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Domestic vs. External Sovereign Debt
Servicing: An Empirical Analysis

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Domestic vs. External Sovereign Debt Servicing: An Empirical Analysis

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Abstract

This paper analyzes the incidence of domestic and external debt crises for a sample of 53 emerging economies between 1980 and 2005. Even though there is substantial time variation in the default rates during the period, sovereign default rates for domestic debts are typically lower than those for external debts. The incidence of both types of defaults is explained by means of the estimation of independent and simultaneous limited-dependent variable models. The results show that while there is considerable evidence that external defaults trigger domestic defaults, evidence for the reverse link disappears when default propensities are estimated in a simultaneous equation model.

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1 Introduction

Sovereigns may choose to raise funds domestically or abroad. In either case, the amount that creditors will be willing to bid for the sovereign's pledges of future disbursements will be a function of the likelihood that each group of creditors will eventually be repaid. While the sovereign debt literature has discussed the issues created by the weak enforcement mechanisms that characterize sovereign credit markets at length,¹ much less has been written on the distinction between domestic and foreign liabilities.² The empirical literature in particular has largely focused on external debts. Yet, many governments that default on their debts do so selectively: as this paper shows, only 12 out of 52 default episodes in emerging markets since the 1980s affected both, domestic and external debt instrument holders. The novelty of this study is to explore the determinants of both classes of default jointly and in a systematic way. For this I use domestic and foreign sovereign debt default data obtained from the rating agency Standard and Poor's. To the best of my knowledge this paper is the first to explore the inter-relation between both classes of defaults empirically. A sample containing 53 emerging markets for which Standard & Poor's sovereign credit ratings are available is used for this purpose. The findings of the paper suggest that domestic defaults are particularly hard to anticipate, even when indebtedness statistics are readily at hand. Moreover, I find that while there is considerable evidence that external

¹ See for instance Eaton and Gersovitz (1981), Bulow and Rogoff (1989), Delaume (1994) and the survey article of Eaton and Fernandez (1995).

² One important exception is the study of Drazen (1998).

defaults trigger domestic defaults, evidence for the reverse link disappears when default propensities are estimated in a simultaneous equation model. One possibility that is raised is that international creditors may have greater leverage in bringing in domestic creditors to share the costs of a default than the other way around.

Outline. The paper proceeds as follows: Section 2 discusses the sample selection, the dataset and the evolution of the global default rates over time. In Section 3, the determinants of defaults and the main findings based on the independent estimation of both types of default are presented. Section 4 discusses the econometric specification of the simultaneous estimation of the probability models and the estimation results. The conclusion outlines directions for further research.

2 Domestic vs. External Default Rates

2.1 Identifying Defaults

Any empirical study on the determinants of debt repayments needs to start by defining which actions characterize a default. As the exact definition of a default will always involve some degree of arbitrariness, many studies end up using a different set of events. Lindert and Morton (1989), Detragiache and Spilimbergo (2001), Reinhart and Rogoff (2004) and Sy (2004), for instance, all use different characterizations of external debt crises. The issue becomes even more important when both, domestic and external defaults are treated

in the same study as a consistent definition needs to be used to flag the credit incidents. This paper follows Reinhart and Rogoff (2004) in that it uses Standard and Poor's identification of sovereign defaults, as this choice allows for ready comparison between domestic and external credit incidents without compromising consistency. It should be noted here that rating agencies tend to follow rather strict standards in the sense that they typically consider that any change on the original terms of a repayment contract constitutes a default.³ It is also important to note that in this sense, technically, a surprise burst of inflation does not constitute a default on local-currency debt instruments - even if debt instruments are not-indexed and the value of the debt stock is effectively diluted.⁴

2.2 The Global Evolution of the Default Rates

The panel of this study comprises 53 emerging market countries that currently have debt instruments rated by Standard and Poor's, where emerging markets were defined as countries that either had a per capita GDP between \$1,000 and \$10,000 or a GDP of at least \$30 bn in 2005.⁵ The later criterion adds India, Indonesia, Nigeria, Pakistan and Ukraine to the sample. In these countries there is arguably a critical mass of demand for government

³For the time period in which ratings are available I consider that a sovereign enters into technical default when its sovereign rating falls below B-.

⁴Along these lines, Doepke and Schneider (2006) calculate that if inflation were 5% higher than what was expected in a benchmark year for 10 consecutive years, the US government would gain between 5 and 13% of GDP through the reduction of the real value of its debt.

⁵Measured in year 2000 \$ values. Lebanon was left out due to substantial gaps in the time series.

liabilities. All countries with a per capita GDP above \$10,000 were left out as the likelihood of default in this group is minimal. This means that countries such as Greece, Israel, Portugal and South Korea are not part of the sample. Only Kuwait had a higher per capita GDP when it defaulted on its domestic debts in the year 1990. Apart from Kuwait, the richest country to experience a default during the sample period was Argentina (with a per capita GDP of \$7,300 in 2001).

The sample selection criteria also exclude all countries that did not have a sovereign credit rating by June 2007. Presumably, countries that have not requested a rating are less active in private credit markets. It is certainly possible that this selection criterion is itself a function of the default propensity. However, including countries that have been largely inactive in private markets could introduce a bias in the results, since some countries might not reschedule their debts simply because they were not able to borrow in the first place. The complete list of countries and the default episodes since 1980 is presented in Table 1. The sample is very broad in the sense that countries with different histories of credit incidents are included in the study. The regional divide is as follows: 22 Latin American countries, 12 (Eastern) European, 12 Asian, 6 African and Fiji. The sample period covers 18 cases of domestic default and 43 cases of external default. 22 out of the 53 developing countries in the sample have not defaulted on either type of obligations since 1980, whereas 18 countries have defaulted both, domestically and externally.

⁶Note that all countries in the sample have both, a local and a foreign currency debt

[Table 1 about here]

Table 2 shows that a typical country in this sample has an annual default likelihood of 3.90% for external liabilities, which compares to 1.65% for domestic liabilities. This implies that a representative developing country would fail to repay its external obligations once every 25 years on average and the obligations to its own citizens once every 60 years. The difference in the default rates suggests that there is indeed a good reason for the observation that rating agencies typically grant a higher rating for domestic government debt instruments than to international. As Cantor (2003, p.57) explains, *the difference [in the credit rating] is usually justified in terms of the sovereign's ability to tax and appropriate domestic currency assets, which is often assumed to be greater than in the case of foreign currency assets. In addition, while the sovereign must generate foreign exchange to repay foreign currency debts, it can print money to meet domestic currency obligations.* It should be noted that the latter distinction is less relevant when the exchange rate is not fixed. In such cases the ability to print money may also be instrumental in repaying foreign debt since a government could print money in order to buy foreign exchange instead of using the fresh currency to buy domestic debt instruments. Naturally, either strategy would eventually cause inflation and the devaluation of the domestic currency.

Differing risks for differing debt instruments issued by the same sovereign are not a new phenomenon. An interesting study by Waldenstrom (2005) for instance shows that already well before World War II creditors of Scania rating.

dinavian governments have requested risk premia that differed considerably according to the type of debt. Furthermore, the above statistics on the incidence of defaults hide important idiosyncrasies between groups: for instance, if we restrict our attention to only the 20 countries in the sample that are parliamentary democracies, an external default typically occurs every 64 years, while a domestic default typically occurs only every 180 years. These figures however ignore the fact that many domestic and external debt incidents occurred simultaneously. As Table 2 shows, no less than 63% of all domestic debt defaults were accompanied by defaults on external debts within a year, while only 27% of external defaults were accompanied by domestic defaults.

[Table 2 about here]

Figure 1 shows the trend in domestic and external default rates of the emerging markets in the sample. It is noteworthy that the domestic default rate has increased markedly in the recent period, i.e. towards the end of the sample period: it has increased from a rate below 0.5% per annum in the mid-1990s to 3% between 2001 and 2005. The major default, of course, was that of the Argentine Republic - which defaulted on its liabilities at the end of 2001. On the other hand, the external default rate shows more dramatic swings in the sample, as the period includes the external debt crises of the 1980s. The increase of the external default rate to 3.8% in the last five years of the sample seems to have ended a period in which external defaults were relatively few. The following section discusses and tests the explanatory power of the main determinants of both types of defaults.

[Figure 1 about here]

3 The Determinants of Defaults

Most studies so far have either ignored domestic debts or treated external and domestic debt crises as independent events. Mainly to permit comparisons with earlier studies, this section draws on the existing literature to analyze the determinants of both types of defaults when debt crises are considered as independent events. The next section then introduces a methodology for the simultaneous estimation of both limited-dependent variable models, highlighting the potential for interaction between crisis in both segments of the market.

3.1 Domestic

Few studies have tried to determine the factors that drive governments to default on its domestic liabilities empirically.⁷ In order to identify the main determinants of domestic debt crises, the explanatory power of some economic and institutional variables mentioned in earlier theoretical studies is tested with the panel of 53 developing countries spanning over a 26-year period. It should be mentioned that, because of limited data availability, the number of observations used in each estimation depends on the particular choice of explanatory variables. This variation in the sample size is no longer

⁷The only such study known to this author is that of van Rijckeghem and Weder-di-Mauro (2004) that relies on non-parametric analysis. The study however does not focus on the joint determination of domestic and external debt defaults.

an issue once we settle with one set of explanatory variables. Furthermore, the lack of direct measures of indebtedness for a representative set of countries makes this study rely on *proxy* measures such as the M3/GDP ratio, the accumulated budget deficits, or the growth rate of government expenditures as potential explanatory variables. All economic explanatory variables were obtained from the World Bank Development Indicators or the IMF International Financial Statistics and are lagged by one period when included as regressors. Summary statistics are shown in Table 3.

[Table 3 about here]

The main institutional variable used as a regressor is in effect a measure of constraints on rulers in the sense of North (1981). More specifically, a dummy variable that indicates whether the country in question has a parliamentary form of government and at the same time is classified as a democracy is used as a *proxy* for such checks and balances. The dummy variable takes the value one if Beck, Demirguc-Kunt and Levine (2001) classify the form of government of the country in question as being parliamentary and the country has a *POLITY* score above zero - which is typically associated with democratic regimes. In an influential paper, North and Weingast (1989) have argued that sovereigns that could be ejected by the legislature through a confidence motion - as is the case in parliamentary regimes - are less prone to default on their debts. This is because those groups that are likely to be the most adversely affected by discontinuations of debt servicing are typically well represented or have influence on Parliament and could eventually

push for a change in government. Recent studies by van Rijckeghem and Weder-diMauro (2004), Bordo and Meissner (2006) and Kohlscheen (2007) find that this institutional commitment mechanism is remarkably successful in explaining external debt crises or their absence in the developing world of both, today and earlier times.⁸ As the Constitutional form of government has typically been inherited from the colonial past and very rarely changes in democracies - even though other components of the Constitution clearly do change from time to time - one could argue that this institution is one of the *deep parameters* that Glaeser, LaPorta, Lopes-de-Silanez and Shleifer (2004) suggest to be the most appropriate for studies that intend to capture the commitment role embedded in institutions.

The number of years that the current head of state has been in office has also been included as a potential explanatory variable. If heads of government do eventually go for a debt rescheduling strategy, they may have incentives to default earlier on in their term in office, rather than shy away capital when their term is ending and electoral financing may be more needed.

Table 4 shows that the only explanatory variables in the probit regressions that are significant at the .05 confidence level are the parliamentary democracy dummy and the GDP growth rate.⁹ Domestic defaults are more likely to occur during recessions and in countries that are not parliamentary democracies. Moreover, if anything, they tend to occur earlier on

⁸It can also explain the pattern of *serial defaulters* alluded to by Lindert and Morton (1989) and Reinhart and Rogoff (2004).

⁹Easterly (2001) analyzes the effect of economic growth on default probabilities in great detail.

in the terms of heads of state, but the *p-value* in this case is .11. ¹⁰

A number of additional economic *proxies* have been tested. None of them added substantial explanatory power. The additional regressors included the CPI inflation rate, the variation of the inflation rate in the previous 10 years, the M3/GDP ratio, the accumulated budget deficits, or the growth rate of government expenditures. Table A, in the appendix, shows that none of these variables seems to be able to explain the occurrence of domestic defaults on a systematic basis.

One limitation of the specifications tested here is that they do not take domestic indebtedness indicators into account directly. The only reason for this is one of data availability. Cowan, Levy-Yeyati, Panizza and Sturzenegger have however recently put together a domestic debt database. This makes the direct inclusion of their indebtedness indicators in the vector of explanatory variables possible. Even though their database goes beyond Latin American economies, including the domestic indebtedness statistics does reduce the sample size by more than two thirds. Table A in the appendix shows that the domestic debt/GDP ratio does not affect the likelihood of debt rescheduling in a significant way, neither does the real interest rate. This may be less surprising for readers that are already familiar with the sovereign debt literature: the finding is not at odds with earlier findings for defaults on external liabilities. Indeed, Reinhart, Rogoff and Savastano (2003) show that

¹⁰Note that in order to avoid double counting, countries were left out of the sample in the two years that followed a default on either class of creditors. This methodology is employed throughout the paper, with exception of the estimation in the second column of Table 5.

the majority of countries that have defaulted on their foreign debt had indebtedness levels that would have satisfied the Maastricht criterion at the time of default.

[Table 4 about here]

3.2 External

In the context of external debt, it is well known that macroeconomic variables and liquidity indicators typically carry some explanatory power as determinants of credit crises. The so-called 'ratio variables' have been widely used to explain the incidence of defaults (see Detragiache and Spilimbergo (2001), for instance). The right column on Table 4 shows the estimation results for the onset of external default probit estimation. As one would expect, sovereign borrowers fail to repay foreign creditors if the economy is struggling to grow and the debt service burden is high relative to the total revenues obtained by the country from exporting goods and services. Also, a higher stock of international reserves relative to imports of goods and services tends to reduce the likelihood of a default. Moreover, parliamentary democracies tend to be more reliable debtors.¹¹ These results largely confirm findings of earlier studies.

¹¹ Kohlscheen (2007) shows that this observation is robust to the exclusion of Latin American countries (that are mostly presidential regimes) and/or OECD members (that are almost all parliamentary democracies).

4 Bivariate and Multi-Variate Analysis

Arguably, one of the main caveats of the analysis in the previous section is that it ignores the relationship that may exist between domestic and external defaults: the fact that a country has stopped servicing its domestic debt might by itself affect the probability of an external default occurring and vice-versa. The possibility of such relations is captured by the econometric specifications that are used in this section.

4.1 Independent Estimation

The results of the bivariate analysis shown in Table 5 suggest that the events are indeed strongly inter-related, as suggested by Table 2 and the Covariance matrix in Table B of the Appendix. Moreover, the second column of the table shows that adding lagged default dummies does not improve the overall fit of the probit regressions. The remainder of the analysis therefore relies on contemporaneous default dummies, continuing to apply a 2 year window after the onset of default episodes.

The multi-variate analysis, shown in the third column, adds the contemporaneous default indicators to the explanatory variables used in the previous section. Low growth rates and a high debt service burden continue to be identified as the main culprits that trigger external default. As earlier, parliamentary democracies default less often on foreigners, but this effect is now only statistically significant at the .10 confidence level. On the domestic side, however, the economic explanatory variables lose their statistical sig-

nificance, though they continue to obtain the expected sign. Independent estimation does suggest that domestic default triggers external default and vice-versa at the .01 level.

[Table 5 about here]

4.2 Simultaneous Estimation

Finally, a complete consideration will take the fact that domestic and external defaults are jointly determined into account during the estimation. An indication that something is being missed when both limited-dependent-variable models are estimated independently comes from the fact that the residuals obtained from the domestic and the external debt default estimations in the previous sections are correlated. What needs to be estimated then, are not the individual probit regressions, but the system

$$y_1 = \alpha_1 y_2 + \beta_1' X_1 + u_1$$

$$y_2 = \alpha_2 y_1 + \beta_2' X_2 + u_2$$

where y_1 and y_2 are the binary dependent variables. As Mallar (1977) and Maddala (1983) have shown, these simultaneous probit model leads to the reduced form:

$$y_1 = \pi_{11} X_1 + \pi_{12} X_2 + v_1 \tag{1}$$

$$y_2 = \pi_{21} X_1 + \pi_{22} X_2 + v_2 \tag{2}$$

We are able to estimate

$$y_1^* = \frac{\alpha_1 \sigma_2}{\sigma_1} y_2^* + \frac{\beta'_1}{\sigma_1} X_1 + \frac{u_1}{\sigma_1} \quad (3)$$

$$y_2^* = \frac{\alpha_2 \sigma_1}{\sigma_2} y_1^* + \frac{\beta'_2}{\sigma_2} X_2 + \frac{u_2}{\sigma_2} \quad (4)$$

where $y_i^* = y_i/\sigma_i$ and $\sigma_i = \sqrt{\text{var}(v_i)}$. Mallar's method consists of estimating the reduced form in (1) and (2) and then use the predicted values y_1^* and y_2^* to estimate (3) and (4). The results of such procedure are displayed in Table 6. The covariance matrices were computed with a code that was based on Maddala (1983).

The results of the simultaneous probit estimation show that, as before, low growth rates, a high debt servicing burden and concentration of power in the hands of the head of government tend to lead to more frequent breaks of international repayment promises. The discontinuation of servicing of international obligations, in turn, seems to trigger default at home as well. Interestingly, the evidence of the reverse causality disappears altogether when the equations are estimated simultaneously, suggesting that the former link is more robust empirically.

[Table 6 about here]

5 Concluding Remarks

Defaults are driven by economic and political considerations. They are particularly likely in low growth environments, when the external debt servicing

burden is high and when there is relatively more power vested in the executive. Typically the sovereign default rate on domestic debt instruments is lower than that on external debts, though it is notable that the former has increased markedly since the mid-1990s. Furthermore, we found that defaults on external debt are more likely to lead to defaults on domestic debt than vice-versa. This suggests that international creditors are more able to bring domestic creditors in to share the cost of a default than domestic creditors are. While more detailed research on the political economy of burden sharing is warranted, one possibility is that international creditors may have more leverage than domestic ones on international financial institutions. These can then effectively force creditors in developing countries into burden sharing.

Future research should aim at disentangling the finer political economy aspects of each type of default, identifying which groups are more likely to benefit or lose from such action as well as the effects they may have on the choice of government policies.

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Table 1 - Country Table

Figure 1 - Sample Default Rate (5 yr mov. av.)

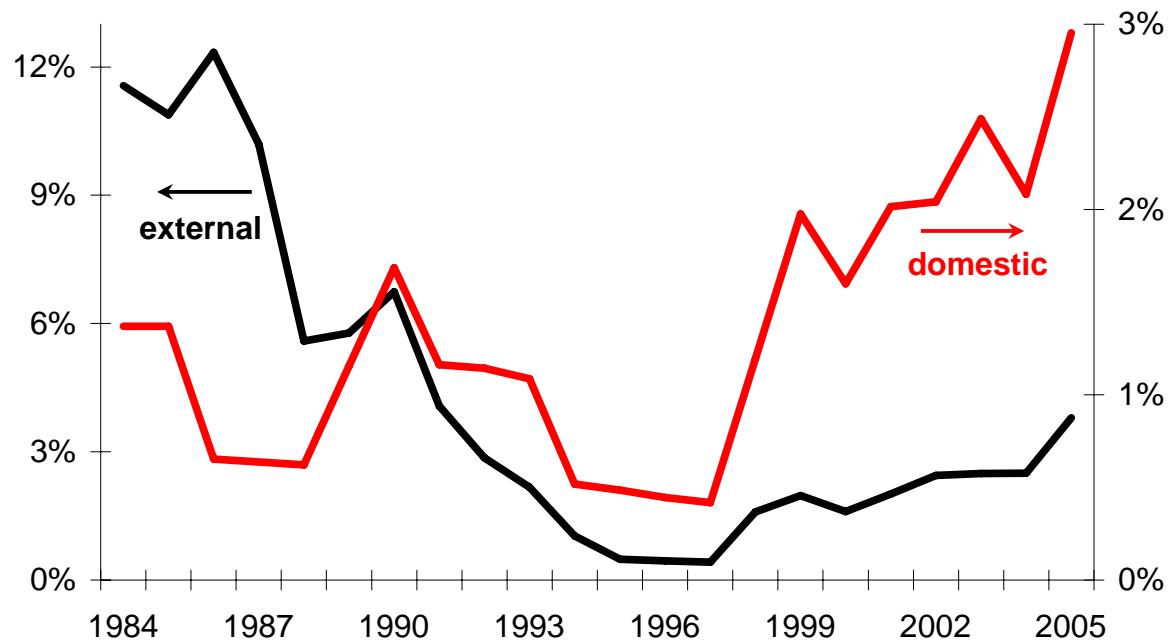


Table 2 - Domestic vs. External Defaults

		External		
		Service	Default	
Domestic	Service	1102	33	1135
	Default	7	12	19
		1109	45	1154
	%	Service	Default	
	Service	95.49%	2.86%	98.35%
	Default	0.61%	1.04%	1.65%
		96.10%	3.90%	100%

Note: All defaults within the window $t-1, t$ or $t+1$ considered.

Table 3 - Summary Statistics

	obs	mean	std. dev.	min	max
Domestic def.	1049	0.017	0.130	0	1
External def.	1049	0.041	0.198	0	1
Parliamentary dem.	1049	0.335	0.472	0	1
years in office	1049	6.756	8.219	1	46
GDP growth	1049	0.037	0.045	-0.261	0.178
debt service / exports	1049	0.222	0.153	0.003	1.288
intl reserves / imports	1049	0.418	0.344	0.022	2.785
short-term debt / ext debt	1049	0.167	0.116	0.000	0.817
ext debt / GDP	1049	0.495	0.281	0.026	2.313

Note: 2 year window after defaults.

Table 4 - Determinants of Defaults: Probit Estimation

D.V.: Onset of Debt Default	domestic	external
parliamentary democracy	-0.540 0.269**	-0.413 0.205**
years in office _{t-1}	-0.040 0.025	
GDP growth _{t-1}	-4.421 1.816**	-5.518 1.468***
debt service / exports _{t-1}		2.236 0.414***
intl reserves / imports _{t-1}		-0.528 0.319*
short-term debt / ext debt _{t-1}		0.787 0.693
Observations	1049	1049
Log likelihood	-82.77	-152.08
Chi**2	16.48	54.77

Robust std errors. Constants not reported.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5 - Determinants of Defaults

D.V.: Onset of Domestic Debt Default			
	bivariate	multivariate	
external debt default _t	1.803 0.247***	1.788 0.244***	1.741 0.263***
external debt default _{t-1}		0.489 0.438	
parliamentary democracy			-0.545 0.343
years in office _{t-1}			-0.046 0.028
GDP growth _{t-1}			-2.084 2.170
Observations	1049	1154	1049
Log likelihood	-66.2	-71.9	-61.7
Chi**2	49.63	49.86	58.63

D.V.: Onset of External Debt Default			
	bivariate	multivariate	
domestic debt default _t	2.147 0.309***	2.087 0.299***	1.947 0.325***
domestic debt default _{t-1}		0.354 0.497	
parliamentary democracy			-0.363 0.220*
GDP growth _{t-1}			-4.763 1.565***
debt service / exports _{t-1}			2.216 0.439***
intl reserves / imports _{t-1}			-0.412 0.332
short-term debt / ext debt _{t-1}			0.866 0.738
Observations	1049	1154	1049
Log likelihood	-154.6	-165.5	-133.4
Chi**2	49.63	49.28	92.11

Robust std errors. Constants not reported.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6 - Determinants of Defaults: Simultaneous Estimation

DV: Onset of Debt Default	domestic	external
external debt default _t	0.578	
	0.198***	
domestic debt default _t		0.018
		0.088
parliamentary democracy	-0.268	-0.406
	0.237	0.218*
years in office _{t-1}	-0.042	
	0.026	
GDP growth _{t-1}	-1.356	-5.427
	2.068	1.807***
debt service / exports _{t-1}		2.213
		0.497***
intl reserves / imports _{t-1}		-0.515
		0.377
short-term debt / ext debt _{t-1}		0.784
		0.682
Observations	1049	1049
Log likelihood	-80.0	-152.1
Chi**2	21.98	54.78

Standard errors computed as in Mallar (1977). Constants not reported

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A - Alternative Explanatory Variables for Domestic Defaults

D.V.: Onset of Default								
parliamentary democracy	-0.540 0.269**	-0.515 0.273*	-0.402 0.290	-0.700 0.342**	-0.116 0.447	0.048 0.477	p.p.	p.p.
years in office _{t-1}	-0.040 0.025	-0.036 0.026	-0.048 0.034	-0.052 0.034	-0.085 0.093	-0.101 0.102	-0.298 0.186	-0.290 0.193
GDP growth _{t-1}	-4.421 1.816**	-4.824 2.087**	-6.659 2.386***	-4.355 2.206**	-6.803 3.529*	-5.260 3.853	-5.547 4.815	-2.269 2.551
inflation _{t-1}		0.407 0.366	-0.134 0.670				-2.344 3.073	-1.867 3.362
std dev (inflation_10) _{t-1}			-0.596 1.234					-1.385 2.178
gov. expenditure growth _{t-1}				0.580 1.287			-2.473 2.544	-2.270 2.551
domestic debt / GDP _{t-1}					-2.844 1.806	-5.103 3.081*	-6.817 4.172	-6.962 4.154*
real interest rate _{t-1}						0.000 0.013	-0.001 0.016	-0.001 0.017
dom.debt/GDP*real rate _{t-1}						0.074 0.068	0.101 0.083	0.119 0.092
Observations	1049	1001	858	966	342	312	234	234
Log likelihood	-82.77	-80.95	-63.71	-69.35	-33.18	-31.18	-23.74	-23.46
Chi**2	16.48	18.43	15.58	16.02	9.52	12.04	15.44	16.00

p.p.: dropped due to perfect prediction. Constants not reported

* significant at 10%; ** significant at 5%; *** significant at 1%

Table B - Covariance Matrix

	onset_dom	onset_ext	parliament	years	GDP growth	debt serv/X	intl res/M	ST debt/D
onset_dom	1							
onset_ext	0.3848***	1						
parliament	-0.063	-0.084	1					
years	-0.054	-0.007	-0.180	1				
GDP growth	-0.096	-0.137	0.029	0.099	1			
debt serv/X	-0.002	0.091	-0.169	0.130	-0.089	1		
intl res/M	-0.032	-0.027	0.001	0.040	0.114	-0.199	1	
ST debt/D	-0.008	0.015	0.047	-0.096	0.017	-0.135	-0.111	1

* significant at 10%; ** significant at 5%; *** significant at 1%