A Nonlinear Approach to Public Finance Sustainability in Latin America

by

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Abstract

Public finance sustainability plays a central role in the stabilisation efforts in Latin America. The emphasis on fiscal policy in these countries goes back to the debt crisis of the 1980s, which was associated with large fiscal imbalances. We analyze the sustainability of government debt for a sample of Latin American countries, employing unit root tests that incorporate nonlinear alternative hypotheses. These tests capture the potential thresholds or corridor behaviour that international agreements or markets impose on emerging economies' public finances. We show that support for sustainability substantially improves when the possibility of nonlinear mean-reversion is taken into account.

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1. Introduction

During the 1980s and 1990s many developing and transition economies weathered major economic disturbances. The 1980s debt crises in Latin America (LA) has been accompanied by macroeconomic imbalances that led to restructuring of the whole economy. Many analysts have suggested that the origins of financial crises in a large number of highly indebted countries are to be found in the public sector (Agenor and Montiel, 1999). In particular, the 1980 crisis in LA stemmed from severe problems in public sector finances, and their correction has been at the centre of the subsequent stabilisation policies.

A voluminous literature focuses on the stabilisation programs in LA, and a more recent strand of it explores institutional and political factors affecting these countries' fiscal performance.[1] However, surprisingly little or no work exists focusing on the time-series properties of debt and deficit to assess the sustainability of fiscal positions in this region. This paper fills this gap by analyzing the state of fiscal imbalances in selected Latin American countries and evaluates the sustainability of their fiscal policies.

The typical empirical approach to fiscal policy sustainability is to examine the stationarity of the government debt or deficit. The traditional stationarity tests used by this approach, however, may be inadequate when the fiscal variables exhibit a threshold behaviour, which biases results to rejecting unit roots. It makes sense to model policymakers' behaviour as following a rule whereby the debt/GDP ratio is kept below an implicit or explicit threshold imposed by markets or international institutions.[2] The traditional stationarity tests assume a continuous and constant-speed adjustment process, however, and they often fail to capture the virtuous nature of such fiscal discipline. In this paper we explore a different explanation for the seemingly unsustainable nature of fiscal policies. We use newly developed stationarity tests that allow the alternative hypothesis to incorporate nonlinearities and show that series initially found to be nonstationary with traditional tests might, in fact, are stationary.

Our contribution to the literature is thus two folds. First, we focus on a region whose public policy has been at the heart of international investors' concerns and stabilisation programs but whose public debt sustainability has remained largely

[1] See Alesina, Hausmann, Hommes and Stein (1996), Stein, Talvi and Grisanti (1998).

unexplored. Second, we use a methodology that accounts for the possibility that the behaviour of fiscal authorities may be nonlinear. That is, their reaction to debt accumulation may be different when debt is high or low thus, affecting the time series properties of the fiscal policy variables. We show that these new tests overturn most of the nonstationarity results obtained from the traditional tests. Depending on the specification of the debt measure and the model used, we are able to find mean reversion in up to four out of six countries where the standard tests showed none.

Our findings indicate that for the purposes of policy evaluation it may be misleading to solely rely on the traditional tests since they frequently fail to reject the unit-root null, wrongly suggesting that policies adopted by these countries are unsustainable. By contrast, the new tests can successfully capture nonlinearities, providing a richer and possibly more reliable framework for the evaluation of fiscal policy sustainability.

2. The presence of 'regimes', stylised facts, and literature review

The class of non-linear models we consider implies the presence of regimes within which the series may behave differently. The seemingly erratic behaviour within a given set of values may not preclude mean-reversion once the series approaches some other values in its state space. A stationarity test that does not account for such non-linearities in the process will wrongly interpret the meandering of the series within the band as evidence of nonstationarity.

The presence of a regime where the process may be more persistent is particularly relevant when the series considered reflect policy/choice variables, possibly affected by explicit or implicit targets. The policy maker can take corrective action when the policy variable that is under its direct control deviates considerably from what the policy maker considers as acceptable values. Government debt and deficit series, in general, fit this description. The possibility of regimes is potentially more pronounced in many Latin American countries, whose public finances are subject to various policy constraints. Such constraints may reflect international agreements and/or domestic stabilisation programs. Recent changes in the fiscal policy frameworks of many emerging market

[2] For a theoretical background see Bertola and Drazen (1993).

economies prescribe explicit ceilings for the government budget deficit. For example the 1999 Fiscal Responsibility Law in Argentina and the 1999 Fiscal Transparency Law in Peru impose ceilings on the government budget deficit. Similar legislation is adopted or being drafted in Brazil, Colombia and other countries (IMF, 2001).

In all five countries we consider, authorities often implemented corrective actions (either initiated by the government or imposed by international investors) after fiscal expansions (Figure 1). The deterioration in public finances due to civil war in Guatemala and El Salvador is stopped and reversed by structural reforms implemented in the second half of the 1980s in the former country and in1993-96 in the latter. The other three economies went through several episodes of financial crises followed by reforms. Mexico's 1982 debt crisis led to a first round of economic and public finance reform in the country during the mid-1980s. The 1994 crisis was also followed by fiscal consolidation and further reforms. The expansionary fiscal policies by Costa Rica and Honduras that relied on the coffee boom of the 1970s were reversed after both countries were hit by the debt crisis in the 1980s. However, fiscal consolidation in Honduras was relaxed soon after, until the country faced a foreign exchange crisis in 1990 and imposed a major public sector reform in 1994-98.

Bertola and Drazen (1993) provide another channel by examining the signalling effects of fiscal policy when agents smooth consumption intertemporally. In a model of fiscal adjustment when government consumption has deviated considerably from acceptable levels, the government spending/GDP ratio is cut drastically. The authors show that the experience of fiscal consolidation efforts in a number of European countries is consistent with such behaviour. An additional source of fiscal tightening may be due to the exchange rate regime and/or shifts in the regime. A characteristic of emerging economies is their vulnerability to massive capital flows swings, which often requires the country to put a cap on its fiscal spending. For example, a typical macroeconomic policy recipe in the presence of a capital inflow surge is to offset the aggregate demand effects of the capital inflow-induced monetary expansion with a tighter fiscal policy.[3]

[3] This has been the case in Costa Rica as suggested by Montiel (1996). Identifying the sources of a fiscal tightening when stabilisation programs are in place, however, is not always a straightforward exercise.

The main approach to analyzing the sustainability of a government's fiscal policy is to examine if the government budget constraint holds in present value terms. If it does, then the current debt is offset by the sum of expected future discounted primary budget surpluses (exclusive of interest payments). Sustainability tests, however, do not provide a consensus because results vary with the theoretical framework, the sample period, the specification of the transversality condition, and the econometric methodology used.

Another approach to analyzing sustainability consists of testing the stationarity of the debt and/or deficit.[4] Other studies look for a cointegrating relationship linking variables of the budget constraint .[5] Most of this literature, however, is nonstochastic and implicitly assumes that dynamic efficiency holds (Abel *et al.*, 1989). Though Bohn (1995) casts doubt on both assumptions and in particular on the IBC tests that rely on constant discount rates, Ahmed and Rogers (1995) show that, under certain conditions, tests of cointegration are still appropriate and find evidence favouring sustainability of the U.S. and the UK fiscal policies .

A third approach to sustainability consists in examining the existence of a feedback from debt to deficit, which avoids pitfalls associated with the debt-stationarity analysis. If such a negative relation exists, debt is considered to be mean reverting. Wickens and Uctum (1993) and Bohn (1998) show that this condition is satisfied for the US national and public debt, respectively.[6]

The empirical literature that tests for public finances sustainability by focusing on debt and/or deficit stationarity has typically relied on the standard Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) tests. When structural breaks exist in the intercept or the trend, however, these tests may misleadingly show that the series in question is

[4] Hamilton and Flavin (1986) and Smith and Zin (1988) reject the nonstationarity of real undiscounted U.S. and Canadian debt, respectively, under the assumption of constant real interest rates. Allowing for stochastic interest rates, Wilcox (1989) finds that discounted real U.S. debt is nonstationary. Corsetti and Roubini (1991) obtain mixed results for debt stationarity among the OECD countries, and Uctum and Wickens (2000) find support for mean reversion in smaller European countries.

[5] Trehan and Walsh (1988) find support for the sustainability of U.S. fiscal policy while Kremers (1989), and Hakkio and Rush (1991) find evidence suggesting violation of the IBC. In a later study, Trehan and Walsh (1991) conclude that using constant discount rates may give conflicting results between the cointegration tests and the stationarity tests based on the first-differenced debt.

[6] Using such a feedback-augmented test, Feve and Henin (2000) find further support for stationarity among the G7 countries, Uctum, Thurston and Uctum (2004) among emerging and industrialised economies.

nonstationary.[7] Moreover, while recent developments in nonstationary panel econometrics provide us with higher–power tests that make the rejection of the unit-root null easier, such tests are of limited use when the objective is to evaluate the stance of a single country. The rejection of the unit-root null in a panel does not imply that all series in the panel are stationary, and does not provide information about specific countries.[8]

The choice of a particular alternative hypothesis in unit-root tests affects their ability to reject the null hypothesis. Thus, using an alternative hypothesis that corresponds to the real process increases the power of the tests. All the stationarity tests mentioned above incorporate alternative hypotheses that involve linear models. In this paper we explore the implications of a nonlinear alternative. If the nonlinear model incorporated in the alternative hypothesis adequately approximates the true model, then the nonlinear versions of the ADF tests proposed below will be better equipped to reject the unit-root null as compared to the standard ADF tests or other variants of them. Thus not only we achieve a higher power for the stationarity tests but we also obtain more transparent, country-specific results.

The argument for threshold effects in public debt is supported by the evidence presented in other recent work using smooth transition autoregressive (STAR) models. These studies point to the presence of nonlinearities in fiscal policy in the United States (Sarno, 2001) and the United Kingdom (Cipollini, 2001).[9] Our approach, however, is fundamentally different from such studies. In particular, the previous studies fit a STAR model assuming that the debt process itself is stationary, while our approach directly tests for the stationarity of the debt series.

3. Model, Methodology and Data

The intertemporal budget constraint

The starting point of the analysis is the government budget constraint:

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[7] Uctum, Thurston and Uctum (2002) and Papadopoulos and Sidiropoulos (1999) show that with unit-root tests allowing endogenous breakpoints reverses the nonstationarity results in most countries.

[8] See Mark (2001) for further details and technical difficulties entailed with this approach.

[9] In addition, Giavazzi et al. (2000) find that the private sector's response to fiscal policy is likely to be nonlinear when the fiscal impulses are sizeable and persistent.

$$\Delta b_t = -s_t + \rho_t b_{t-1} \tag{1}$$

where b is a measure of government debt, *s* is the seignorage inclusive primary surplus, and ρ is the ex-post interest rate on the outstanding stock of government debt. Earlier literature uses various measures of government debt. In this study we consider real debt, and debt normalised by GDP. Each of these debt measures has a corresponding interest rate. For example, if b is real debt, then ρ is the real interest rate, and if b is defined as debt/GDP ratio then ρ is the real interest rate adjusted for the growth rate of real GDP.

Solving (1) forward assuming perfect foresight and successively substituting out the future discounted debt measure, gives the n-period intertemporal budget constraint:

$$b_t = \delta_{t,n} b_{t+n} + \sum_{i=1}^{n} \delta_{t,i} s_{t+i} \tag{2}$$

where $\delta_{t,n} = \prod_{s=1}^{n} (1+\rho_{t+s})^{-1}$ is the time-varying discount factor n-periods ahead.

A necessary and sufficient condition for sustainability is that as *n* goes to infinity, the discounted value of the debt measure converges to zero. Also known as the transversality condition, it implies that no Ponzi games are allowed, meaning no new debt is issued to meet interest payments. This condition can be expressed as:

$$\lim_{n\to\infty} \delta_{t+n} b_{t+n} = 0 \tag{3}$$

It then follows that current debt is offset by the sum of current and future discounted surpluses, implying that the government budget constraint holds in present value terms. The traditional sustainability approach consists in applying the ADF test on b_t or on its discounted version and test if it is stationary.

Methodology

We use two unit-root tests that incorporate a nonlinear alternative hypothesis. The first test, due to Kapetanios, Shin, and Snell (2002) –henceforth KSS-, considers the null hypothesis of a unit root against the alternative of a STAR model in a context similar to DF test. In particular, we test for the null hypothesis of $\gamma = 0$ in the following model:

$$\Delta b_t = \beta b_{t-1}(1 - e^{-\gamma b_{t-1}^2}) + \varepsilon_t \,. \tag{4}$$

The test is carried out by a *t*-test of the coefficient of b^3_{t-1} being zero in the auxiliary regression

$$\Delta b_t = \alpha + \phi b_{t-1}^3 + \varepsilon_t \,. \tag{5}$$

In the presence of constants and trends, the data are first detrended/demeaned. The 1%, 5%, and 10% critical values for the detrended and demeaned data are –3.93, -3.40, and -3.13, respectively. We refer to this test as the non-linear augmented Dickey-Fuller (NLADF) test.

The second test uses an alternative detrending strategy. Chortareas, Kapetanios, and Shin (2002) combine the analysis of KSS and Schmidt and Phillips (1992) to derive a test of the unit root hypothesis against a smooth transition autoregressive alternative when the unit root appears in a model of the form envisaged by Schmidt and Phillips. To be more specific, let the model be given by

$$b_t = \psi + \xi t + x_t \tag{6}$$

$$\Delta x_t = \beta x_{t-1}(1 - e^{-\gamma x_{t-1}^2}) + \varepsilon_t \tag{7}$$

where $\beta < 0$, and ε_t is an *i.i.d.* error with finite variance σ^2. We are interested in testing the null hypothesis $\gamma = 0$. Under this hypothesis, the model is a unit root model whereas under the alternative it is a stationary nonlinear model. To test this hypothesis one needs to construct an LM test along the lines discussed in Schmidt and Phillips. This is given by a *t*-test of $\phi = 0$ in the regression

$$\Delta b_t = \alpha + \phi s_{t-1}^3 + \varepsilon_t \tag{8}$$

where $s_{t-1} = b_t - \tilde{\psi} - \xi(t-1)$ and $\tilde{\xi} = (b_T - b_1)/(T-1)$, $\tilde{\psi} = b_1 - \tilde{\xi}$. Under the null hypothesis, the asymptotic distribution of

$$\tau = \frac{\sum_{t=1}^{T}(s_{t-1}^3 - \bar{s}^3)\varepsilon_t}{\hat{\sigma}\left[\sum_{t=1}^{T}(s_{t-1}^3 - \bar{s}^3)\right]^{1/2}} \tag{9}$$

is given by

$$\tau \Rightarrow \frac{\int V(r)dW(r)}{\int V^2(r)dr} \tag{9´}$$

where $\hat{\sigma}$ is the estimated standard error of the regression, $\bar{s^3}$ is the mean of s_t, *W(r)* is a standard Brownian motion, *V(r)* is a standard Brownian bridge and $\underline{V}(r) = V(r)^3 - \int V(r)^3 dr$. To deal with the issue of possible weak dependence in ε_t regression (8) is augmented with lags of Δb_t following the approach of DF and Ng and Perron (1995). Standard analysis along the lines of, say, KSS shows that the asymptotic distribution of the test does not change. The results of Ng and Perron (1995) concerning data dependent selection of the lag order for the lag polynomial in Δb_t carry over to this case as argued by KSS. We refer to this test as the nonlinear Schmidt-Phillips (NLSP) test. The 1%, 2.5%, 5%, 10% critical values of the test are -3.52, -3.23, -3.00, -2.73, respectively.[10]

Data

The countries in the sample are Mexico, Costa Rica, El Salvador, Guatemala, Panama, Honduras, and their choice has been dictated by the availability of data. We analyze three different debt measures used in the literature: real debt, debt/GDP ratio, discounted real debt and discounted debt/GDP ratio. The last two debt measures are compound discounted with the corresponding discount rate (adjusted for inflation or/and growth rate). However, as is explained below, the discount rate is an approximation of the real cost of debt. In high inflation/growth economies, adjusting the real rate for real GDP growth (required to discount the debt/GDP) sometimes gives a negative discount rate that gets compounded in the measurement. Since the resulting debt measure is meaningless, we only report results from the first three measures.

We used the following series to construct our debt measures: nominal government debt, the GDP deflator, nominal GDP (GNP when the GDP not available), and interest rate. All series come from the *International Financial Statistics* and the *Government Financial Statistics* of the IMF. The debt and the interest rate data are quarterly and the starting date varies from 1970 to 1986 and ends at 2000. The GDP data are mostly annual. To ensure efficient use of the statistical tests carried in the analysis, we

[10] The critical values for this test and the NLADF test have been obtained by simulation. For further information, see KSS and Chortareas, Kapetanios and Shin (2002).

converted the annual data to quarterly using a cubic transformation (further details available from the authors). The interest rate series are notoriously poor in Latin American countries. For an interest rate series that roughly reflects borrowing conditions in the economy and matches the sample length of government debt series, we computed the geometric average of the existing interest rates at a particular date, except the discount rate that tends not to fluctuate. For compounding, the interest rate is adjusted for the inflation rate calculated as a centered moving average with four lags and four leads.

4. Results

We present the results for the three different measures of debt in Tables 4.1, 4.2, and 4.3. All tables have the same structure. In particular, the first three columns provide the results of the standard DF and ADF tests. We consider two versions of the ADF test corresponding to different optimal lag-length selection procedures. The first, ADF(4), assumes four lags while the second, ADF(A), employs an automated process for selecting the optimal number of lags. The next three columns provide the results of the unit-root tests that incorporate a nonlinear alternative in the form of an Exponential Smooth Transition Autoregressive (ESTAR) process. The three specifications correspond to those of the first three (standard) stationarity tests DF, ADF(4), and ADF(A) and are labelled NLDF, NLADF(4), and NLDF(A), respectively. The last three columns provide the results of the nonlinear tests where the alternative hypothesis represents a geometrically ergodic process defined by a self-exciting threshold autoregressive (SETAR) model with three regimes. Those three tests are labelled NLSP, NLASP(4), and NLASP(A) respectively.

<Insert Table 4.1 about here>

Compared to the gloomy picture of the traditional unit-root tests, the nonlinear tests generally present a more optimistic view of the sustainability of fiscal policies in Latin America. The typical DF and ADF tests point unequivocally to the presence of unit roots in the undiscounted real debt processes in all sample countries (Table 4.1). The results of the nonlinear unit-root tests, however, dispute this picture. The six nonlinear tests (with the exception of NLSP) indicate stationarity in up to three out of the five countries we consider, namely Costa Rica, Honduras, and Mexico.

Although the literature commonly analyzes government debt in real terms, this is not a concept that is frequently used in practice. Financial analysts often refer to a compound present-value concept of real debt, while the popular press reports government debt as a ratio to GDP. The contradicting results provided by alternative methodologies in Table 4.1, motivate our further inquiry using additional debt measures.

<Insert Table 4.2 about here>

We first consider the debt-to-GDP ratio and the results from the three types of tests (Table 4.2). As with the real debt measures, all three DF and ADF specifications show complete lack of evidence for stationarity. In contrast, both versions of nonlinear unit-root tests show a completely different picture. In particular, the NLADF(4) tests that incorporate the ESTAR process alternative show mean reversion in up to three out of five countries (Costa Rica, Guatemala, and Honduras). The NLASP(4) tests that incorporate the SETAR alternative hypothesis also show mean reversion in up to three out of five countries (El Salvador, Guatemala, and Honduras).

<Insert Table 4.3 about here>

Finally, Table 4.3 shows the results from applying the same set of tests to compound discounted real debt measures. Unlike the previous cases, now the typical DF and ADF tests provide some limited evidence of mean-reversion. More specifically, the ADF(4) and ADF(A) tests show evidence of stationarity for El Salvador. The non-linear tests, however, provide again stronger evidence of stationarity in the compound discounted real debt measures. In particular, the NLADF(4) test results support stationarity in the debt measures of three countries (El Salvador, Honduras, and Mexico), as well as the NLASP(4) tests do (for Costa Rica, El Salvador, and Honduras). Both the NLADF(A), and NLASP(A) test results support stationarity for the same three countries (Costa Rica, Honduras, and Mexico).

The results from conducting further tests using alternative debt measures point to the same direction. When a simple (not compound) discounted debt-to-GDP ratio measure is used, the results of the DF and ADF tests indicate complete lack of stationarity while each of the nonlinear stationarity test results support stationarity in two countries (results available from the authors upon request).

To sum up, the use of nonlinear unit root tests allows us to uncover substantial evidence of stationarity in the debt/deficit series of the countries in question. This finding is important by itself since it questions the broad picture of non-stationarity –thus unsustainability- of government debts portrayed by conventional tests.

The nonlinear tests reverse the traditional test results for sustainability in Mexico and Honduras when we use the real debt measures either undiscounted or compound discounted. In Honduras the results are strongly reversed when we consider the debt/GDP ratio as well. In Costa Rica, the new tests reverse the nonstationarity result for most debt measures, namely the debt/GDP ratio and the compound discounted real debt. The NLADF and NLASP test results confirm the ADF test evidence for stationarity in the compound discounted real debt series in El Salvador, but also reverse the ADF test results when we consider the debt/GDP ratio series. The evidence for debt stationarity provided by the nonlinear tests is weaker for Guatemala (for which stationarity evidence found only in the debt/GDP series). Nevertheless, the ability of the new tests to uncover even limited stationarity provides potentially eye-opening evidence and a contrast to standard stationarity tests. [11]

5. Conclusion

Both the global macroeconomic environment and the domestic imbalances have confronted the Latin American emerging markets with continual challenges. Authorities repeatedly implemented stabilisation policies that were either self-imposed or encouraged by the international financial community. A typical component of such efforts is curbing the accumulation of national and, in particular, public debt. Surprisingly, however, one can hardly find evidence that address the sustainability of public finances in those countries by focusing on the times series properties of the debt/deficit measures.

This paper responds to this challenge by providing evidence on debt stationarity or public finances sustainability for a set of Latin American countries. In addition to

[11] Considering unit root tests with structural breaks in this paper would not change the direction of our results, since typically, allowing for structural breaks leads to more stationarity evidence.

investigating a relatively unexplored geographical area, we offer a new perspective on testing for public debt stationarity by using unit root tests that allow the alternative hypothesis to incorporate nonlinear processes. Fiscal authorities often take corrective actions when the debt/deficit approaches critical thresholds and thus, fiscal policy may respond differently to different levels of public debt. In such a context, the traditional stationarity tests (ADF) may fail to capture adequately the adjustment-to-equilibrium process and interpret such policies as unsustainable. The methodology we adopt in this paper is not constrained by a continuous and constant-speed adjustment process and therefore is better suited for addressing public debt stationarity under such circumstances.

The new tests overturn most of the nonstationarity results obtained from the traditional tests. Depending on the specification of the debt measure and the model used, we are able to find mean reversion in up to three out of five countries where the standard tests showed none. One implication of our results is that the standard stationarity tests may underestimate the sustainability of public debt. One should be careful, however, in interpreting the above results so that it does not lead to an overly optimistic view about the public finances of the countries considered. A complete assessment of fiscal policy would require the use of various criteria in addition to further tests. Nevertheless, our results provide a motivation for further research on that would focus on the modelling of such non-linearities.

Figure 1: Debt/GDP ratios

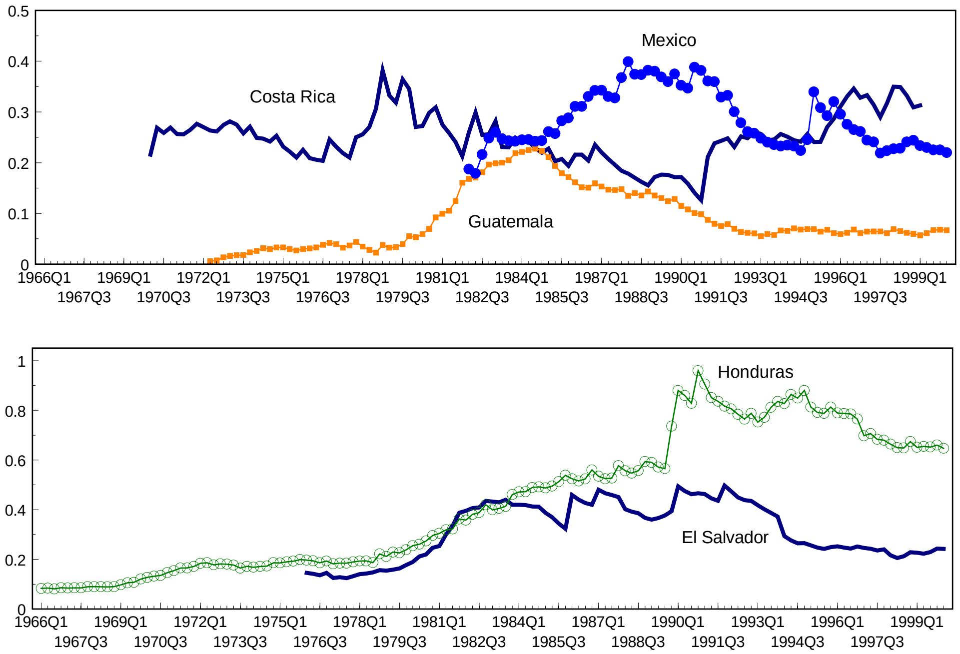

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Table 4.1: Stationarity of real debt[+]

	DF	ADF	ADF(A)	NLDF	NLADF(4)	NLADF(A)	NLSP	NLASP(4)	NLASP(A)
Costa Rica	-1.267	-0.876	-1.033	-2.564	-2.232	-2.228	-1.214	-1.015*	-1.038
El Salvador	-1.703	-2.064	-2.170	-2.059	-2.337	-2.285	-2.074	-2.459	-2.397
Guatemala	-1.166	-2.369	-2.178	-0.932	-2.537	-2.341	-0.833	-2.584	-2.423
Honduras	-1.746	-2.251	-1.890	-3.353	-5.456**	-4.633**	-2.571	-4.087**	-3.402*
Mexico	-2.338	-2.488	-2.776	-3.761*	-4.544**	-4.413*	-3.161*	-3.707**	-3.763**

[+] DF (ADF) is the Dickey-Fuller (augmented DF) test, NLDF and NLADF are the nonlinear DF and ADF tests, NLSP and NLASP are the nonlinear Schmidt-Phillips test and its augmented version. X(4) assumes four lags, X(A) selects an optimal number of lags. The 1%, 5% and 10% critical values are –3.93, -3.40, -3.13 for the NLADF tests, and the 1%, 2.5%, 5% and 10% critical values are –3.52, -3.23, -3.00, -2.73 for the NLSP tests.

Table 4.2: Stationarity of Debt/GDP[+]

	DF	ADF(4)	ADF(A)	NLDF	NLADF(4)	NLADF(A)	NLSP	NLASP(4)	NLASP(A)
Costa Rica	-2.442	-2.008	-1.625	-3.715*	-3.671*	-3.128	-2.896	-2.790	-2.487
El Salvador	-1.204	-1.914	-1.715	-1.637	-2.406	-2.422	-1.952	-2.991*	-2.910
Guatemala	-1.014	-2.766	-2.095	-0.830	-3.142*	-2.759	-0.708	-3.433*	-2.699
Honduras	-1.500	-2.359	-1.754	-2.802	-5.364*	-4.371**	-2.568	-4.538**	-3.629**
Mexico	-2.136	-1.730	-2.335	-2.348	-1.602	-1.671	-1.366	-1.143	-1.275

[+] See footnote Table 4.1.

Table 4.3: Stationarity of compound discounted real debt[+]

	DF	ADF(4)	ADF(A)	NLDF	NLADF(4)	NLADF(A)	NLSP	NLASP(4)	NLASP(A)
Costa Rica	-0.130	-1.788	-1.564	-0.654	-2.895	-3.782*	-1.436	-3.556*	-4.458**
El Salvador	-1.790	-3.596*	-3.694*	-1.510	-3.362*	-1.931	-1.346	-3.756**	-1.965
Guatemala	-0.709	-1.955	-1.888	-1.176	-2.856	-2.783	-1.269	-2.695	-2.646
Honduras	-0.493	-3.109	-2.758	-1.086	-7.393**	-6.865**	-1.052	-6.373**	-6.684**
Mexico	-0.638	-2.381	-2.756	-0.858	-3.533*	-3.932**	-1.245	-2.547	-2.990*

[+] See footnote Table 4.1.