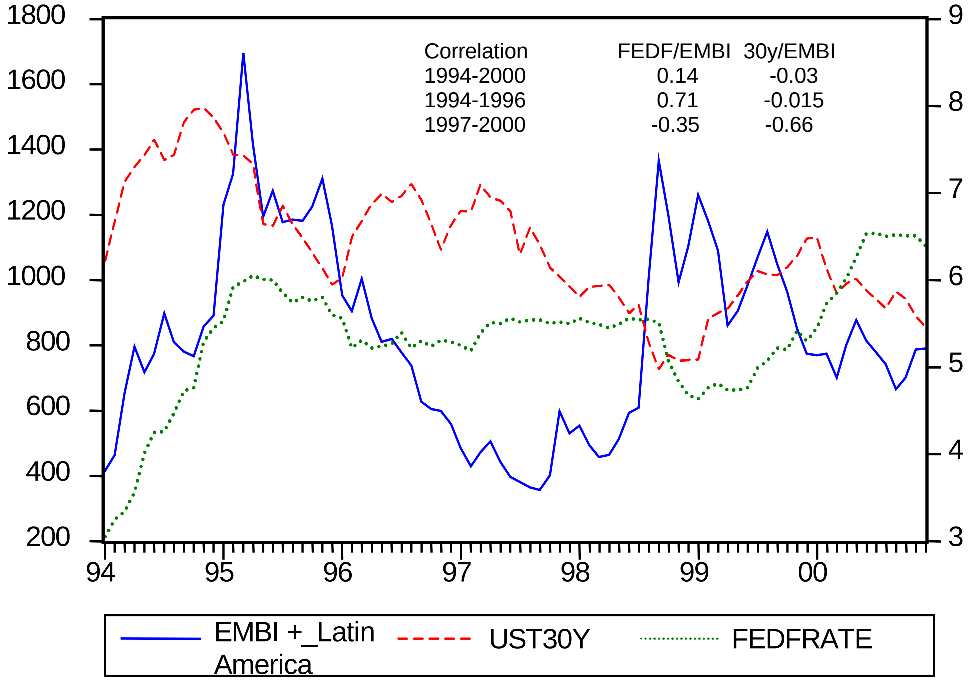
The current account to GDP ratio is very significant for all countries. For Argentina and Chile, the expected negative sign is found, both countries expressed in 1st differences, though a positive one, in levels, is obtained for Mexico. When a small change in the CCGDP variation occurs, say a 0.1 per cent relative to GDP increase in the change of the current account deficit –0.001 in absolute values, monthly spreads come down 9.7 and 0.31 per cent in the Argentine and Chilean cases, respectively. Real effective exchange rate disequilibrium and the resulting loss in competitiveness may explain that imbalance. The "wrong" sign in Mexico's equation might be due to the close positive link between the current account deficit and the foreign direct investment observed during the post-crisis period (spreads come down 14.6 per cent when CCGDP level becomes less negative by 0.001 or 0.1 per cent of GDP, a non negligible effect). If current account deficits are financed by more productive, long-run oriented foreign investment, this can be seen as a sign of a strengthened future ability to meet outstanding obligations.

Public sector accounts enter significantly into almost all the equations, either in permanent or cyclical magnitudes. Permanent fiscal deficit components are very significant in all but Chile (little variability in fiscal deficits). That means larger monthly variations of three-month accumulated fiscal deficits, e.g. from –\$10 million to –\$20 million, increase sovereign spreads 53 per cent in the Argentine equation. As for the Mexican regression, we took the public debt to GDP rate of growth as a proxy for permanent fiscal deficit fluctuations[14]. Here, a more rapid pace of decrease of public debt to GDP ratio, e.g. from 1 to 5 per cent of GDP, yields a 10 per cent fall in risk premia. Cyclical deficit estimates turn out significant in all but Mexico, especially for Chile. In conclusion, being permanently in the red matters even more in Argentina, and consequently has a larger impact on sovereign spreads. If this is put together with the current account to GDP ratio effect, it turns out that building up excessive net foreign liabilities produced a perverse outcome to the Argentine risk premia. Section IV will come back to this crucial issue.

The terms of trade effect are meaningful in all but the Chilean case[15], with the wrong sign in the Argentine equation. The estimated permanent coefficients say that a 1 absolute point increase in the respective Mexican growth rate, lagged three months, reduces current sovereign spreads 10.5 per cent points. A faster positive change in the cyclical terms of trade also contributes significantly in bringing spreads down, but only in the Mexican case.

US interest rates shocks deserve some notice. The FED Funds effect seems not to have been critical, but by means of the subsequent term-structure pass-through. Indeed, the USTB 30 years yield leaves relevant results for Argentina and Mexico, with a negative sign (1 per cent increase in USTB 30 years causes a –0.69 and –0.62 per cent cut in both spreads, respectively). Some clarifications can be useful at this point. First of all, it is worth noting that both rates have been modestly correlated over the period under study (linear coefficient –0.23) so colinearity problems might be disregarded. In this respect, a strong positive correlation between the EMBI_LAT and the FEDFRATE in 1994-96 is observed, but weak and negative since then, as well as a weak association between the EMBI_LAT and USTB 30 years over the first sub-sample but strong and negative over the last four years (Figure 3 below). Furthermore, the non-significance of the USTB 30 years (or FEDFRATE) in the respective cases may be due to some linear correlation with respect to the contagion variable EMBI_NONLAT, which would be capturing in consequence a two-folded effect. Second, USTB 30 years negative coefficients confirm previous findings in Eichengreen and Mody (1998), Kamin (1999) or Nogues and Grandes (2001). Flight to quality and reduced access to the international capital markets seem to prevail[16].

Figure 3. **US Interest Rates and the Latin American EMBI Index**



Note: USTB 30Y and FEDFRATE stand for the 30 years United States Treasury Bond and Federal Funds Rate.

Last but not least, contagion effects also matter. This includes Chile, which even holding the investment grade status, has been somehow hit by the subsequent Asian and Russian crises[17]. All in all, Argentina and Mexico's equation shows the highest response to contagion, the first in growth rates, Chile remains the lowest, as expected. Lagged spread volatility is also highly significant — excluding Mexico — and the corresponding regressors have the expected positive sign. The Tequila dummy turns out relevant only for Argentina.

IV. THE ECONOMICS OF VICIOUS VERSUS VIRTUOUS CIRCLES: WHEN PUBLIC SECTOR LOSES ITS GRIP

The rest of this paper is devoted to answering our second question: How can a relatively high and volatile spread be the cause of unsustainable public debt accumulation? In this setting we emphasise the "destructive" power of having a "far above the ground" sovereign risk premia hand in hand with inconsistent fiscal behaviour. A prolonged recession together with a heavy debt-service burden in the context of a very hard currency regime could produce a time bomb for repayment possibilities (Argentina has recently defaulted on its external public debt). Persistent high spreads can make matters even worse.

We proceed as follows. First, we present a brief theoretical framework. Second, details about the econometric methodology are given[18]. Finally we offer a discussion of the results and policy implications. The Mexican case will also be considered as a benchmark to contrast the Argentine experience.

IV.1. Government Budget Constraint and Debt Dynamics

From the government budget constraint we have the following identity:

$$R^* B^* e + R B = (T-G) + (T^*-G^*) e + dM/P + dB + dB^* e \qquad (2)$$

where:

— R and R* are the domestic (peso) and foreign-currency nominal interest rates respectively[19];

— B and B* represent the outstanding external public debt (e.g. bonds held by non-residents) issued in local and foreign currency, respectively;

— T and T* are tax revenues on tradable and non-tradable goods and services, respectively;

— G and G* compute the non-interest public spending in the tradable and non-tradable goods;

— M/P are the real cash balances held by the households and firms;

— e is the nominal exchange rate;

— and dX means the change in X between period t and t–1.

In other words (2) sketches how the government finances the interest payments bill on the outstanding debt to regularly meet its obligations, converted into local currency amounts. That means a three-fold financing source: generating primary surplus, raising seignoreage (inflationary tax) or rolling over the debt by issuing new bonds. A stationary state would mean dB=dB*=0, hence if seignoreage revenues are negligible — as the case of Argentina proves, its inflation rate being near zero — the bulk of the interest bill would be cancelled out by the primary budgetary surplus. However, when the last case does not apply, dB>0 dB*>0. Rearranging terms in (2) and expressing the variables in terms of GDP, a dynamic equation results straightforward (see Buiter, 1985 or Reisen, 1989):

$$D_t = D_{t-1} ((1-f) R + f (R^* + e) - \lambda) - ((T-G) + (T^*-G^*) e) - (\pi + \lambda) m \qquad (3)$$

being D the external public debt to GDP ratio; f the share of the foreign currency-denominated public debt over the total; λ the GDP growth rate between T–1 and T, (T–G) + (T*–G*) e the primary fiscal surplus in GDP terms, m the money base over GDP and π the inflation rate.

As was argued above, in a zero or even negative inflation regime like the Argentine one, the last term (right hand side) of (3) becomes irrelevant[20]. Furthermore, almost 95 per cent of the external public debt stock are other than peso-denominated (Grandes, 2001), what turns f near one. Rearranging terms, the dynamics of the debt to GDP ratio turns out:

$$D_t = D_{t-1} (R^* + e - \lambda) - ((T-G) + (T^*-G^*) e) \qquad (4)$$

As long as the output growth or an increasing primary surplus — as a GDP percentage — do not make up for interest payments or contingent devaluation effects which may bring about an additional rise in D_t, the public debt will be growing at a higher rate than the GDP. This could signal a solvency problem. The larger the solvency problem, the riskier the country (ratings below the investment grade) and the more fiscal-procyclical a country is, hence the more likely the chance is of being rationed (binding the rollover).

A key factor of (4) is the interest rate component R*, which stands for the yield on foreign currency — denominated government bonds or simply the foreign borrowing cost. R* can be further decomposed into a risk-free rate (US Treasury bills of the same maturity, henceforth USTB) plus a sovereign risk premium. The last component has played a significant role in emerging economies which liberalised their capital account, concerning the nature and volatility of the business cycles (see Avila, 1998; Rodriguez, 1999; Berg and Borenzstein, 2000; Arora and Cerisola, 2000; Nogues and Grandes, 2001; among others). Assuming that devaluation expectation could be captured by the risk premium (ϕ) and e=1[21]:

$$D_t = D_{t-1} (USTB_t + \phi - \lambda) - ((T-G) + (T^*-G^*)) \qquad (5)$$

IV.2. Econometric Structure

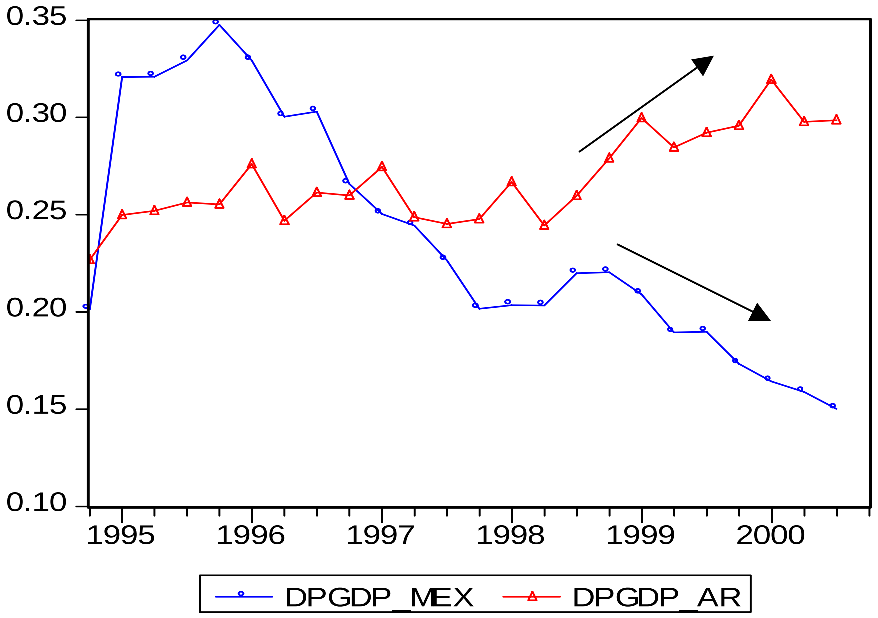
Although the former equations are identities, it would be perfectly reasonable to uncover what the *ex ante* relationships might be and proceed on to verify if the data shows any consistency.

In this way, it is quite simple to demonstrate how the relevant variables may be related to each other. Firstly, lower output growth causes lower expected primary surplus that in turn makes the risk premia go up. But a higher risk premia induces a drop in expected output growth, this drops investment and consumption plans, which triggers lower expected tax levies (signalling weaknesses) and further increases the sovereign spreads. In consequence, the interest bill becomes unbalanced and $D_t/\ D_{t-1}$ starts moving upward, leading to a worsening solvency scenario that can bring about successive risk premia upward adjustments to make up for this, etc. The USTB rate can be considered the only true exogenous variable.

Hence, there should exist a long-run equilibrium whereby a stable D_t would be linked to given "equilibrium" values of $USTB_t$, ϕ , λ and the primary surplus (or its excess over the interest outlay). Likewise, if a shock on one of these variables results in a deviation from the long-run trend, the equilibrium path should be restored in a time depending on the convergence speed. Nevertheless, it may well fail in going the way back to the equilibrium driving D_t to an unsustainable path.

Table II.2 had already shown the existence of an upward (downward) trend of the total external debt to GDP ratio in Argentina (Mexico) during the second half of the last decade. The same holds for the public sector (Figure 4). Does this imply an intertemporal disequilibrium pattern? Is there a divergent or unstable public debt path mainly driven by the country risk premia? How does it compare to the Mexican case? In order to account for the Argentine/Mexican debt dynamics, an econometric exercise based on vector error correction models (henceforth VECM) is proposed. This methodology allows testing if a long-run relationship, as the one pointed out, exists, and provides estimates of the short-run dynamics when a shock in one of the endogenous variables occurs[22].

Figure 4. **Quarterly External Public Sector Debt to GDP Ratio (Argentina and Mexico)**



VECM Estimates: Uncovering the "Achilles" Heel

In order to perform the VECM specification and estimation, several steps were followed (see Appendix B). Summing up, the VECM specification went as follows:

$$\Delta \text{Log}(X)_t = B_i\, EC_{i,t-1} + A_j\, \Delta \log(X_{t-j}) + Z_t + e_t \qquad (6)$$

where:

— j is the optimum lags number for endogenous variables X (dpgdp_h, embi_h, fisc1ycgdp_h, emisa_ar or iaglobsa_mex, with h= AR, MEX), i=1…3 the number of cointegrating vectors found by means of the Johansen test;

— B_i is the adjustment speed coefficient matrix respect to the deviation to each of the three long-run relationships or cointegrating vectors $EC_{i,t-1}$;

— A_j represents the parameter matrix corresponding to the lagged endogenous variables;

— Z_t are the control variables mentioned above (FEDFRATE, RUSSIA, ASIA);

— and e_t are random shocks or structural forecast error terms.

As the reader will recall, the fundamental purpose of these kinds of models is to assess the variables dynamics once a shock to one of the endogenous takes place and spreads over the remaining variables in the subsequent periods. On the other side, the individual significance turns out fairly irrelevant (Enders, 1995)[23]. The VECM analysis focuses on the response of those variables to a deviation from its stable long-run trend, which in turn makes all the system move toward the new "equilibrium" path after the adjustment took place. The extent of the shock impact is measured by the impulse response functions.

For our purpose, it is particularly interesting to assess how the external public debt to GDP ratio (DPGDP_AR and DPGDP_MEX) evolves given a positive shock to the sovereign risk premia (increase in EMBI_AR, EMBI_MEX) or to the one-year accumulated fiscal deficit (FISC1YCGDP_AR, FISC1YCGDP_MEX less negative). Additionally it is interesting to look at how the risk premia reacts to a self-induced shock and an augmenting budgetary deficit. An underlying assumption suggests the existence of an "autonomous" high country risk premia, supported by the weaker solvency performance of the Argentine economy (compared to other Latin American countries, as was demonstrated in Section II). That spread would be triggering an unstable time path of growing public debt, unsustainable deficits and low output growth[24].

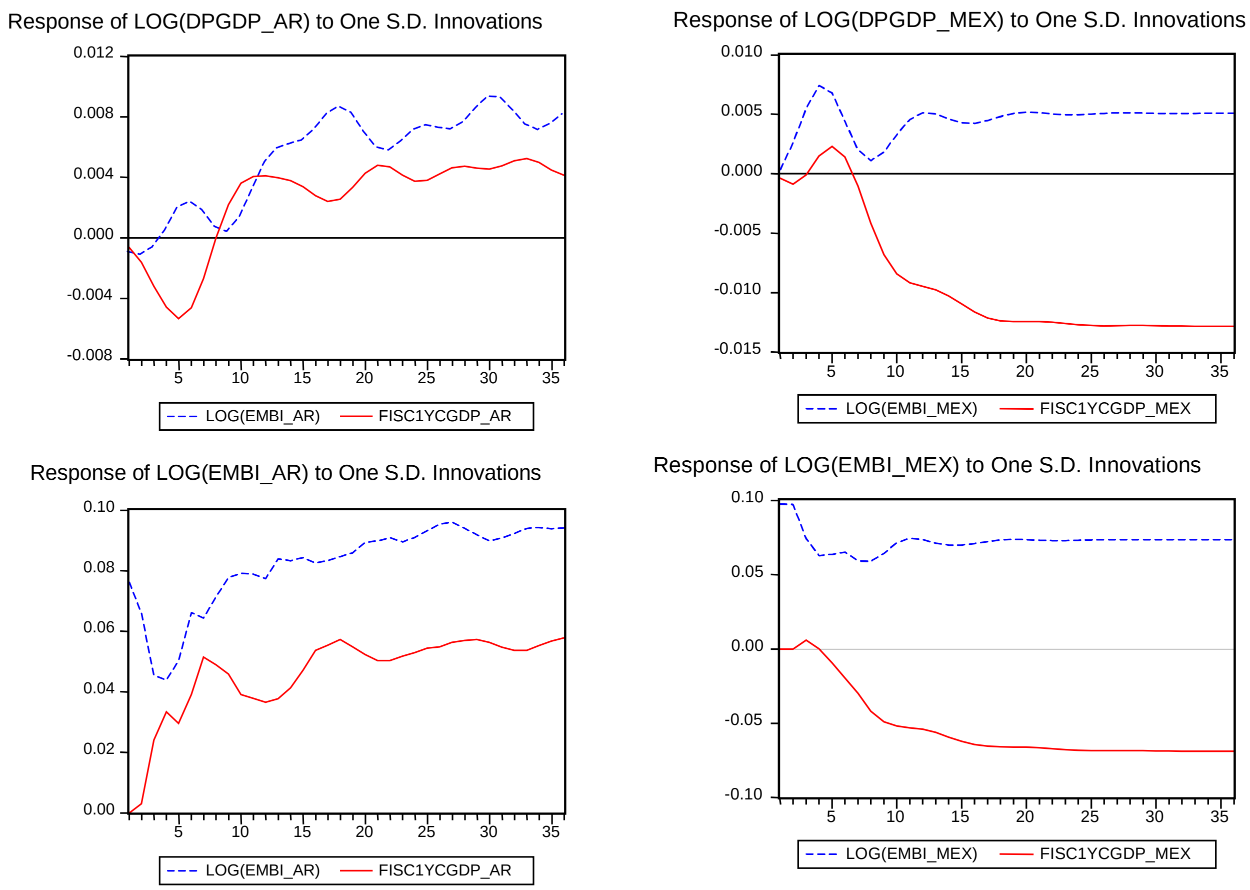
Figure 5 below displays the impulse response functions of both DPGDP_AR and EMBI_AR (DPGDP_MEX and EMBI_MEX) in log terms, over a 36-months forward horizon, when innovations to EMBI_AR and FISC1YCGDP_AR (EMBI_MEX, FISC1YCGDP_MEX) are allowed. To compute the impulse response functions, it is necessary to identify canonical shocks from the structural ones ($\mathbf{e_t}$ above). The *Choleski decomposition* is a standard way of doing so. For this to be achieved, it is necessary to assume that some variables are not contemporaneously correlated to each other, in the econometric jargon "an ordering" is required. Ranging from the most to the less “exogenous” variable — meaning they are not contemporaneously affected by a shock to any/some of the other variables — the suggested ordering was, respectively:

EMBI_AR → EMISA_AR → FISC1YCDGDP_AR → DPGDP_AR

EMBI_MEX → IAGLOBSA_MEX → FISC1YCGDP_MEX → DPGDP_MEX

Indeed, as long as the structural error correlations were not large (as a rule of thumb, it is proposed +–0.20), there would not be any reason to expect fairly dissimilar patterns in the impulse response functions. This is in fact corroborated in appendix D (Tables A3). Changing the ordering of EMISA_AR with respect to FISC1YCGDP_AR and EMBI_AR (the same holds for Mexico), has not lead to different results from those obtained in Figure 5[25].

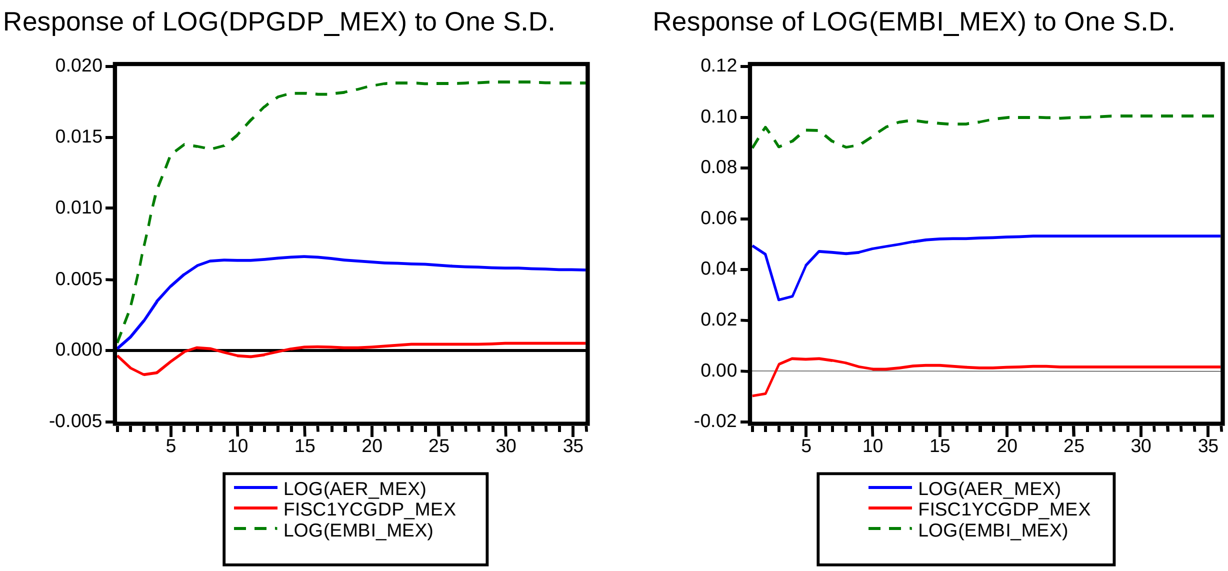
Figure 5. **Impulse Response Functions of Public Debt to GDP Ratios and EMBI + Indexes Given a Shock to Fiscal Deficits and EMBI + Spreads**



Both the public debt ratio and the sovereign spreads show a clear-cut upward slope in the Argentine case, except for the second during the first five months. That could be due to the different sign of the speed adjustment coefficients in the DPGDP_AR equation. Intuitively, that FISC1YCGDP_AR diminishes is partly because, *ceteris paribus*, the primary surplus is increasingly offsetting the interest payments. In consequence, the public debt ratio starts falling, but not for long. As the risk premia goes up, output growth slows down and higher future deficits are to be expected, what again drives the debt ratio. In other words, lower output means lower tax collection but also higher risk premia if solvency is compromised. This, in turn, puts further upward pressure on the public debt ratio, so the vicious circle gets under way.

On the other hand, the Mexican functions display an asymmetric behaviour, featured by lower and less volatile responses together with faster and convergent paths. It is worth noting *i)* the permanent reduction in the public debt to GDP ratio due to a decreasing fiscal deficit (higher primary surplus); *ii)* the non-explosive link between public debt and sovereign risk (the variable time paths reach a steady state sooner and at lower levels). Unlike the Argentine debt dynamics, Mexico's case supports the rationale that another circle — a virtuous one — is possible: sustainable growth, decreasing and stabilised fiscal deficits, lower risk premia and diminishing public debt ratios[26]. Moreover, letting the nominal exchange rate be an endogenous variable according to (4) does not substantially alter the former findings. After re-estimating the model allowing for this variable, we simulated a one-standard deviation shock to the same variables and the exchange rate (AER_MEX). Although equivalent shocks to fiscal deficits (in GDP per cent) have this time a neutral effect — with rapidly converging paths — on the debt ratio and EMBI+ spreads, innovations to EMBI+ and the nominal exchange rate push those variables up in the same way as the previous model which assumed a fixed exchange rate (Figure 6).

Figure 6. Impulse Response Functions of Mexican Public Debt to GDP Ratios and EMBI + Indexes Given a Shock to Fiscal Deficits, Nominal Exchange Rate and EMBI + Spreads



In any case, the Figures clearly show the "destructive" power of extremely high risk premia. This takes the analysis back to the sovereign risk literature (e.g. Eaton *et al*., 1987; Calvo, 1988; Cohen and Sachs, 1985). Indeed a high risk premia, high default probability equilibrium might fit the Argentine economy. The lack of credibility and intertemporal inconsistent policies within the framework of a hard currency peg may have been at the root of the problem. A very interesting question deals with the chance that a flex can do a better job by bringing the economy back to a sustainable path. Unfortunately, the issue exceeds the scope of this paper. Mexico's experience hints that it may have coped with that in order to bring deficits down, setting the economy on a more sustainable path.

V. CONCLUSIONS

The present paper aimed at tackling two questions: *i)* to what extent do permanent or transitory changes in fundamentals affect sovereign risk perception, i.e. default risk, once contagion is controlled for? *ii)* how can a relatively high and volatile spread be the cause of unsustainable public debt accumulation? With these questions in mind, we first introduced fresh empirical evidence about fundamentals/solvency indicators, and secondly we performed two econometric exercises to gauge spreads performance and its link to debt dynamics.

While the earlier literature was focused mainly on pooled data approaches or regional/country-specific estimations predominantly targeted to uncover the effects of US monetary policy or the incidence of currency risk, we offered a more comprehensive study concerning the four Latin market movers. One salient feature of our econometric modelling refers to a larger span (1994-2000) across various financial crisis episodes, a breakdown between permanent and transitory effects from fundamental variables and a special emphasis on a comparative perspective based upon polarised experiences. The other feature, the VECM estimates, provided a first-hand public debt dynamics analysis of Argentina and Mexico — two fairly contrasting experiences. To our knowledge, there are no previous contributions addressing this issue in the same manner as this paper. What are our key findings?

First, even as fundamental/solvency variables matter, especially their permanent component, contagion also contributes to explain spreads variation. Even Chile, an investment grade country, suffers from contagion effects though the spreads show a less volatile and more gentle tendency than the other countries' responses. Moreover, the econometric estimates corroborate the striking procyclicality between spreads and GDP pointed out in Section II. When things go wrong, spreads widen, and vice-versa. This finding points to the weak monetary independence claimed by those countries with more flexible exchange-rate arrangements ("fear of floating" phenomenon).

On the external shock side, the estimates confirm previous findings implying a negative response of the sovereign risk faced to a USTB 30 years positive shock (Eichengreen and Mody, 1998; Kamin and von Kleist, 1999). This result is strengthened by the predominance of flight to quality events or a more risk-averse behaviour in the emerging bond market. FED Funds rate variation did not prove to be relevant.

As Section II clearly demonstrated, Argentina and Mexico's experiences reflect two extremely opposite solvency stories throughout the post-Tequila period. The weights (and signs) that fiscal and current account deficits have in their respective sovereign risk functions give some preliminary evidence in this regard. Simulations of debt dynamics confirm this. When shocking fiscal deficits and sovereign spreads, our VECM estimations show a less convergent path in the Argentine episode relative to the Mexican one, suggesting that non-sustainable deficit (increasing interest burden) coupled with insufficient economic growth and an excessive risk premia make up an explosive device.

The Mexican case provides a benchmark for policy-making oriented analysis. Better long-term prospects for Mexico are backed by strong fundamentals, less contagion since the Russian default as well as an outstanding export growth mainly driven by the US engine, which allowed a substantial improvement in its solvency profile. Furthermore, current account deficits are not troublesome given the FDI counterpart which finances it, and public sector accounts are more or less back on track (despite the banking bailout costs). As a result, the assignment of the investment grade rating has validated what markets had already priced in. This is not trivial: once a country achieves this notch, more finance along with lower yields is available because the country’s debt enters a “senior” class of portfolios, otherwise restricted to long positions in speculative grades. OECD membership helped a great deal with capital costs (lower minimum requirements according to Basle regulations). Summing up, an aggressive liberalisation of the economy, together with the NAFTA agreement, a less terms of trade dependent export profile, a high and steady output growth driven by a very dynamic exporting sector (though US dependent) and sound macroeconomic management (banking bailout aside) have all contributed to form the basis of the rather successful Mexican story.

Where capital markets are far from being perfect and investors remain increasingly risk-averse and reluctant to place their wealth in emerging economies after a sequence of endless financial crises, risk-premia will remain high if nothing is done at the domestic level. The different Latin American country experiences demonstrate there is some room for manoeuvre. Accordingly the paper’s findings make the case for a solvency-oriented policy framework. Such a framework should not omit GDP growth-oriented policies together with export-oriented strategies (regional integration can bolster this move), FDI promotion (especially towards the tradable goods production), better debt management and sustainable fiscal deficits as well as capital flow stabilisation.

APPENDIX

Data Sources

All data was taken on monthly basis. Exceptions are the current account, some terms of trade index (AR, BR), public debt stocks (AR, MEX) and the GDP (constant and current prices) which were converted from a quarterly basis using a cubic spline algorithm provided by Eviews.

The EMBI + indexes (AR, BR, MEX, Latin and non-Latin) come from JP Morgan, USTB rates from Yahoo-Finance quotes and the FED Funds rate as well as the nominal/real exchanges rates or inflation rates from IMF Financial Statistics.

Other Country Data

— **Argentina**: external debt stocks [total and non-financial public sector (central government)], external debt services, fiscal deficit, current account, exports and imports of goods and services, EMISA (seasonally adjusted industrial manufactures index), current and real GDP (base year 1993) and terms of trade index, from the Ministry of Economy. The international reserves minus gold figures, from IMF Financial Statistics.

— **Chile**: external debt stock (total), the current account, exports and imports of goods and services, current and real GDP (base year 1986) and IMACEC (Global Activity Index) from the central bank. Public sector balance (includes national companies) is from DIPRES (budget planning office). The external debt service was obtained from the OECD-WB-BIS-IMF joint database. International reserves minus gold, and the terms of trade (cooper/oil price) from the IMF Financial Statistics.

— **Mexico**: the external debt stock (total and public), external debt services, and public sector balance (including privatisation revenues, not so relevant for the period under study[27]) from Secretaria de Hacienda (budget planning office). The current account, exports and imports of goods and services, terms of trade, current and real GDP (base year 1993) and IAGLOBAL (Global Activity Index) from INEGI (Instituto Nacional de Estadistica, Geografia e Informatica). International Reserves minus gold and fiscal deficit without privatisation revenues, from the IMF Financial Statistics.

A) ADF Tests: Adjusted Sample Method

ADF equation: $\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{j=1}^{n} \Delta Y_{t-1} + \varepsilon_t$ (A1)

H_0: $\gamma = 0$

Table A1. **ADF Test**

Variable	Optimal lags	H_0: $\gamma = 0$; τ value	Critical Value 5%
EMISA_AR	1	-1.36	-2.91
IAGLOBSA_MEX	3	-2.22	-3.46
EMBI_MEX	1	-2.36	-2.91
EMBI_AR	1	-2.55	-2.91
DPGDP_MEX	12	-1.37	-2.89
DPGDP_AR	12	-0.15	-2.91
FISC1YCGDP_AR	3	-1.75	-2.91
FISC1YCGDP_MEX	1	-1.25	-2.90
FISC1Y_MEX	3	-1.15	-2.91
FISC1Y_AR	3	-1.47	-2.91
AER_MEX	10	-1.30	-2.90
FEDFRATE	2	-1.92	-2.91

B) Preliminary Steps to Specify the VECM

Firstly, the endogenous and exogenous variable set was defined, for the span January 1995-December 2000. The endogenous entailed monthly data of the seasonally adjusted Production Index (EMISA_AR) as a proxy of GDP (IAGLOBSA_MEX), the JP Morgan's EMBI + Brady Bonds Spreads (EMBI_AR, EMBI_MEX), the one-year accumulated fiscal deficit without privatisation revenues over current GDP (FISC1YCGDP_AR, FISC1YCGDP_MEX) as the difference between the primary surplus and the interest payments, and the external public debt to GDP ratio (DPGDP_AR, DPGDP_MEX) converted from quarterly figures. On the other hand, the Federal Funds rate (FEDFRATE) was included as exogenous as well as two dummies to control for the Asian and Russian crisis. All but the dummies were expressed in logarithm values.

Secondly, since the series are not stationary it was necessary to test whether they were integrated of the same order or not, and then to perform the cointegration test (Johansen version) to detect the number of cointegrating vectors, in case the former holds. Briefly, for each variable the Augmented Dickey Fuller (adjusted-sample) test was run to examine the null hypothesis of non-stationarity. We conclude that all variables were integrated of order one or simply I(1) (Appendix A, above)[28].

Before carrying out the cointegration test, the number of lags to be included in the model was specified. For that reason, the Akaike Information Criteria (AIC) was employed. The Sims' Likelihood Ratio test was also performed. According to AIC, the optimal lag was six months. Unlike the AIC, the Sim's LR test indicated that the restrictions set were non-binding, starting from 3 lags. However, this test tends to conduct to misleading conclusions when relatively small samples are considered. Allowing for possible serial correlation in each of the equations to be estimated, 6 lags (3 for Mexico — 2 when the nominal exchange rate AER_MEX was made endogenous) were preferred even if the last turned out to be less parsimonious.

Finally, the Johansen trace statistic identified the existence of 2 cointegrating vectors (2 for Mexico), assuming no linear trend in data (see Appendix C).

C) Cointegration and VECM Estimation

Johansen Test

Given a group of non-stationary series — like the ones presented above — it may be interesting to determine whether the series are cointegrated, and if they are, to identify the cointegrating (long-run equilibrium) relationships. One of the possible methods to test for these relationships was developed by Johansen (1991), which consists on testing the restrictions imposed by cointegration on the unrestricted VAR involving the series.

Consider a VAR of order p:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B x_t + \varepsilon_t \qquad \text{(A2)}$$

where y_t is a k–vector of non-stationary endogenous I(1) variables, x_t is a d–vector of deterministic variables, and ε_t is a vector of innovations. We can rewrite the VAR as:

$$\Delta y_t = \Pi y_{t-1} + A_j \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + B x_t + \varepsilon_t \qquad \text{(A3)}$$

where:

$$\Pi = \sum_{i=1}^{p} A_i - I_I \qquad \text{and } \Gamma_I = -\sum_{j=i+1}^{p} A_j$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank r<k, then there exist kr matrices α and β each with rank r such that $\Pi = \alpha\beta$ and $\beta' y_t$ is stationary. R is the number of cointegrating relations (the cointegrating rank according to this method) and each column of β is the cointegrating vector[29]. The elements of α are known as the adjustment parameters in the vector error correction model, in response to a deviation from the equilibrium. Johansen's method is to estimate the Π matrix in an unrestricted form, then test whether the restrictions implied by the reduced rank of Π can be rejected or not.

How many cointegrating vectors would there be? If there are k endogenous variables, each of which has one unit root, there can be from zero to k–1 linearly independent, cointegrating relations. If there are no cointegrating relations, standard time series analysis such as the (unrestricted) VAR may be applied to the first-differences of the data. Since there are k separate integrated elements driving the series, levels of the series do not appear in the VAR in this case.

Conversely, if there is one cointegrating equation in the system, then a single linear combination of the levels of the endogenous series $\beta' y_{t-1}$ should be added to each equation in the VAR. When multiplied by a coefficient for an equation, the resulting term $\alpha \beta' y_{t-1}$ is referred to as an error correction term. If there are additional cointegrating equations, each will contribute an additional error correction term involving a different linear combination of the levels of the series.

If there are exactly k cointegrating relations, none of the series has a unit root, and the VAR may be specified in terms of the levels of all of the series. Note that in some cases, the individual unit root tests will show that some of the series are integrated, but the Johansen tests show that the cointegrating rank is k. This contradiction may be the result of specification errors.

Once the optimal lag number is defined (Sims tests, Information criteria), and a choice on different deterministic trends paths for the data is made (here it was assumed no deterministic trend), it is necessary to compute the eigenvalues λ_i of the Π matrix. In this way, the number of distinct cointegrating vectors can be obtained by checking the significance of those characteristic roots. Moreover, the number of λ_i statistically different from zero will be exactly the number of cointegrating vectors.

Subsequently, two tests can be now performed. One test can be based on a trace-statistic and another on a “maximum” statistic. For this exercise only the first one was carried out, but the second can be easily computed leading to similar conclusions (there is however some scope for discrepancy, see Enders 1995).

The trace statistic tests the null hypothesis that the number of distinct cointegrating vectors is less than or equal to r against a general alternative. The test is of the Log Likelihood Ratio type under the following statistic:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1-\lambda_i) \qquad \text{(A4)}$$

Table A2 below displays the results concluding, at a 5 per cent, that there are at most two cointegrating vectors.

Table A2. **Johansen Trace Test**
A2-1. **Argentina**

Sample: June 1995-December 2000
Included observations: 66
Test assumption: No deterministic trend in the data
Series: LOG(EMBI_AR) LOG(DPGDP_AR) FISC1YCGDP_AR LOG(EMISA_AR)
Exogenous series: LOG(FEDFRATE) RUSIA ASIA
Lags interval: 1 to 6

Eigenvalue	Likelihood Ratio	5 Per cent Critical Value	1 Per cent Critical Value	Hypothesised No. of CE(s)
0.464457	84.83214	53.12	60.16	None **
0.403816	43.61679	34.91	41.07	At most 1 **
0.131603	9.481243	19.96	24.60	At most 2
0.002545	0.168217	9.24	12.97	At most 3

Notes:
*(**) denotes rejection of the hypothesis at 5 per cent (1 per cent) significance level.
L.R. test indicates 2 cointegrating equation(s) at 5 per cent significance level.

A2-2. **Mexico**

Sample: July 1995-December 2000
Included observations: 66
Test assumption: No deterministic trend in the data
Series: FISC1YCGDP_MEX LOG(EMBI_MEX) LOG(IAGLOBSA_MEX) LOG(DPGDP_MEX)
Lags interval: 1 to 3

Eigenvalue	Likelihood Ratio	5 Per cent Critical Value	1 Per cent Critical Value	Hypothesised No. of CE(s)
0.324655	66.47798	53.12	60.16	None **
0.280826	40.57087	34.91	41.07	At most 1 *
0.172294	18.81384	19.96	24.60	At most 2
0.091500	6.33340	9.24	12.97	At most 3

Notes:
*(**) denotes rejection of the hypothesis at 5 per cent (1 per cent) significance level.
L.R. test indicates 2 cointegrating equation(s) at 5 per cent significance level.

A2-3. **Mexico**, with endogenous nominal exchange rate

Sample: July 1995-December 2000
Included observations: 66
Test assumption: No deterministic trend in the data
Series: LOG(AER_MEX) LOG(DPGDP_MEX) FISC1YCGDP_MEX LOG(IAGLOBSA_MEX) LOG(EMBI_MEX)
Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Per cent Critical Value	1 Per cent Critical Value	Hypothesised No. of CE(s)
0.363932	84.12565	76.07	84.45	None *
0.316984	54.26394	53.12	60.16	At most 1 *
0.179328	29.10230	34.91	41.07	At most 2
0.137538	16.05861	19.96	24.60	At most 3
0.090943	6.29296	9.24	12.97	At most 4

Notes:
*(**) denotes rejection of the hypothesis at 5 per cent (1 per cent) significance level.
L.R. test indicates 2 cointegrating equation(s) at 5 per cent significance level.

D) VECM Estimates

Table A3. **Structural Errors Correlation**

Table A3-1. **Argentina**

	LOG(EMBI_AR)	LOG(DPGDP_AR)	FISC1YCGDP_AR	LOG(EMISA_AR)
LOG(EMBI_AR)	1	-0.077	0.214	-0.394
LOG(DPGDP_AR)	-0.077	1	-0.207	0.011
FISC1YCGDP_AR	0.214	-0.207	1	-0.205
LOG(EMISA_AR)	-0.394	0.011	-0.205	1

Table A3-2. **Mexico**

	FISC1YCGDP_MEX	LOG(EMBI_MEX)	LOG(IAGLOBSA_MEX)	LOG(DPGDP_MEX)
FISC1YCGDP_MEX	1	-0.113	0.187	-0.185
LOG(EMBI_MEX)	-0.113	1	-0.049	0.074
LOG(IAGLOBSA_MEX)	0.187	-0.0497	1	-0.527
LOG(DPGDP_MEX)	-0.185	0.074	-0.527	1

Table A3-3. **Mexico**, with endogenous nominal exchange rate

	LOG(AER_MEX)	LOG(DPGDP_MEX)	FISC1YCGDP_MEX	LOG(IAGLOBSA_MEX)	LOG(EMBI_MEX)
LOG(AER_MEX)	1	0.029	0.130	0.193	0.486
LOG(DPGDP_MEX)	0.029	1	-0.073	-0.530	0.117
FISC1YCGDP_MEX	0.130	-0.073	1	0.224	-0.033
LOG(IAGLOBSA_MEX	0.193	-0.530	0.224	1	0.007
LOG(EMBI_MEX)	0.486	0.117	-0.033	0.007	1

Ordering for Impulse Response Functions (Choleski Decomp):

AER_MEX → EMBI_MEX → IAGLOBSA_MEX → FISC1YCGDP_MEX → DPGDP_MEX

E) Pesaran, Shin and Smith Test

The traditional approach to verify the existence of a long-term relationship among a set of variables is based on cointegration techniques (Engle and Granger, 1987: Phillips and Ouilaris, 1990; Johansen, 1991; among others). These techniques require variables to be integrated of order one, I(1). Pesaran *et al*. (1999) have proposed a new approach to test the existence of a long-term relation that can be applied independently from the order of integration of the regressors, or from the fact they were cointegrated in the classical sense. This means that it is not transcendental if they are I(0), I(1) or mutually cointegrated. The underlying statistic is the Wald or F-statistic in a Dickey-Fuller regression (ARDL model).

The authors supply two sets of asymptotic critical values for the polar cases: the first assumes that all the variables are I(1), while the second assumes that all are I(0). So all the possibilities are delimited for any classification from a combination of these limit values. If the Wald or the F statistic computed falls outside the area delimited by those values, then a conclusive inference on the long-term relationship could be induced independently of whether the regressors are I(0), I(1) or mutually cointegrated. Nevertheless, if the Wald and the F statistics fall within the delimited area, the inference would be inconclusive and it would be necessary to know the order of integration of the regressors.

Accordingly, the test can be performed whether or not the dependent variable follows a deterministic tendency. In the case of the spread of a bond, we opted for the second choice. Therefore, we estimated the following equation selecting the quantity of lags according to the above-mentioned Akaike-criteria (the minimum) but considering the trade-off between parsimony and autocorrelation. To avoid an excessive use of parameters in the model, non-significant variables in the spreads functions presented in Section III were also excluded from the equation (A5) below:

$$\Delta\ LX_t = \alpha + \lambda\ LX_{t-1} + \beta\ W_{t-1} + \sum_{j=1}^{n} \gamma_j\ \Delta\ Z_{t-j} + \delta \Delta W_t\ + \varepsilon_t \quad \text{(A5)}$$

where $Z_t = (\ \ ) = (LX_t,\ W_t)$, LX being the log of the spread (EMBI)for each country and W the control variable set, expressed in logs when possible; β is a parameter vector.

The null hypothesis is Ho: $\lambda = \beta\ = 0$

The number of optimum lags was 1 and none of the equations suffered serial correlation problems[30]. As the asymptotic F distribution under the null hypothesis is not standard, we used the critical values estimated by Pesaran *et al*. in Table C1.iii, page [T.2], where I(0) and I(1) mean the bounding values. The test shed the following outcome:

Equation	Regressors (k)	Wald statistics	I(0) 95%	I(1) 95%	I(0) 99%	I(1) 99%
Argentina	6	1.16	2.45	3.61	3.15	4.43
Chile	5	1.34	2.62	3.79	3.41	4.68
Mexico	8	6.38	2.22	3.39	2.79	4.10

Given the estimated Wald F-statistic, which falls outside the bounded “inconclusive area”, we conclude in all cases that there could be a long run relation among the variables irrespective of whether they are cointegrated, or whether they are from different order of integration.

F) Diagnostic Tests

1) Serial Correlation: Optimal Lags Were Chosen Running up to 6 Months

ARGENTINA Breusch-Godfrey Serial Correlation LM Test (2 lags)			
F-statistic	0.411937	Probability	0.664225
Obs*R-squared	1.029439	Probability	0.597668

CHILE Breusch-Godfrey Serial Correlation LM Test (2 lags):			
F-statistic	1.243626	Probability	0.317637
Obs*R-squared	8.299042	Probability	0.140507

MEXICO Breusch-Godfrey Serial Correlation LM Test (4 lag)			
F-statistic	1.100308	Probability	0.364961
Obs*R-squared	5.414367	Probability	0.247360

2) Heteroskedasticity (White, No Cross-Terms)

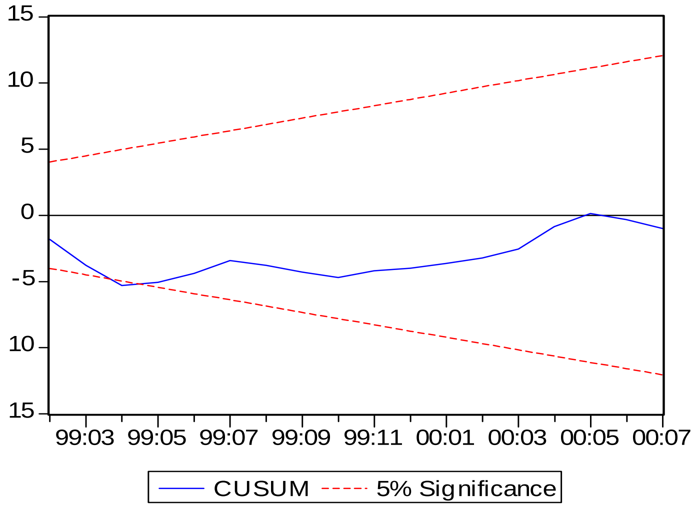
ARGENTINA White Heteroskedasticity Test			
F-statistic	0.778041	Probability	0.740821
Obs*R-squared	19.45800	Probability	0.674345

CHILE White Heteroskedasticity Test			
F-statistic	1.160176	Probability	0.368345
Obs*R-squared	23.09421	Probability	0.338976

MEXICO White Heteroskedasticity Test			
F-statistic	1.628630	Probability	0.070349
Obs*R-squared	33.10773	Probability	0.101821

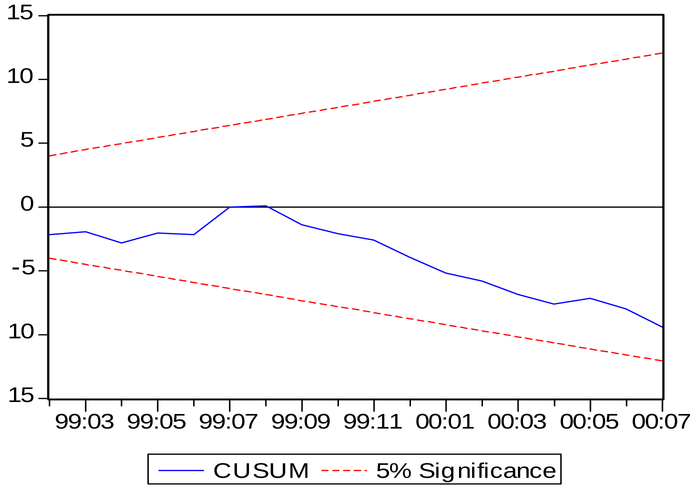
3) Stability Tests

CHILE



MEXICO: Not available given the MA(1) term included.

ARGENTINA



NOTES

1. See, for instance, Eichengreen and Mody, 1998; Kamin and von Kleist, 1999; Arora and Cerisola, 2000, Wong, 2000 or Nogues and Grandes, 2001, among others).
2. See Aronovich, 1999, and Jostova, 2001.
3. The Chilean country risk series is incomplete for the span considered here. A very recent bond issue in 1999 and the external debt repurchase around 1993 explain why. In spite of the lack of older data, the Central Bank staff provided a series of corporate bond spreads for 1997-2000. This series proves to be a good proxy of the sovereign. In this regard, my thanks to Klaus Hebbel-Schmidt and Herman Bennett.
4. These tendencies are fairly similar when international reserves (in foreign exchange) are deduced from debt stocks.
5. The underlying link between output and risk premia results even more striking when looking at the cyclical component of real GDP, e.g. performed by the difference between the actual figures and the Hoddrick-Prescott filtered trend. However, as it will be tested along Section III, permanent changes in output are expected to have an important effect on spreads as they affect the solvency profile deeper.
6. Wong runs a pooled data regression since quarterly data from early 1994 to early 1999. Although he provides interesting insights based on an APT model, the dependent variable is the spreads ARCH (1) volatility which renders his results not comparable to the others. On the other hand, Jostova's goal is to study the forecastability of emerging markets sovereign spreads in a framework allowing for both short- and long-run dynamics, rather than the explanatory power of macro fundamentals or other factors.
7. Chile data runs from early 1997. See Note 3.
8. Currency risk variables were not included as all the Brady bonds are issued in dollar currency, hence they do not encompass devaluation risk. Even if they could capture an indirect effect, i.e. balance sheet effects, endogeneity inconvenients would arise (see Ahumada and Garegnani, 2000 or Nogues and Grandes, 2001, for an in-depth discussion).
9. In other terms, weak exogeneity is assumed, e.g. current GDP expectations are not affected by future errors of prediction of the sovereign risk premia. Thus far, a perfect foresight path (actual output was the one forecasted by the agents) was assumed.
10. The last two variables are a proxy of the net foreign assets growth, i.e. net external debt variation, including the external debt to GDP ratio would then be redundant. However, we tried when possible with quarterly public external debt to GDP ratio instead of fiscal deficits.
11. Chile's terms of trade were calculated as the cooper/oil relative price.
12. Generally, a great deal of the macroeconomic data is known or disclosed with some lag, so if expectations were not perfectly formulated this could be capturing a "revision" effect. Data sources can be found in the Appendix.

13. Mexico's estimates were corrected for an ARMA term, i.e. MA(1), owing to a residual correlation pattern which appeared in the original estimation.

14. Raw data on fiscal accounts was not exactly comparable to the other countries, and privatisation revenues could not be deducted owing to the time series incompleteness.

15. This can reflect some colinearity between cyclical fiscal deficits and terms of trade shocks.

16. This effect means that when USTB rates remain high, emerging countries have fewer incentives to launch new bonds, what *ceteris paribus* could imply a bond supply shortfall in turn pushing secondary market prices up (spreads down). See Eichengreen and Mody (1998) for more details.

17. Given that private sector spreads were used as a proxy, and considering this is a more volatile and illiquid market, a lower effect would have likely been found had a sovereign spread series been available.

18. In fact, the forthcoming analysis will allow for the implicit endogeneity problem raised in the estimations along Section III and circumvented by using lagged variables or first differences. In this regard, higher country risk may imply a drop in investment plans (and in GDP growth by consequence) or an increase in future debt service putting additional pressure over the fiscal accounts.

19. Notice that, in Section III, r* was the US interest rate. Now R* (capital letters) imply an interest rate for an emerging country bond issued in foreign currency (among them, obviously, the dollar).

20. After the first years of the Convertibility Plan, where a fast remonetisation took place, the money base to GDP ratio has remained quite stable. Consequently not only does the term π m tends to zero but also λ m is relatively constant from six years onward (1995-2001).

21. Although it is reasonable to assume a fixed exchange rate in the Argentine case, it isn't the same as for Mexico's equation. Besides showing the debt dynamics equation as displayed in (5) we will also let the nominal exchange rate be endogenous to account for independent effects of this last variable on the debt to GDP ratio path.

22. In Grandes (2001) a VAR approach was devised to prove the endogeneity of country risk, the GDP growth rate and fiscal deficits, but no cointegration relationships were supposed. Unlike the present work, the goal was not to estimate the public debt dynamics itself but to give a rationale for the limits to a solvency-improving policy derived from dollarisation. Likewise, this model can be seen as an extension to those paper findings. Other differences dealing with data appear: there seasonally adjusted and monthly converted GDP instead of the EMISA and 3-month accumulated fiscal deficit instead of figures over a one year base were used.

23. The VECM output is available for the interested reader upon request.

24. It is also fair to remark that much of current public deficits have to do with the tax authority mismanagement in levying due taxes, the past reform of the pension fund system which unbalanced the net present value cashflows of the "pay-as-you-go system", and other related reasons.

25. These results are available upon request. In the Mexican case, the ordering was irrelevant except for the relation between DPGDP_MEX and IAGLOBSA_MEX, yielding a –0.55 coefficient. In spite of this, the impulse functions did not substantially change.

26. A further comment is in order. We cut off the time-horizon after innovations take place for the sake of comparison. The Argentine impulse response functions give the impression of not converging to a steady state, provided they are expressed in logs, but they do. The complete picture is also available upon request.

27. The series excluding privatisation revenues were not fully available but till mid-1999 (IFS).

28. Contrary to the estimations carried out in Section III, where the order of integration was assumed irrelevant under the Pesaran *et al*. (1999) hypothesis, the VECM analysis requires cointegration in the classical sense. Perron-Philips tests were also carried out yielding the same results [all were I(1)].

29. The cointegrating vector is not identified unless we impose some arbitrary normalisation. The program used (Eviews) adopts the normalisation so that the r cointegrating relations are solved for the first r variables in the y_t vector as a function of the remaining k–r variables.

30. Those equations as well as those corresponding to the associated error correction models are available from the author upon request.

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