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Tangos, Sambas or Belly Dancing? Or, do Spreads Dance to the Same Rhythm? Signaling Regime Sustainability in Argentina, Brazil and Turkey

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Tangos, sambas or belly dancing? Or, do spreads dance to the same rhythm? Signaling regime sustainability in Argentina, Brazil and Turkey[1]

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Abstract

This paper examines the role of primary fiscal balances as a signaling device in a world in which investors are uncertain about the sovereign's commitment to honor its obligations. Based on the Drudi-Prati model that rationalizes delayed stabilization and debt accumulation, we verify the existence of a rating (sovereign spreads) function that depends negatively (positively) on the debt ratio and negatively (positively) on the primary balance. This relationship, however, is non-monotonic and is conditioned on a threshold debt level. At low debt levels, the primary balance has an ambiguous relationship with sovereign spreads, but as debt increases, the primary balance's effect on spreads is magnified. Beyond a given threshold, the committed sovereign has the incentive to tighten fiscal policy, while the weak government does not. Using data for Argentina, Brazil, and Turkey, for the period 1994-2007, we show that during their most recent crises, Brazil and Turkey can be characterized as dependable (in Drudi-Prati's terminology), while Argentina's incentives to use the primary balance in the late nineties were not as determinant. The explanatory power of the model improves by allowing heteroskedasticity in the shocks to each country and heterogeneity across countries in the coefficient estimates. Hence, though spreads react to debt levels and to primary balances in these countries, they do so with different intensity.

[1] The authors thank Alice Kuegler, Ernesto Rezk, and Sweder van Wijnbergen for comments to a previous draft of this paper. The findings, interpretations and conclusions are those of the authors, and do not necessarily represent the views of The World Bank or the Central Bank of the Republic of Turkey. The title paraphrases the Aiyagari (1988) paper on the stock market.

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I. Introduction

How do governments that are not fully credible signal regime sustainability? This paper seeks to answer this question analyzing the experiences of Argentina, Brazil and Turkey confronting their macroeconomic crises during the last decade. We use the Drudi-Prati (2000)[4] model that rationalizes debt accumulation and delayed stabilization. This model postulates the existence of two types of government – dependable or weak- and investors do not know the true type of the sovereign. Dependable governments effectively change the primary balance as part of a stabilization package of after the debt has reached a threshold, while weak governments do not. At low debt levels and low cost of debt issuance, both types of governments may issue debt and there is no discernible relationship between fiscal discipline (primary balance) and the country rating (sovereign spread). But as debt accumulates and spreads are high in tight international financial conditions, the primary balance becomes a signaling tool that strong governments use to signal their commitment to pay their obligations. At high debt levels and high cost of debt, weak governments cannot issue new debt and default.

The main testable implication of the model is the existence of relationship between the sovereign spreads, the debt level and the primary balances, which evolves through time as debt accumulates. In particular, the primary balance's impact on sovereign spreads is enhanced when debt exceeds a threshold or during a stabilization plan, if the government is dependable.

This paper tests the validity of this hypothesis in Argentina, Brazil and Turkey. Our results verify the positive relationship between spreads and debt to GDP ratios, a negative correlation between primary balances to GDP ratios and spreads, and an amplified effect of the primary balance during stabilization periods in two of the countries (Brazil and Turkey). These results are robust even when we control exogenous individual country risk and use panel and pooled estimation techniques.

The next section presents stylized facts of public debt, the primary balance, and sovereign spreads in the three countries, and a summary of the Drudi-Prati model. The third section presents the econometric results and the last section concludes.

II. Stylized Facts and the model

A. Stylized facts

Argentina, Brazil and Turkey experienced macroeconomic crises in the period 1999 - 2002. In 2000, they had similar public debt ratios, as shown in Table 1. However, other public finance indicators revealed significant differences. For instance, interest payments in Argentina were slightly above 3 percent of GDP, while Turkey's were about 16% of GDP. While the primary balance in Argentina was close to zero, in Brazil it was 3.6% of GDP, and in Turkey it was about 5 Percent of GDP. However, it was Argentina that suffered a major debt crisis that ended with repudiation. Can

[4] Drudi, F. and A. Prati (2000) Signaling fiscal regime sustainability, European Economic Review, 44 pp. 1897-1930.

fiscal variables help explain the different fortunes? Our hypothesis is that, it can, once you consider a longer history of both public debt ratios and primary balances[5].

[Insert Table 1 here]

During the early 1990s, Argentina made progress in basic reforms of privatizations, partial deregulation, pension reform, financial liberalization and trade liberalization that led to a surge of capital inflows and a real exchange appreciation. However, rising primary expenditures of the public sector implied a rising public debt stock as shown in Graph 1. The contagion effects of "Tequila Crisis" and the South East Asian crisis of late 1990s increased country risk premium and further worsening of the public debt to GDP ratios. The confidence crisis coupled with political instability and lack of commitment to reforms culminated in a debt default and the abandonment of the fixed parity with the dollar.

[Insert Graph 1 here]

In the late nineties and early 200os Brazil suffered two crises. The first one, in 1999, derived from the contagion from the Russian default coupled with a rigid exchange rate and fiscal policy. When the currency was allowed to float and the primary balance increased, the economy stabilized. The second crises derived mostly from political uncertainty during the electoral campaign, which raised concerns about the candidates' commitment to fiscal prudence, causing a run on the public debt and on the currency. Only when the elected president gave assurances of its commitment to fiscal discipline, raised the targets for the primary balance, and announced technocrats to run the central bank and ministry of finance, the economy stabilized. Blanchard (2005) and Favero and Giavazzi (2005) describe this period of adjustment. After the elections the commitment to tight fiscal policy continued (Graph 1) – and reform of the social security system did well to anchor expectations. Spreads[6] on sovereign debt are crucial determinants of the nominal exchange rate in Brazil (Bacen, 2001)[7] and via this route on domestic interest rates. What is their relationship with fiscal variables? Primary balances and spreads in Brazil show a non-stable relationship (Graph 2): From 1994 to 1998, when fiscal balances deteriorated, but debt levels were not excessively high, spreads declined. And after 1999, when fiscal balances improved, spreads decreased.

[Insert Graph 2 here]

Turkey's case is similar to both Argentina and Brazil. Turkey's debt level is the highest among the three prior to the financial crisis of 2001 (Graph 1) and interest payments are significantly higher as well (Table 1). The exchange rate depreciation during the crisis played a major role in the accumulation of debt due to foreign

[5] It is possible to argue that the flexibility of the exchange rate played a major role. Though that may be true, that line of reasoning is moderated by the fact that external sustainability indicators (debt service to exports) were similar for both Argentina and Brazil. Additionally, given the flexible exchange rate and the dollar-indexing of domestic debt in Brazil and Turkey, the government's cash flow (debt service) was subject to exchange rate risk in these countries..

[6] We used Emerging Markets Bond Index (EMBI) Global Spreads published by JP Morgan.

[7] Bacen, Modeling Exchange Rate and Risk Premium. Inflation Report, December 2001.

currency denominated debt was a significant portion of total public debt.[8] Moreover, interest payments rose to over 20 percent of GDP in 2001 (Table 1). Since then, the primary balance has averaged 5 percent of GDP (Graph 1). We also observe a non-monotonic relationship between the primary surpluses and the spreads in Turkey: from 1998 to 2001 both spreads and primary balances move together, but only when the fiscal adjustment is consolidated and primary balances rise even more do spreads decline (Graph 2). Along with nominal appreciation of the Turkish Lira these two variables helped for a reduction in the public debt stock to GDP from almost 100 percent to 50 percent levels by 2007.

Drudi and Prati described this non-monotonic relationship for some European countries (Graph 3)[9]. The relationship between public debt and spreads is also non-monotonic. From 1994 –1997, when the debt ratio is low and slightly rising, spreads fell. But from 1999 onwards spreads seem to have settled in a higher plateau as well as debt ratios (Graph 4). Drudi and Prati described the same phenomenon for the European countries. At first glance, and judging by resilience of the debt-to-GDP ratio to decrease, the Italian and Belgian cases appear more similar to the emerging economies we are considering. It is worthwhile noting the size of the primary balances that these countries generated before the credit ratings improved; Italy's primary balance surpassed 6% of GDP while Belgium's oscillated in the 4% - 6% of GDP range before the ratings stabilized in a higher plateau.

[Insert Graphs 3 & 4 here]

[8] Prior to the crisis, around 40 percent of the total debt stock was denominated in foreign currency. And during the crisis a doubling of the exchange rate resulted in a significant rise in the total debt stock. Another reason for the rapid accumulation of debt was the consolidation of operational deficits of public bank's and issuing bonds to match the deficits of these institutions.

[9] Drudi and Prati use Institutional Investor ratings for the European countries, while we use sovereign spreads. The two are inversely related; hence the graphs show a different relationship among the variables. Our econometric results, resented later, show opposite sign as those reported by DP, given the inverse relationship between the sovereign spreads and the ratings. Alessandro Prati kindly provided the data for the European countries.

B. Description of the Drudi-Prati (DP) model

The DP model rationalizes why governments delay stabilization, within a framework that sets governmental decisions as results of the balancing the benefits of postponing adjustment and costs of fiscal adjustment. The basic features of the model are the following:

There are two types of government: dependable governments (D type) that will never default, or a weak (W type) one that cannot pre-commit not to default. Agents are uncertain regarding the nature of the government. This uncertainty allows a weak government to issue debt and mimic dependable government policies in certain circumstances. The choice of default depends on balancing the benefits of being able to issue new debt and the costs of undertaking fiscal adjustment. The benefits of issuing new debt depend on the benefits of public spending, which in turn depend on the productivity of public spending, on the amount of government spending. The cost of fiscal adjustment depends on the marginal cost of public funds, with higher costs implying that it losses to society will be bigger with more taxes, and hence, the weak government will be less likely to do the adjustment. The initial level of public debt and interest rates will also affect the decision of issuing new debt or defaulting, as higher debt levels or higher interest rates will imply higher future taxation, and hence the higher the cost of issuing debt and the less likely that the weak government assumes the cost of adjustment.

The model predicts two types of equilibria: One, a pooling equilibrium, generally prevailing at low interest rates and small debt ratios, in which, initially, all governments tend to run primary deficits and weak governments default when debt matures. The other equilibrium, prevailing when debt ratios are large and the cost of borrowing is high, is characterized by dependable governments generating a primary balance surplus to signal their true type and weak governments defaulting because the cost of mimicking dependable governments is too high.

The DP model predicts that both primary fiscal balances and public debt ratios enter into the rating (spreads) function, and that the primary balance has a larger determinant role when debt ratios are high. Other models with exogenous shocks to interest rates (Missale, 1997) or to public expenditure (Calvo and Guidotti, 1990) generate defaults because of the uncertainty of a large enough shock that may cause even a dependable government to default. In the DP model, for a given distribution of shocks, the likelihood of default increases with the debt ratio and with the primary deficit.

The three testable implications of the DP model, which we verify econometrically in the next section, are:

1. Debt ratios and primary balances are complimentary in the spreads function.
2. The primary balance's signaling role increases with the debt ratio.
3. If the government is dependable, then the primary balance will increase when the debt ratio increases.[10]

[10] This is the same test proposed by Bohn (1998) to verify sustainability of the fiscal regime.

The changing nature of the signaling ability of primary balances is captured by two alternative ways: One, by defining a dummy variable that has a value of one during a specific adjustment period when a stabilization plan is adopted, and zero otherwise. During this period the government signals its true type. The dichotomous variable is interacted with the primary balance to create an auxiliary variable. If it is statistically significant (with negative sign), the result is interpreted as the primary balance having a larger impact on the spreads during the adjustment period, implying that the government reacts to the incentives and assumes the cost of adjustment during this period. An alternative testing procedure defines the signaling period as the deviation of the debt level from the period average; hence, the variable is continuous rather than dichotomous, and is not subject to an arbitrary definition of the signaling period. Again, this variable is interacted with the primary balance, with a similar interpretation as before.[11]

III. Econometric Results

This section verifies the three testable implications using individual country data, as well as pooling it. Given quarterly data availability for Argentina and Brazil since 1994, but for Turkey only since 1998, the Turkey results are only reported in the panel context. The panel regressions are allowed to have a correlated error across countries, and we allow for heterogeneity in the estimated coefficients.

Initially we replicate the Drudi-Prati estimation procedure, but we also added a variable to control for omitted variables bias, that captures exogenous shocks – which we call the variable orthogonalized composite risk. Since this variable is orthogonalized with respect to risks associated with budget balance and public debt stock, it mostly reflects political uncertainty.[12]

A) Brazil

Following DP, we ran a regression[13] of spreads as a function of (lagged) primary balances and debt ratios. Table 2 (Model 1) shows that, effectively, both variables enter significantly in the spreads function[14] with the expected signs.

[Insert Table 2 here]

[11] Specifications for the regressions are provided in the Appendix.
[12] The regressions used to orthogonalize variables are given in the Appendix.
[13] To isolate the credit risk exclusively associated with Brazil, we orthogonalized the Brazil risk from the rest of the Latin countries by regressing the Latin aggregate spreads onto the Brazil spreads and taking the residuals. Details are provided in the appendix.
[14] All our variables were I(1) and we were unable to reject the cointegration hypothesis. The cointegrating vector coefficients estimated by the Johansen method were slightly different than the OLS coefficients reported in the tables, but we maintained these facilitate comparison with Drudi-Prati's results. The regressions included lagged values of the independent variables to minimize endogeneity bias. As mentioned, the Cointegration analysis eliminates this problem, and results are qualitatively identical as those reported in the text.

For the first signaling option (dummy variable), the signaling period begins in June 1999, when the inflation-targeting framework was adopted, the currency floated, and primary balances were on the rise, until the present. Since this auxiliary variable is significant (Table 2, model 2), we conclude that the primary balances affected spreads in a more significant way during this signaling period. The alternative test (Table 2, model 3) shows identical results.

Finally, the third testable implication of the DP model postulates that, if the government is dependable, the primary balance should increase as the debt ratio increases. The second panel of Table 2 summarizes the results. The value of the coefficient for Brazil, 0.17, is close to the lower-end that of those reported by Drudi-Prati for European countries, ranging from 0.14 to 0.24. Not surprisingly, the countries with the lowest coefficients were Italy and Belgium. The explanatory power of the debt ratio as determinant of the primary balance is significant, as reflected by the R^2 (.43). This value is similar to Drudi-Prati's result for Ireland, but lower than the other European countries.

B) Argentina

Argentina's experience contrasts markedly with Brazil's during the nineties. The primary balance in both countries was similar until 1999, when debt ratios rose in both countries, as shown in Graph 1. Primary balances turned into significant surpluses only in Brazil, as predicted by the Drudi-Prati model for the dependable government.

Table 2 shows the results of the signaling exercise for Argentina using quarterly data for the period 94.4 –2001.4 (period prior to the default) we conclude the following:

1. Both the debt ratio and the primary balance enter into the spreads function with the correct signs (i.e. spreads increase with the debt ratio and decrease with primary balances).
2. Primary balances in Argentina did not play a signaling role as the debt ratio increased (Table 2 – Model 2)[15] in 1999
3. Higher debt ratios are associated with a higher primary balance (Table 2 – Model 3) though at a low significance level and the value of the coefficient is extremely low when compared with Brazil and the OECD countries. The debt ratio has a low explanatory power of the variability of the primary balance, based on the low R^2 statistic (.06).

The same exercise was done pooling the data for both Argentina and Brazil for the period 1994-2001 and results did not change. First we imposed coefficient homogeneity (Table 3) and results were verified jointly for both countries. Allowing coefficient heterogeneity (Table 3A), allows verifying the credibility of the Brazilian signaling and the insignificance of the primary adjustment in the Argentinean case.

[Insert Tables 3 & 3A here]

[15] The signaling period began in 1999 and ended in 2001:4.

Argentina's lack of fiscal adjustment in the nineties, contrasts with its post-default plan to sustain an undervalued currency. To examine the role of the primary balance in this longer horizon (1994-2007) we changed the signaling period to begin in June 2004. Table 4 shows that, in the complete period, there is some role for the primary balances, that is enhanced when the dummy model (model 2) is considered, lending some support to the credibility of the package. However, when the alternative signaling variable "debtdev"[16] is considered, it has the opposite sign yielding ambiguous results in this case.

[Insert Table 4 here]

The entire sample period is rather volatile for emerging economies, with other types of factors affecting the confidence of investors besides the purely fiscal variables. In that sense, the previous estimations can be subject of the omitted variable bias. To control for this possibility, we augmented the model with the "Composite Risk" indicator published by Political Risk Services (PRS). A rise in this index is interpreted as a general decrease in overall risk level.[17] We orthogonalized the Composite Risk indicator with respect to budget and debt dynamics. Details are relegated to the appendix. Graph 5 displays the evolution of the variable over the sample period for each country.

[Insert Graph 5 here]

We include the composite risk variable in models 2 and 3 indicated above (original Drudi-Prati formulation). Models 4 and 5 described in what follows are the regressions controlling for the exogenous political risk.

C) Turkey

Turkey has a long history of primary surpluses with two distinct periods as shown in Graph 1. The first one, prior to 2001, in which the primary surplus was volatile and low; the second one, beginning with the 2001 crisis, in which primary balances are much higher and with a stable rising trend. The average primary surplus was about 5 percent of GDP. Moreover, the debt ratio in Turkey is larger than both Argentina and Brazil during the entire sample period. Graph 2 reveals the non-monotonic relationship between the sovereign spread and the primary balance.

For the entire sample from 1998 to 2007 the debt ratio and primary balance enter into the regressions with the expected signs (Table 5). Moreover, when we include the post – crisis-signaling period for the primary balance, the explanatory power of the regressions increases and the signaling variable is dominant over the primary balance for the entire period. The introduction of composite risk enhances the explanatory power, as in Argentina and Brazil (Table 6, Models 4 and 5). We also document the significant positive relationship between the debt ratio and primary balances in

[16] $Debtdev_t = Debt_t - \sum_{t=1}^{T} Debt_t \,/\, T$

[17] The Composite Risk indicator is a summary of political, economic and financial risk that includes variables like government stability, risks for budget balance, current account, debt service, exchange rate stability, foreign debt and international liquidity.

Turkey (second panel of Table 6), with the value of the coefficient being an intermediate level between the high case of Brazil and the low extreme of Argentina.

D) System Estimations

Table 5 shows the results for the three-country panel for the entire sample period (unbalanced panel)[18] assuming homogeneity in the coefficients using fixed effects panel estimation. These results confirm previous findings of the growing importance of the primary balance as the debt ratio increases.

Table 6 relaxes the homogeneity assumption and estimates heterogeneous coefficients for each country. Models 4 and 5 (last two columns) show that in both Brazil and Turkey the signaling effect is verified regardless of the signaling variable utilized. In Argentina, results are ambiguous.

[Insert Tables 5 & 6 here]

IV. Conclusions and policy implications

Our results show that the primary balance is an important signaling device for a sovereign to convey to investors its commitment to honor its obligations. The tool is especially valuable when the debt level has exceeded a certain threshold, or when interest rates are high, because in those circumstances the committed but non-fully credible government can show that it is willing to forgo the benefits of additional public spending to fulfill its future debt obligations.

The Brazilian and Turkish management of the primary fiscal balance during their crises turned out to be a major differentiating factor from Argentina. Credibility of the reform packages is an essential element for successful stabilization, and the primary balance is one of the few variables under the government's control to signal its flexibility to adjust.

[18] The panel is unbalanced as Turkey sovereign spreads are only available since 1998. The system of equations used the White method to compute the standard errors which is robust to cross- equation contemporaneous correlation and heteroskedastictiy across countries.

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Appendix : Model Specification

1. Orthogonalization of Spreads and the Composite Risk Variable

For individual regressions and pre-crisis Argentina and Brazil pooled regressions we used Orthogonalized Spread as the endogenous variable. For both Argentina and Brazil we ran the following regression and obtained the residuals to represent orthogonalized spreads for the 1994 – 2007 period. Spread data is the EMBI Global published by JP Morgan.

a. $$Spread_t^{ARG,BRA} = \gamma_0 + \gamma_1 Spread_{Latin} + resid^{ARG,BRA}$$

For Turkey, orthogonalized spreads are the residuals of the following regression.

b. $$Spread_t^{TUR} = \gamma_0 + \gamma_1 Spread_{Global} + resid^{TUR}$$

Since we control for risks associated with budget balance and debt stock, we need to extract only the risks exogenous to these two variables. Political Risk Services (PRS) survey includes a composite risk variable for each country and detailed risks associated with indicators ranging from government stability, to budget to exchange rates etc. Therefore, orthogonalized composite risk is the residuals from the following regressions where $Risk_j$ for j: Budget, Debt are the variables that control for risks associated with budget balance and debt stock. Details of the variables can be found at PRS website at http://www.prsgroup.com/

c. $$Composite_t^{ARG,BRA,TUR} = \eta_0 + \eta_1 Risk_{Budget} + \eta_2 Risk_{Debt} + resid^{ARG,BRA,TUR}$$

2. Complementary Roles of Debt and Primary Balances as Spreads

Variables: D/Y is the debt to GDP ratio, PB/Y is the primary balance to GDP ratio, DSIG is a dummy variable that takes one during the signaling period, Ddev is the deviation of debt from its average value within the sample period as explained in footnote 16, X is the orthogonalized composite risk variable as explained in item number one above, epsilons are error terms, t are time subscripts and alpha's are parameters.

Model 1 $$Spread_t = \alpha_0 + \alpha_1 \left(D/Y\right)_{t-1} + \alpha_2 \left(PB/Y\right)_{t-1} + \varepsilon_t$$

Model 2 $$Spread_t = \alpha_0 + \alpha_1 \left(D/Y\right)_{t-1} + \alpha_2 \left(PB/Y\right)_{t-1} + \alpha_3 \left(DSIG*PB/Y\right)_{t-1} + \varepsilon_t$$

Model 3 $$Spread_t = \alpha_0 + \alpha_1 \left(D/Y\right)_{t-1} + \alpha_2 \left(PB/Y\right)_{t-1} + \alpha_3 \left(PB*Ddev/Y\right)_{t-1} + \varepsilon_t$$

Model 4 $$Spread_t = \alpha_0 + \alpha_1 \left(D/Y\right)_{t-1} + \alpha_2 \left(PB/Y\right)_{t-1} + \alpha_3 \left(DSIG*PB/Y\right)_{t-1} + \alpha_4 X_t + \varepsilon_t$$

Model 5 $$Spread_t = \alpha_0 + \alpha_1 \left(D/Y\right)_{t-1} + \alpha_2 \left(PB/Y\right)_{t-1} + \alpha_3 \left(PB*Ddev/Y\right)_{t-1} + \alpha_4 X_t + \varepsilon_t$$

3. Primary Balances and Debt Ratios

The specification, although may change slightly due to the estimation method used, is basically the following describing the contribution of debt to the change in the primary balance. It presents how likely the governments run primary surpluses for a growing stock of government debt.

$$PB_t = \beta_0 + \beta_1 \left(D/Y\right)_{t-1} + \varepsilon_t$$

4. Panel Regression

We used Efficient Generalized Least Squares (EGLS) with Cross-section weights for panel estimations. Total periods included: 55 with 3 cross-section units with a total panel of (slightly) unbalanced observations. We conducted linear estimation after one-step weighting matrix and corrected the errors with White diagonal standard errors & covariance (d.f. corrected). Modeling and error specifications for estimation are given below. Variables are explained on item two above, where the *i* subscript indicates the cross section.

Model 1 $Spread^{orth}_{t,i} = \alpha_0 + \alpha_1 \left(D/Y \right)_{t-1,i} + \alpha_2 \left(PB/Y \right)_{t-1,i} + error_t$

Model 2 $Spread^{orth}_{t,i} = \alpha_0 + \alpha_1 \left(D/Y \right)_{t-1,i} + \alpha_2 \left(PB/Y \right)_{t-1,i} + \alpha_3 \left(DSIG*PB/Y \right)_{t-1,i} + \varepsilon rror_t$

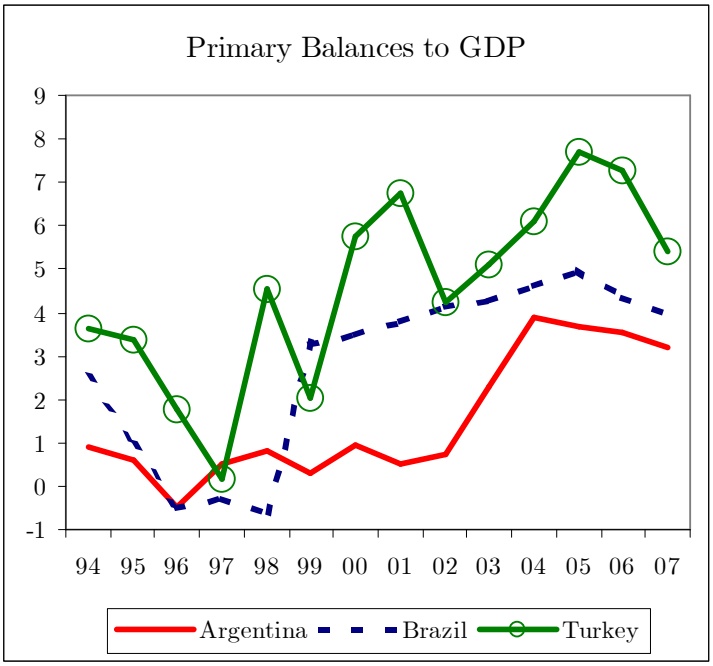
Model 3 $Spread_{t,i} = \alpha_0 + \alpha_1 \left(D/Y \right)_{t-1,i} + \alpha_2 \left(PB/Y \right)_{t-1,i} + \alpha_3 \left(PB*Ddev/Y \right)_{t-1,i} + \varepsilon rror_t$

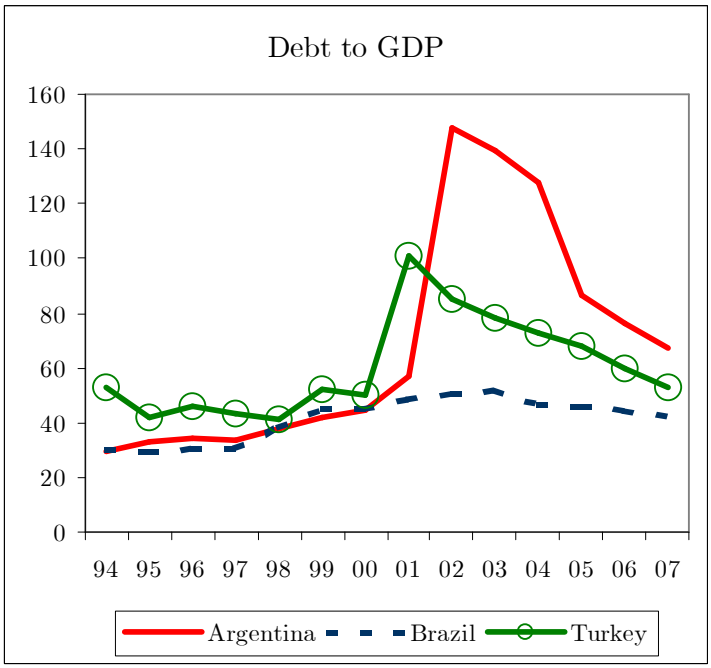
Model 4 $Spread_{t,i} = \alpha_0 + \alpha_1 \left(D/Y \right)_{t-1,i} + \alpha_2 \left(PB/Y \right)_{t-1,i} + \alpha_3 \left(DSIG*PB/Y \right)_{t-1,i} + \alpha_4 X_{t,i} + \varepsilon rror_t$

Model 5 $Spread_{t,i} = \alpha_0 + \alpha_1 \left(D/Y \right)_{t-1,i} + \alpha_2 \left(PB/Y \right)_{t-1,i} + \alpha_3 \left(PB*Ddev/Y \right)_{t-1,i} + \alpha_4 X_{t,i} + \varepsilon rror_t$

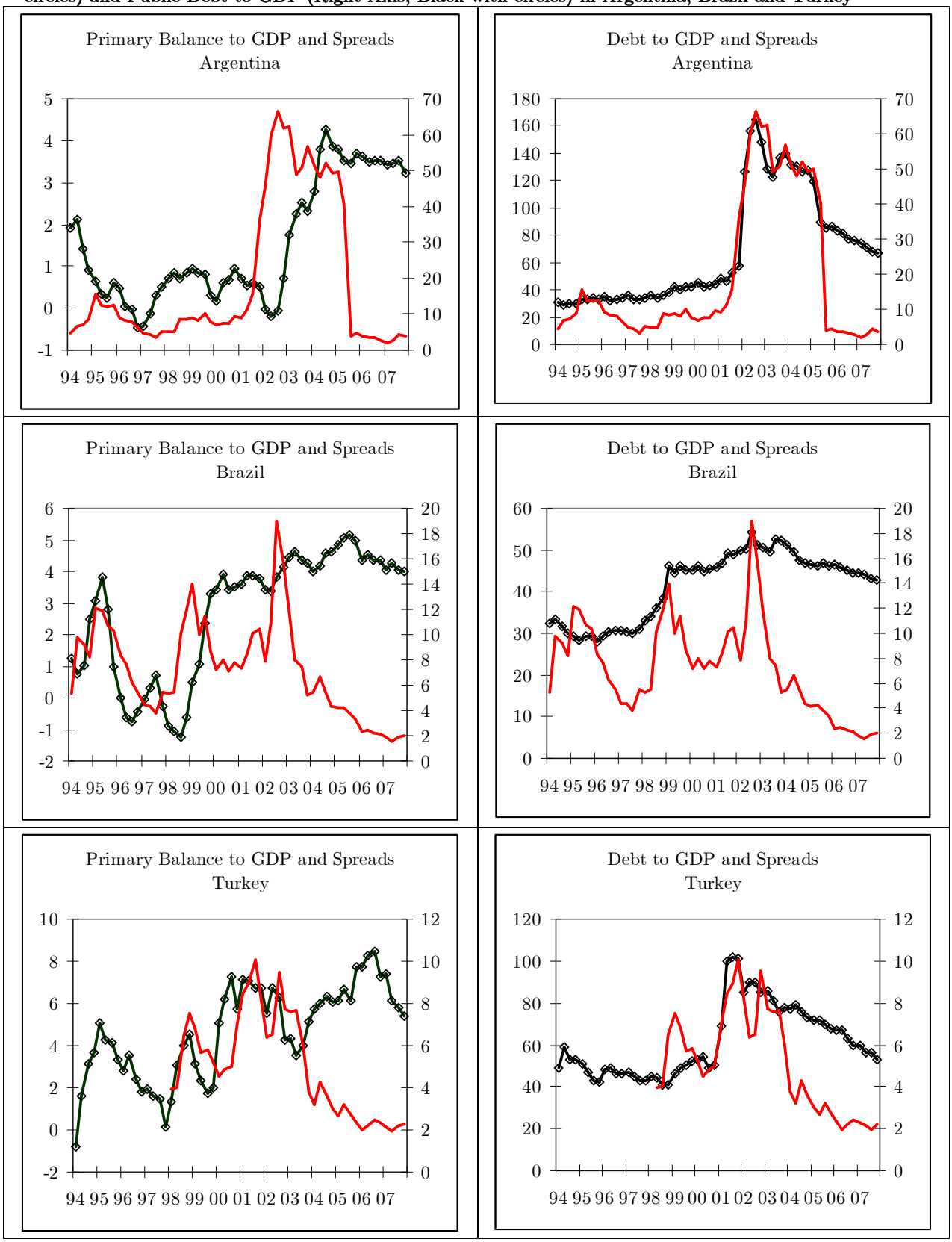
Error specification $error : \varepsilon_t + u_i + v_{i,t}$, where ε_t, and u_i are time and cross section specific errors, and $v_{i,t}$ varies in both time and cross section.

Graph 1
Primary Balances and Debt Ratios in Argentina, Brazil and Turkey
(Argentina, solid line: Brazil, dashed line, Turkey: solid line with dots)

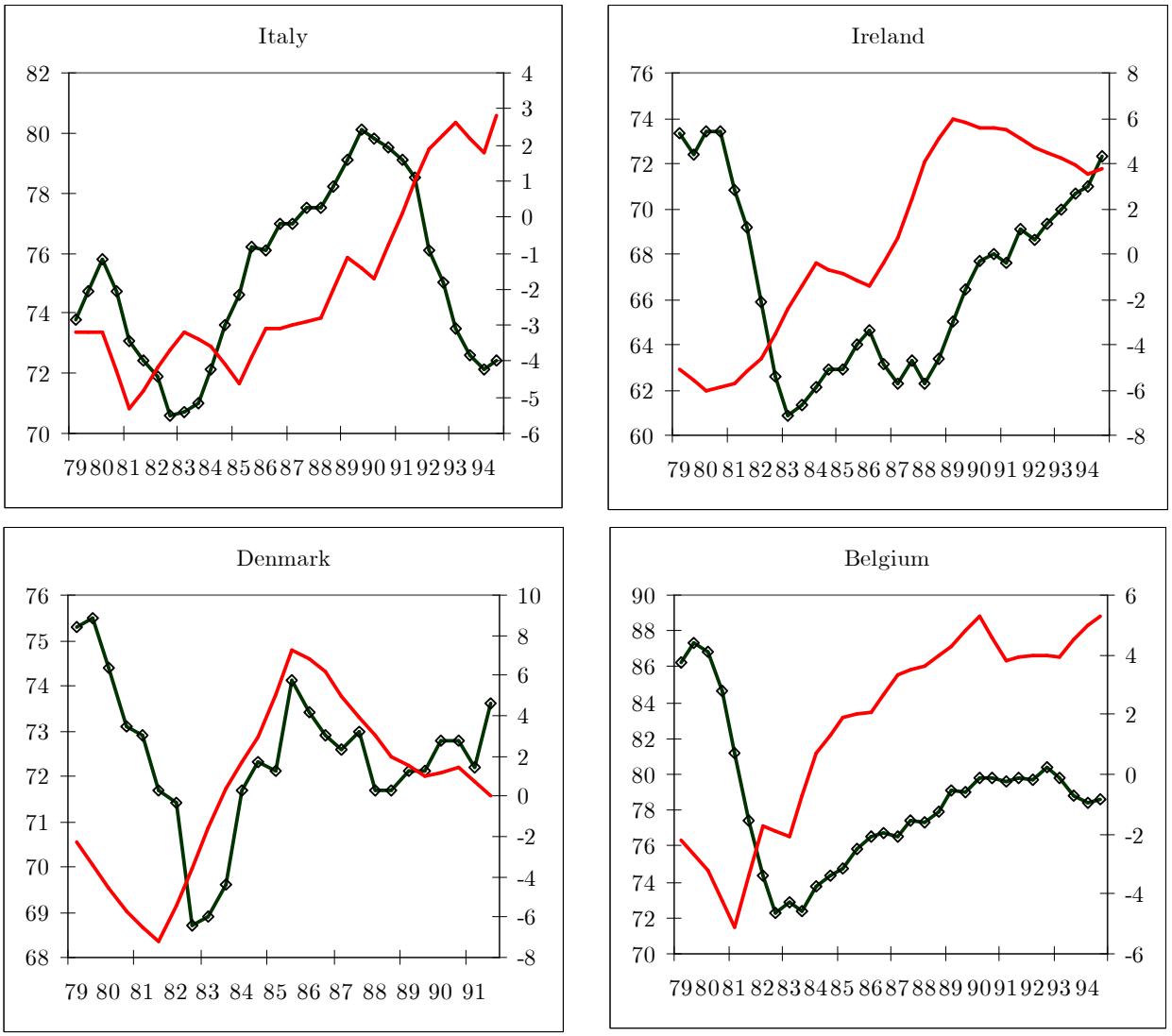




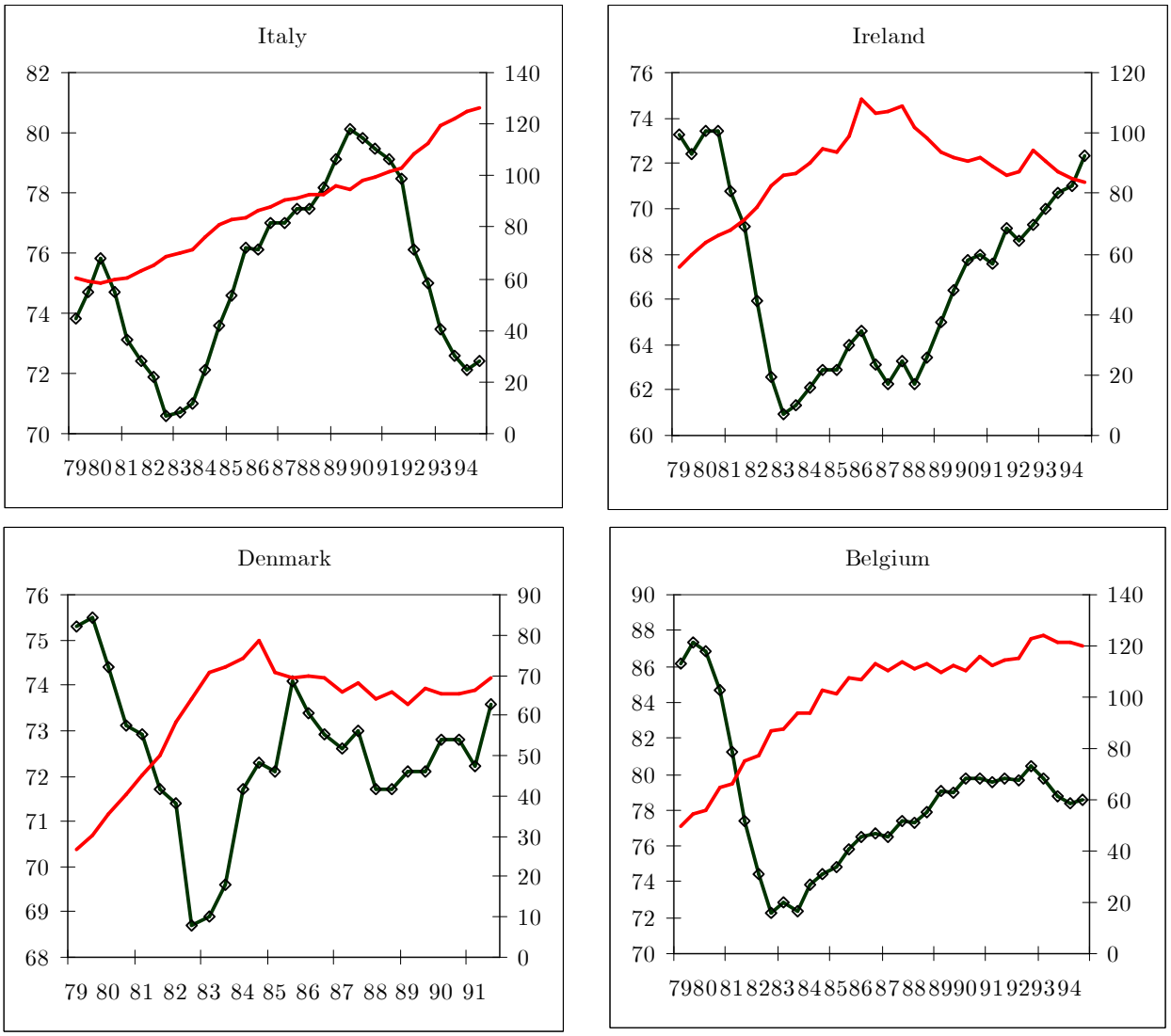
Graph 2
EMBI Global Spreads (Left Axis, Red solid line), Primary Balances to GDP (Right Axis, Black with circles) and Public Debt to GDP (Right Axis, Black with circles) in Argentina, Brazil and Turkey



Graph 3
Ratings and Primary Balances in European Countries
Primary Balances to GDP (Red - Left Axis), Ratings (Blacks)



Graph 4
Ratings and Public Debt (% of GDP) in European Countries
Public Debt to GDP (Red - Left Axis), Ratings (Blacks)



Graph 5
Overall Risk Indicators in Argentina, Brazil and Turkey

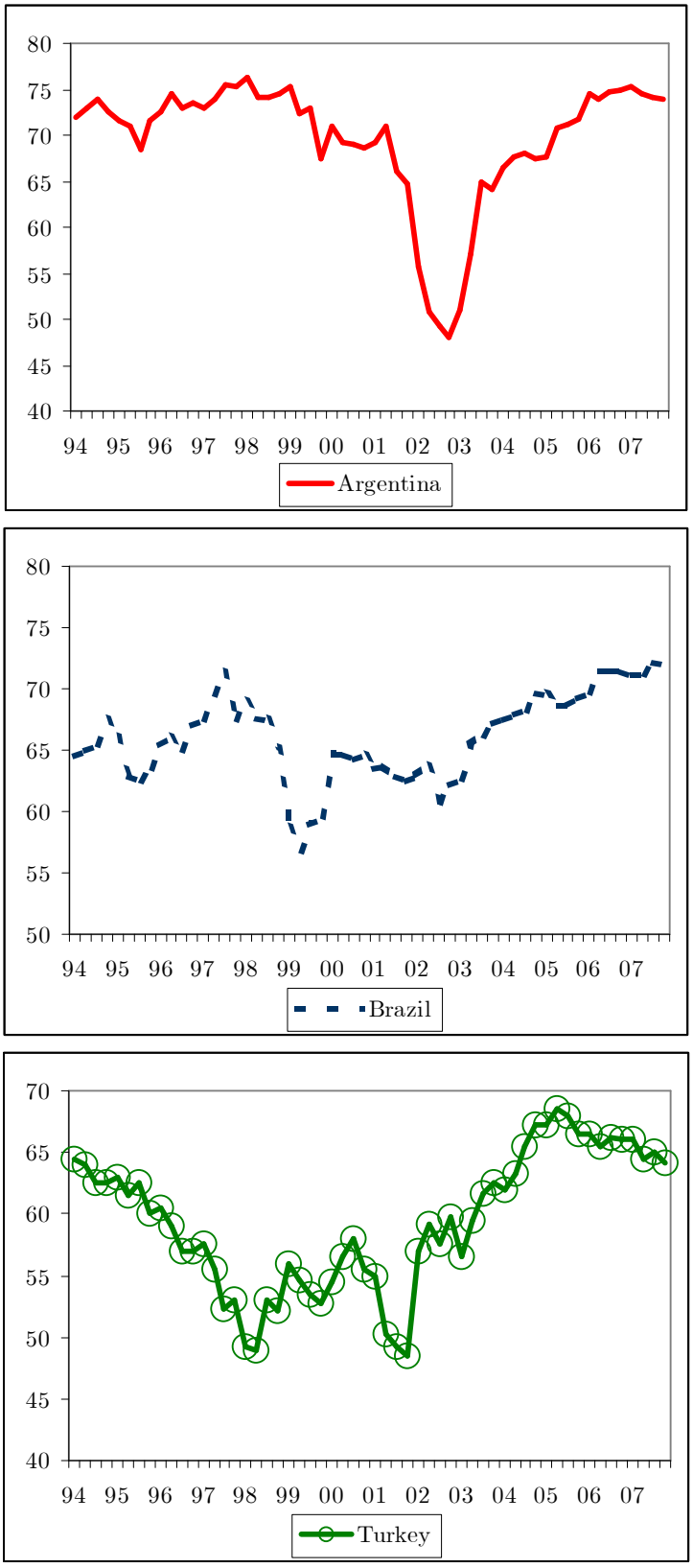


Table 1
Summary of Public Debt Indicators in Argentina, Brazil and Turkey 2000-2001

	Argentina		Brazil		Turkey	
	2000	2001	2000	2001	2000	2001
Public Debt (% of GDP)	45.0	57.3	45.4	48.8	50.0	101.0
Interest payments (% of GDP)	3.4	3.6	7.2	7.3	16.3	22.2
Interest/ tax revenue (%)	23.7	25.9	30.9	29.8	77.1	103.3
Interest/current revenue (%)	17.2	18.8	18.0	16.5	53.4	70.2
Overall fiscal balance (% of GDP)	-2.4	-3.1	-3.6	-3.6	-10.9	-15.6
Primary fiscal balance (% of GDP)	0.9	0.5	3.6	3.7	5.3	6.7

Table 2
Complementary Roles of Debt and Primary Balances as Spreads Determinants in Argentina and Brazil - Quarterly Data 1995-2001

Orthogonalized Spreads

Model 1

	cons	α_1	α_2	R^2
Argentine	-37.60*	0.74*	-5.38*	0.50
1995:Q1-2001:Q4	(8.89)	(0.25)	(1.39)	
Brazil	-6.53*	0.19*	-0.60*	0.72
1995:Q1-2001:Q4	(0.71)	(0.02)	(0.08)	

Model 2

	Cons	α_1	α_2	α_3	R^2
Argentine	-37.23*	0.73***	-5.40*	0.27	0.48
1995:Q1-2001:Q4	(13.16)	(0.38)	(1.23)	(3.49)	
Brazil	-6.99*	0.21*	-0.56*	-0.11	0.71
1995:Q1-2001:Q4	(1.00)	(0.03)	(0.10)	(0.12)	

Model 3

	Cons	α_1	α_2	α_3	R^2
Argentine	-21.59	0.28	19.86	0.78	0.52
1995:Q1-2001:Q4	(14.62)	(0.42)	(16.80)	(0.50)	
Brazil	-7.72	0.23	-0.69	-0.02	0.72
1995:Q1-2001:Q4	(1.32)	(0.04)	(0.09)	(0.01)	

Primary Balances and Debt Ratios

	β_0	β_1	R^2
Argentine	-0.31	0.02	0.06
1995:Q1-2001:Q4	(0.59)	(0.01)	
Brazil	-4.66**	0.17*	0.43
1995:Q1-2001:Q4	(2.14)	(0.05)	

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.

Table 3
Complementary Roles of Debt and Primary Balances as Spreads
Determinants in Argentina and Brazil - Pooled Quarterly Data 1994Q2-2001Q4
Homogenous Coefficients

Spreads

	Model1	Model2	Model3
Constant	4.53	-4.87	-6.85
	(3.50)	(4.87)	(4.48)
$Debt_{t-1}$	0.11	0.38*	0.41*
	(0.10)	(0.14)	(0.13)
$Primary_{t-1}$	0.13	1.15*	-0.67***
	(0.40)	(0.34)	(0.40)
$Dsig_{t-1}*pb_{t-1}$		-2.44*	
		(0.66)	-0.14*
$Debtdev_{t-1}*pb_{t-1}$			(0.04)
Fixed effects	0.46	-0.23	-1.33
	-0.46	0.23	1.33
R^2	0.03	0.27	0.27
T	62	62	62

Primary Balances and Debt Ratios

	PB_t
constant	-0.72
	(0.74)
$Debt_{t-1}$	0.05*
	(0.02)
Fixed effects	-0.49
	0.49
R^2	0.20
T	62

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.

Table 3A
Complementary Roles of Debt and Primary Balances as Spreads
Determinants in Argentina and Brazil - Pooled Quarterly Data 1995-2001
Heterogeneous Coefficients

Spreads

		Model1	Model2	Model3
constant		-1.36	-9.58	-7.92
		(5.98)	(9.40)	(9.63)
$Debt_{t-1}$	Arg	0.47	0.62	0.48
		(0.31)	(0.50)	(0.53)
	Bra	0.04	0.39**	0.43*
		(0.08)	(0.16)	(0.13)
$Primary_{t-1}$	Arg	1.91**	2.35***	1.59
		(0.89)	(1.28)	(14.30)
	Bra	0.26	1.18*	-0.69
		(0.38)	(0.34)	(0.43)
$Dsig_{t-1}*pb_{t-1}$	Arg		-3.47	
			(5.24)	
	Bra		-2.53*	
			(0.82)	
$Debtdev_{t-1}*pb_{t-1}$	Arg			-0.01
				(0.40)
	Bra			-0.17*
				(0.04)
Fixed effects				
	Arg	-8.01	-4.87	-1.67
	Bra	8.01	4.87	1.67
R^2		0.39	0.62	0.31
T		62	62	62

Primary Balances and Debt Ratios

		PB_t
$Debt_{t-1}$	Arg	0.00
		(0.01)
	Bra	0.16*
		(0.03)
Fixed effects		
	Arg	2.52
	Bra	-2.52
R^2		0.37
T		62

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.

Table 4
Complementary Roles of Debt and Primary Balances as Spreads
Determinants in Argentina - Quarterly Data 1994-2007
(Signaling period is 2004:Q2 – 2007:Q4)

Orthogonalized Spreads

Model 1

cons	α_1	α_2	R^2
-28.72	0.48	-2.46	0.87
(2.41)	(0.04)	(1.32)	

Model 2

Cons	α_1	α_2	α_3	R^2
-30.10	0.48	0.18	-2.60	0.87
(2.32)	(0.04)	(1.36)	(1.21)	

Model 3

Cons	α_1	α_2	α_3	R^2
-23.17	0.40	-3.80	0.08	0.90
(2.33)	(0.02)	(1.08)	(0.02)	

Primary Balances and Debt Ratios

β_0	β_1	R^2
0.20	0.02	0.3
(0.47	(0.01	

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.

Table 5
Complementary Roles of Debt and Primary Balances as Spreads
Determinants in Argentina, Brazil and Turkey – PANEL Quarterly Data 1994-2007

Spreads

Error specification $error : \varepsilon_t + u_i + v_{i,t}$

	α_0	α_1	α_2	α_3	α'_3	α_4	T	R2
Model 1	-4.43*	0.35*	-1.67*				150	0.62
	(1.63)	(0.03)	(0.22)					
Model 2	-8.83*	0.42*	0.70*	-2.59*			150	0.69
	(1.31)	(0.03)	(0.28)	(0.27)				
Model 3	-10.23*	0.47*	-1.48*		-0.06*		150	0.64
	(1.46)	(0.03)	(0.17)		(0.01)			
Model 4	-8.21*	0.41*	0.56**	-2.40*		-0.14	150	0.70
	(1.32)	(0.03)	(0.28)	(0.31)		(0.10)		
Model 5	-8.85*	0.43*	-1.29*		-0.05*	-0.35*	150	0.66
	(1.46)	(0.03)	(0.18)		(0.01	(0.07)		

Primary Balances and Debt Ratios

	PB_t
Cons	1.20*
	(0.34)
$Debt_{t-1}$	0.03*
	(0.01)
R^2	0.46
T	165

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are standard errors.

Table 6
Complementary Roles of Debt and Primary Balances as Spreads
Determinants in Argentina, Brazil and Turkey - POOLED Quarterly Data 1994-2007

Spreads

		Model1	Model2	Model3	Model4	Model 5
Constant		-0.24	-8.91*	-3.23	-7.93*	-5.60**
		(1.81)	(2.12)	(2.41)	(2.39)	(2.74)
$Debt_{t-1}$	Arg	0.51*	0.55*	0.44*	0.57*	0.45*
		(0.03)	(0.04)	(0.03)	(0.06)	(0.05)
	Bra	0.15	0.66*	0.61*	0.46*	0.47*
		(0.13)	(0.18)	(0.16)	(0.15)	(0.18)
	Tur	0.05**	0.10*	-0.01	0.13*	0.21*
		(0.02)	(0.03)	(0.07)	(0.02)	(0.05)
$Primary_{t-1}$	Arg	-5.58*	1.26	-6.96*	1.41	-6.91*
		(1.13)	(1.48)	(1.18)	(1.67)	(1.19)
	Bra	-0.91**	1.41*	-1.53*	0.69	-1.43*
		(0.45)	(0.33)	(0.39)	(0.45)	(0.46)
	Tur	-0.38**	0.30***	-0.32***	0.51*	0.01
		(0.17)	(0.18)	(0.19)	(0.15)	(0.16)
$Dsig_{t-1}*pb_{t-1}$	Arg		-7.21*		-7.47*	
			(1.54)		(1.72)	
	Bra		-4.22*		-2.80*	
			(0.86)		(0.86)	
	Tur		-0.71*		-0.72*	
			(0.21)		(0.13)	
$Debtdev_{t-1}*pb_{t-1}$	Arg			0.07*		0.06**
				(0.03)		(0.03)
	Bra			-0.17*		-0.12**
				(0.04)		(0.05)
	Tur			0.01		-0.03**
				(0.01)		(0.01)
$composite_{t-1}$	Arg				0.28	0.14
					(0.46)	(0.26)
	Bra				-0.39***	-0.53*
					(0.21)	(0.20)
	Tur				-0.26*	-0.38*
					(0.05)	(0.06)
Fixed effects						
	Arg	-6.54	-1.71	1.50	-4.67	2.70
	Bra	3.88	-4.54	-8.67	1.26	-1.29
	Tur	3.66	8.60	9.86	4.81	-1.94
R^2		0.71	0.70	0.68	0.78	0.69
T		150	150	150	150	150

- * 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.

Table 6 (continued)

Primary Balances and Debt Ratios

		PB_t
cons		-1.44*
		(0.45)
$Debt_{t-1}$	Arg	0.02*
		(0.01)
	Bra	0.19*
		(0.02)
	Tur	0.07*
		(0.01)
Fixed effects		
	Arg	1.64
	Bra	-3.78
	Tur	2.13
R^2		0.61
T		165

* 1% significance, ** 5% significance, *** 10% significance, Adjusted R^2's are used, figures in parenthesis are Newey-West corrected standard errors.