Amundi
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Amundi Working Paper

WP-049-2015

April 2015

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Abstract

In this paper, we use a transition model to study the determinants of the amount of debt defaulted by the emerging countries, going a step further than the usual estimation of a probability of sovereign default. The empirical framework is a panel smooth transition model that allows to capture the heterogeneous effects, across time and countries, from threshold variables defining different regimes of vulnerability to sovereign default. We highlight four variables able to discriminate country-year observations into different vulnerability levels, and find that countries located in the same geographical area do not necessarily present the same vulnerability profile.

JEL Classification Numbers : E6, E44, G15, H63.

Keywords : Sovereign debt, PSTR model, emerging countries, vulnerability regimes

1 Introduction

Are the emerging countries that defaulted in the past condemned to remain in a debt spiral and are they more prone to default again in the future ? Up until recently, the literature provided a positive answer to this question. The emerging countries' debt situation has often been referred to as "serial default" (see, for instance *Reinhart and Rogoff*, 2004, [13]). This denomination gives the impression that they are condemned to their unsustainable debt situation without a possible trip back. *Reinhart, Rogoff and Savastano* (2003, [15]) argue that the historic dimension of past default and inflation is enough to give a good insight on emerging countries' default risk. Thus, they suggest that their past default and inflation history are important warning indicators of debt intolerance in some emerging market countries. This pessimistic view has been echoed extensively in many papers, the authors putting forward several arguments. As a matter of fact, redundant default episodes over the past decades have probably contributed to exacerbate the economic policies' lack of credibility, due to inefficient institutions. In fact, emerging countries were inclined to use pro-cyclical economic policies (notably because of weak automatic stabilizers, unemployment benefits being for example not much significant). Once a budgetary crisis has occurred, it is therefore more difficult to go over it through counter-cyclical policies, leading emerging market countries remain stuck in the so called "debt trap" (*Sachs*, 2002, [16]), from where they struggle to go out because of a debt burden that yet became to heavy.

Another argument that has been frequently put forward is the "original sin". This expression refers to a situation in which countries need to resort to short-term maturity external debt. In fact, the detention of external debt ties the hands of the emerging countries' governments which have to back money creation on foreign currency reserves if they want to maintain a peg on their exchange rate (or at least some currency stability). If, by contrast, money depreciates, an asymmetry appears between interest expenditure (essentially in foreign currency) and revenues (in local currency). This "currency mismatch" explains the importance of exports' revenues for emerging markets.

However, since the mid 2000s, the hypothesis of a "debt trap" as a consequence of past defaults seems to be undermined by the historical facts. Indeed, it seems that the share of the emerging countries' domestic debt over GDP has slightly increased in the last decade, linked to a better managed debt and their willingness to hedge against capital flows sudden stops (*Mehl and Reynaud*, 2005, [10]). Lower inflation and healthier fiscal and monetary policies (becoming more countercyclical) have helped following this trend (*Mohanty*, 2012, [9]). Moreover a new risk management strategy, taking into account the liquidity inflows from investors (willing to diversify their portfolios by buying emerging countries' local debt) have enhanced their financial stability and their integration into the world financial markets (*Blommestein and Santiso*, 2007, [4]). On the whole, these changes should have reduced their exposition to currency risk and lowered rollover risk.

Now, the general conclusions in terms of a typical default behavior must be nuanced, even if we consider the episodes of defaults since the 1980s. In this paper, we support the idea that, in line with the emerging countries' diversity, the origins of the important defaults on sovereign debt have been very heterogeneous across the emerging countries and over time. Thus, we overcome a drawback of the existing empirical literature by permitting some heterogeneity in the slope parameters of a model that relates sovereign debt default to several determinants. This allows taking a step forward with respect to the existing studies by proposing early warning indicators specific to each country, in spite of the fact that the forewarning indicator is based on panel data. We are able to see which macroeconomic and financial variables explain the weight of sovereign default, depending on the country's economic features. And for the variables that matter, we show that their impact on sovereign default quantitatively differs across countries and through time. The sources of heterogeneity come from the fact that the variables causing debt default follow regime-switching dynamics that characterize different degrees of vulnerability. These different vulnerability levels are defined inherently by threshold values estimated for some highlighted variables.

Moreover, we choose to look beyond the probability of default and consider the amount of default. In fact, we think that the occurrence of a default isn't in itself the sole important aspect, as the non-payment of a tiny or of a large part of one's debt or debt service commitments are not equivalent at all, notably in terms of market impacts. This is the reason why we focus, not on the incidence of a default, but on its heaviness compared to the country's GDP.

More precisely, our contribution to the literature is threefold : *i)* we use a new database from the Bank of Canada (2014, [3]) that reports information on outstanding amounts of their debt being in default by countries between 1975 and 2013. We work on the amount of sovereign default for 50 frontier and emerging countries, as of 1980 ; *ii)* our empirical analysis is based on a nonlinear panel data model that allows for regime-switching dynamics and heterogeneous effects of the determinants on sovereign debt being in default ; *iii)* we highlight four variables that are able to determine distinct vulnerability regimes and provide evidence that the variables influencing the amount of debt default vary across these regimes.

The remainder of the paper is organized as follows. Section 2 presents the empirical framework (data and model). In Section 3 we comment our main results. Finally Section 4 concludes the paper.

2 Empirical framework

2.1 Data

2.1.1 Sources of data

In order to get a panel which presents sufficient diversity, we consider the most important emerging countries that are either in the list of the emerging market countries of the IMF [1] or in the MSCI coverage [2], but also less important ones [3], some of which could be qualified as frontier-countries. The observations for the 50 countries considered, taken on an annual basis, span from 1980 to 2013, depending on availability. Nevertheless, as some variables are not available until 1990, the observations used in many estimations only begin at this date.

Sovereign default data (y_{it} in our regressions) stems from a dataset built by *D.T. Beers and J.-S. Nadeau* from the Bank of Canada (2014, [3]). In this database, the authors do not only reference episodes of sovereign default from 1975 to 2013 worldwide (merging data previously published by the Paris Club, the IMF, the World Bank and other institutions), but also report the amount of debt concerned by the non-payment for each episode of sovereign default, distinguishing between different types of creditors [4]. They consider *"that a default has occurred when debt service is not paid on the due date (or within a specified grace period), payments are not made within the time frame specified under a guarantee, or, absent an outright payment default, in [...] circumstances where creditors incur material economic losses on the sovereign debt they hold"* (including agreements reducing interest rates or extending maturities on outstanding debt and government exchange offers where existing debt is swapped or re-denominated, leading to the detention of new debt or equity on less-economic terms). Our aim is to analyse the determinants of the amount of debt in default using this data (as a share of the country's GDP), highlighting the existence of different vulnerability regimes regarding default risk, depending on the country's economic characteristics.

The variables we make use of to explain the amount of sovereign default and determine the vulnerability regimes are similar to those used in the literature, which essentially focuses on the linear explanation of default events (whatever their significance as regards the country's activity). They consist of :

- capital and current account variables (yearly change in the terms of trade and in the exchange rate, and portfolio equity flows as a share of GDP) from the World Bank ;
- economic variables (real GDP growth, inflation, gross domestic savings as a share of GDP, total reserves on short-term external debt, external debt on exports, external debt as a share of general government debt, general government debt, public balance, interest expenditure as a share of public revenues) from the IMF, the World Bank and Oxford Economics ;
- institutional variables (World Global Indicators from the World Bank and Corruption perception index from Transparency International) ;
- financial variables (spreads versus the United States as regards treasury bill interest rates, blended spread component of the Emerging Market Bond Index, overnight interbank rates, lending minus deposit rates and Standard & Poor's ratings) from various sources, even if their availability is not so obvious for some of the considered countries.

For more details regarding the sources of the data, see Appendix 1, Tables A.2 to A.6.

2.1.2 Heterogeneity in terms of vulnerability to sovereign default

As said before, we do believe that all countries do not react the same way to changes in their economic environment, in terms of making default. As a matter of fact, even though it is right to observe that default episodes really differ from one geographic area to another (in terms of temporality, but also regarding their importance, see Figure 1), we do think that countries belonging to a same geographic area can be more or less prone to default due to a specific shock, depending on their economic profiles.

1. Argentina, Brazil, Bulgaria, Chile, China, Colombia, Estonia, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, Ukraine and Venezuela.
2. Brazil, Chile, Colombia, Mexico, Czech Republic, Egypt, Greece, Hungary, Poland, Qatar, Russia, South Africa, Turkey, United Arab Emirates, China, India, Indonesia, South Korea, Malaysia, Philippines, Taiwan and Thailand.
3. Algeria, Croatia, Hong Kong, Israel, Kenya, Kuwait, Lebanon, Mauritius, Morocco, Nigeria, Saudi Arabia, Singapore, Slovakia, Slovenia, Tanzania, Tunisia and Uruguay.
4. We do not use this information here.

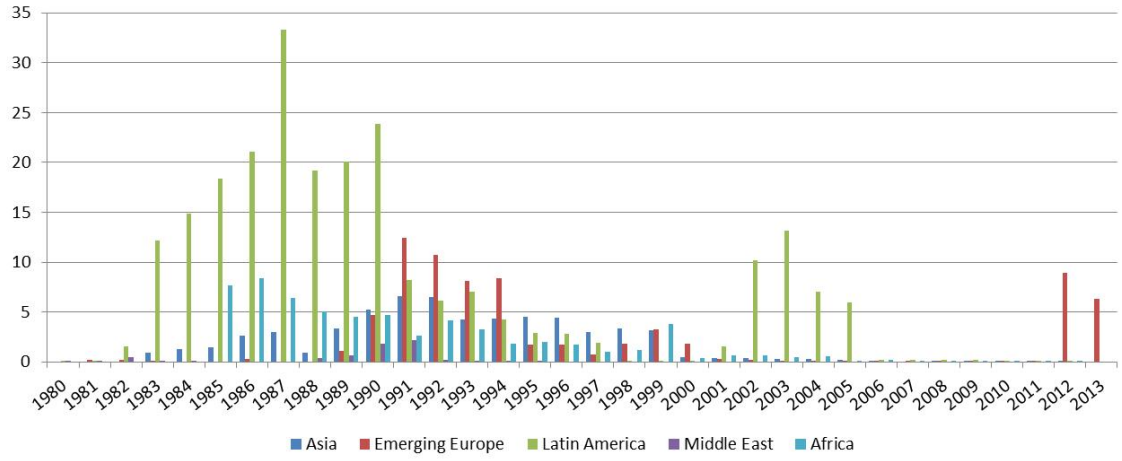


FIGURE 1 – Debt in default (% of GDP)

Note : The reported percentage corresponds to the mean of the amount of debt being in default (as a % of GDP), for each geographic area. See Table A.1, in Annex, for the repartition of the countries into geographic areas.

In fact, if one looks at the economic characteristics of the countries when they face default and when they do not, it can be observed that there really is a difference. Table 1 shows that, compared to a country whose situation is sound, a country being in default is more likely to have a deteriorated economic environment (local currency depreciating hugely, low equity net inflows, low growth and high inflation), less healthy public finances (high debt burden, high general government debt), a more fragile financing basis (low domestic savings, high share of external public debt, less foreign reserves compared to short-term financial commitments), a more stressed financial environment (higher interest rates) and institutions of lower quality (lower WGI and CPI indicators). This observation strengthens our belief that a model allowing for heterogeneity can be a good framework to highlight the explanatory factors of the potential amount of debt being in default.

		No default		**Default**	
		Mean	N	**Mean**	N
Current account variables	Terms of trade (YoY % Change)	0,4	801	0,5	388
	Exchange Rate (YoY % Change)	6,4	982	68,9	450
	Portfolio Equity Net Inflows (% of GDP)	0,8	673	0,4	219
Intern economic variables	Real GDP growth (YoY % Change)	4,4	1078	3,0	497
	Inflation (YoY % Change)	10,2	1064	110,5	497
	Central government interest payments (% of general government revenues)	13,3	708	23,3	210
	General government debt	45,3	711	53,8	173
	General government balance	-1,9	979	-2,9	343
	Domestic Savings (% of GDP)	26,3	1010	19,9	463
External debt variables	Reserves (% of total short-term external debt)	301,1	671	280,7	445
	External debt (% of Exports)	126,7	864	231,0	382
	Share of external debt in General Government debt	40,2	467	47,9	73
Institutionnal variables	Corruption perception Index	45,5	659	28,5	183
	WGI Rule of Law	0,3	705	-0,5	195
	WGI Government Effectiveness	0,3	705	-0,3	195
	WGI Control of Corruption	0,2	705	-0,6	195
Financial variables	EMBI	366,3	659	644,7	158
	Interbank rate (overnight)	5,2	312	15,0	52
	S&P Rating	14,3	871	10,3	329
	Lending minus deposit rate	7,0	768	24,9	390
	Sovereign interest rate spreads (3Months, vs US)	6,0	556	15,8	196

TABLE 1 – Descriptive statistics

Note : Data stretches from 1980 to 2013, depending on availability for each variable and each country. Means (for the available observations whose number is mentionned in column N) are computed in two sub-samples : countries not being in default and countries whose amount of debt being in default is strictly positive. For S&P rating data, notations have been rescaled, AAA (resp. D) rating being equivalent to 22 (resp. 0). For more details regarding the data, see Tables in Appendix A.1.

2.2 Model and econometric methodology

Though our modelling methodology differs from the approaches considered so far, our background is the literature on early warning indicators to model sovereign risk. We briefly recall how the empirical studies usually proceed to

predict sovereign risk.

Sovereign risk is often evaluated using vulnerability indicators based on economic fundamentals. These models are employed to explain the occurrence of extreme events (debt restructuring, sovereign default, late payments episodes, stress episodes in terms of exchange rate or inflation, banking crises). See, for instance, *Reinhart, Goldstein and Kaminsky*, (2000, [12]).

Many predictors of sovereign default take the form of a z-score (*Baldacci, Mc Hugh and Petrova*, 2011, [2], *Rabobank*, 2011, [11]). Early-warning indicators are then resulting from the link done between such indicators and the occurrence of default events. These warnings trigger once some thresholds are exceeded : that is why they are called "signals approach". The choice of the threshold (which can for example be based on the minimisation of some "wrong warnings") favors either predicting more crises correctly (at the expense of more noise) or being less frequently wrong. Nevertheless, as underlined by *Andréou, Dufrénot and alii.* (2009, [1]) as regards financial crises, noise due to an early warning indicator which would trigger more easily is not necessary a bad thing, as it can highlight a very deteriorated economic situation (which is an interesting information in itself), even if default does not occur immediately.

Another common way to describe the determinants of sovereign default is to estimate a default probability through a binary model (logit or probit), with similar explanatory variables as the ones used for early warning indicators (i.e. macroeconomic variables, fiscal variables, financial variables and institutional variables). *Manasse, Roubini and Schimmelpfennig* (2003, [8]), as *Cohen and Valladier* (2011, [5]) estimate the default probability (including important IMF supports for the former, and also Paris Club supports and other punctual events regarding debt servicing and payment arrears for the latter) with a logit model. *Cohen and Valladier* (2011, [5]) then classify the countries with respect to the quintile they belong to, in order to differentiate them by risk level. *Kraay and Nehru* (2004, [7]) resort to a probit model to highlight the determinants of events relative to payment arrears as regards external debt, Club de Paris debt rescheduling and non conventional IMF loans.

To the best of our knowledge, the literature seems to have focused until now on models or indicators describing the origins (economic and financial, but also political and institutional ones) of the occurrence of sovereign defaults (taking various forms). Most frequently, the developed models are linear, as they assume that all the observations present the same sensibilities to the explanative variables to explain this default occurence. Finally, they usually derive different degrees of vulnerability from the distribution of the indicator. We attempt to enrich the existing models by working with a model that allows for heterogeneity in the response to explanative variables to explain this amount of default. Moreover, our model enables us to directly identify the different vulnerability regimes, as the thresholds dividing in different regimes are estimated endogenously, and thus, are inherent to the model.

We consider the panel smooth transition regression model (PSTR proposed by *Gonzalez, Teräsvirta, van Dijk*, 2005, [6], henceforth GTD) [5]. It enables us to estimate, for various emerging market countries, the heterogeneous effects on the amount of debt being in default of the explanatory variables (presented herebefore). The heterogeneous effects, across time and countries come from threshold variables defining different regimes of vulnerability to sovereign default.

Formally, the panel smooth transition regression model (PSTR) is as follows :

$$y_{it} = \mu_i + \beta_0' x_{it} + \sum_{j=1}^{r} \beta_j' x_{it} g_j(q_{it}^{(j)}; \gamma_j, c_j) + u_{it} \tag{1}$$

where $i = 1, ..., N$, $t = 1, ..., T$, μ_i corresponds to the country fixed effects, r is the number of transition functions g_j defined by the threshold variables $q_{it}^{(j)}$ (for $j \leq r$) ; c_j are the corresponding thresholds, γ_j are the parameters defining the degree of smoothness of the transition from one regime to another and u_{it} the error term.

The transition function is continuous, bounded between 0 and 1 :

$$g_j(q_{it}^{(j)}; \gamma_j, c_j) = \frac{1}{1 + exp(-\gamma_j \prod_{k=1}^{m} (q_{it}^{(j)} - c_{jk}))} \tag{2}$$

with $\gamma_j > 0$, and $c_{j1} < c_{j2} < .. < c_{jm}$ the thresholds associated to the transition function g_j. m is the number of returns between the two extreme regimes associated to this transition function, these returns taking place at the thresholds $c_{j1}, c_{j2}, .., c_{jm}$. In the extreme regimes associated to each transition function, the vectors of parameters take the values β_0' and $\beta_0' + \beta_j'$.

In Equation (1) two important parameters are m and r. m describes the shape of the transition function g_j. For $m = 1$, the shape is that of a standard logistic function. For $m = 2$, the transition function is described by a "V curve" with a middle regime and two identical outer regimes. For $m > 2$, the transition function has a more complex shape.

5. The estimations were done using the MATLAB code provided by Christophe Hurlin.

The parameter r defines the number of transition functions (or, equivalently, the number of regimes).

To estimate Equation (1), we proceed in two steps.

Step 1

We test the null assumption of a linear model against a PSTR model ($r = 0$ against $r = 1$). This is equivalent to testing the null assumption of homogeneous effects against heterogeneous effects across countries and years. We test

$$H_0 : \gamma = 0 \text{ or } H_0^{'} : \beta_1 = 0 \text{ against } H_1 : \gamma \neq 0 \text{ or } H_1^{'} : \beta_1 \neq 0$$

To overcome the problem of nuisance parameter (β_1 is unidentified under H_0 and γ is unidentified under $H_0^{'}$), we consider the following auxiliary regression, resulting from the first-order Taylor expansion around $\gamma = 0$ of Equation (1) (for r=1) :

$$y_{it} = \mu_i + \sum_{j=0}^{m} \beta_j^{'*} x_{it} q_{it}^j + u_{it}^* \tag{3}$$

Our null assumption is then equivalent to $H_0^* : \beta_1^* = .. = \beta_m^* = 0$. Considering the result of a LM test, if the null hypothesis is not rejected, then we conclude that the model reduces to an homogeneous model. If the null is rejected, then we proceed to test the null $H_0 : r = 1$ against $H_1 : r = 2$. If the null is not rejected, then we conclude that the model is a PSTR model with one transition function. If the null is rejected, then we test $H_0 : r = 2$ against $H_1 : r = 3$.

Step 2

For a given r, we estimate the PSTR model. This is done by applying a non linear least squares estimator after appropriately subtracting the individual means from the variables in the model (see GTD for details). First, we consider some initial values for the slope parameter γ_j and the threshold values c_j [6]. Next we estimate the slopes β of the model conditional to these values, by ordinary least squares. Then, we go on iteratively, finding new values for γ_j and c_j through non linear least squares optimization and then re-estimating the slopes.

3 Results

3.1 Results based on individual variables

We begin applying the PSTR model by showing that several macroeconomic and financial variables are potential candidates that can explain time-varying and cross section differences in the impact of vulnerability factors on the amount of potential debt default.

To begin with, we estimate Equation (1) for $m = 1$ and $m = 2$ with q_{it} (the threshold variable) being the different explanatory variables that are potential candidates to explain the amount of the sovereign default. We run as many regressions as potential candidate variables for q_{it}. For each of them, x_{it} is a vector of q_{it} and a dummy variable describing past default [7].
The estimated equation is

$$\text{Debt in default (\% of GDP)} = \mu_i + \beta_0' x_{it} + \beta_1' x_{it} g(q_{it}; \gamma, c_j) + u_{it} \tag{4}$$

with $x_{it} = (dummy, q_{it})$

The results of the tests are shown in Table 2. We also report the p-value corresponding to the Fisher statistic of the test $H_0 : r = i$ against $H_1 : r = i + 1$ focusing on the number of transition functions (see Table 2, columns 4 to 7) [8]. The idea is then to select the regressions accepted with the highest p-value, in order to identify the variables that could be relevant for splitting observations into regimes differing in the effects of explanatory variables (among which past default) on the amount of sovereign debt in default.

Then, for the best models, we report the PSTR estimations when the explanatory variables are considered individually. The results are shown for $m = 1$ and for $m = 2$ (in Table 3). Over the 21 variables originally considered, we present the results of the estimations making sense (i.e. where there is convergence of the parameter's estimation and

6. We use the method proposed by GTD, to determine the initial values. It consists in computing the concentrated sum of squared residuals for a "grid" of possible values for γ and c, finally taking as initial values for the NLS estimation those minimising this target.

7. This dummy equals 1 if sovereign default has occurred within the last 5 years, and 0 otherwise.

8. For m=1 (resp. m=2) we go on until $r_{max} = 3$ (resp. $r_{max} = 2$).

Dependent variable : amount of debt being in default (% of GDP)						
			Fisher Statistic : p-value			
Threshold variable	**m**	**N**	**r=0 vs r=1**	**r=1 vs r=2**	**r=2 vs r=3**	**r=3 vs r=4**
Terms of Trade	m=1	1112	**0,124**	0,845		
	m=2	1112	0,025	**0,295**		-
Exchange rate	m=1	1339	0,002	**0,033**		
	m=2	1339	0,000	**0,083**		-
Equity net inflows	m=1	892	**0,762**	0,503		
	m=2	892	**0,951**	1,000		-
Growth rate of GDP	m=1	1465	0,000	**0,121**		
	m=2	1465	0,000	0,004	0,000	-
Inflation	m=1	1451	0,009	**0,089**		
	m=2	1451	0,001	**0,365**		-
Interests payments on public revenue	m=1	918	0,002	**0,115**		
	m=2	918	0,012	0,023	**0,025**	-
General government debt	m=1	871	0,000	0,000	0,000	0,000
	m=2	871	0,000	0,000	0,000	-
Public balance	m=1	1322	0,004	**0,303**		
	m=2	1322	0,011	0,017	0,014	-
Gross domestic savings	m=1	1390	**0,152**	0,449		
	m=2	1390	0,034	0,023	**0,076**	-
International reserves on short-term external debt	m=1	1018	0,000	**0,264**		
	m=2	1018	0,000	**0,051**		-
External debt on exports	m=1	1246	0,000	**0,066**		
	m=2	1246	0,000	0,000	0,000	-
External debt share in general government debt	m=1	536	0,007	**0,456**		
	m=2	536	0,035	**0,035**		-
Corruption perception index	m=1	826	**0,367**	0,387		
	m=2	826	**0,644**	0,560		-
WGI Rule of Law	m=1	882	**0,904**	0,020	0,551	
	m=2	882	**0,599**	0,253		-
WGI Government effectiveness	m=1	882	**0,483**	0,975		
	m=2	882	**0,686**	0,793		-
WGI Control of corruption	m=1	882	**0,964**	0,024	0,958	
	m=2	882	**0,291**	0,742		-
EMBI	m=1	801	0,000	0,000	0,000	0,000
	m=2	801	0,000	0,000	0,000	-
Interbank rates	m=1	364	0,019	**0,097**		
	m=2	364	0,000	**0,337**		-
S&P Ratings	m=1	1176	0,000	0,009	**0,491**	
	m=2	1176	0,000	0,013	**0,389**	-
Lending minus deposit rates	m=1	1069	**0,295**	0,526		
	m=2	1069	**0,057**	0,462		
Spreads	m=1	713	0,000	**0,101**		
	m=2	713	0,000	0,002	0,000	

TABLE 2 – First PSTR estimations - Tests regarding the number of regimes

Note : For each threshold variable tested, the estimation is done for m=1 and m=2 (respectively constraining to $r_{max} = 3$ and $r_{max} = 2$), and the countries whose required information was available less than 3 years were not taken into account. The number of observations included is mentionned in column 3. For each threshold variable, we test $H_0 : r = i$ against $H_1 : r = i + 1$ until the p-value of the Fisher Statistic (presented in columns 4, 5, 6 and 7) is superior to α. α is set to 0.05 for r=0 and divided by 2 at each new iteration, to favour parcimony (doing this, we follow a method suggested by the authors of GTD). The bold p-values correspond to the estimations the more likely accepted. Moreover, it is worth mentionning that the estimations do not converge for the following threshold variables : Equity net inflows (m=2), General goverment debt (m=1), EMBI (m=1), and Spreads (m=2). The results are therefore not presented for these estimations.

where each regime contains enough observations).

Our main findings are the following.

The dummy variable capturing past defaults within the recent five years appears to be statistically significant in almost all regressions. Thus, a country which defaulted in the past is likely to be confronted to a sovereign default today. However, a default is of particularly high significance, only if the country faces a macroeconomic and financial environment that becomes more risky. Whether or not the country is more sensitive to past default depends upon some threshold values taken by the variables in the transition function.

The first column of Table 3 contains the transition variables q_{it}, the second column reports the selected value for r, columns 3 and 4 show the estimated values of the slope γ_j of the transition function and of the threshold value c_j for the associated transition variables. In column 6, we write the exogenous variable considered in the left-hand side of the estimated equation. Columns 7 and 11 show the estimated values of the coefficients in the extreme regimes, while columns 8 and 12 respectively report the p-value of the estimates to see whether they are statistically significant. In the last column, we report the share of observations in the first regime [9] (the share of observations in the second regime is 100 minus the percentage reported for the first regime). The estimates in Table 3 lead to the following conclusions.

9. i.e. the observations characterized by the slope β_0.

Dependent variable : amount of debt being in default (% of GDP)														
	r	**γ**	**c**		**Iterations**		**β_0**	**p-value**	**β_1**	**p-value**	**$\beta_0+\beta_1$**	**p-value**	**N**	**P_0**
Estimations done with m= 1														
Exchange Rate	1	0,1	43,3		31	Past default	0,761	*0,289*	14,732	*0,000*	15,493	*0,000*	1339	93%
						Exchange Rate	0,048	*0,161*	-0,045	*0,185*	0,003	*0,048*		
Real GDP growth	1	21,4	-3,4		36	Past default	17,055	*0,000*	-13,014	*0,001*	4,041	*0,000*	1465	7%
						Real GDP growth	-0,081	*0,585*	0,077	*0,633*	-0,004	*0,908*		
Public balance	1	267,0	-10,4		58	Past default	16,854	*0,009*	-13,271	*0,017*	3,583	*0,000*	1322	4%
						Public balance	0,194	*0,227*	-0,307	*0,089*	-0,113	*0,023*		
Interest exp. (% of public revenue)	1	31,6	11,3		40	Past default	-0,176	*0,915*	6,156	*0,004*	5,980	*0,000*	918	53%
						Interest exp. (% of public revenue)	0,389	*0,090*	-0,297	*0,188*	0,091	*0,002*		
Reserves (% of STED)	1	0,1	97,5		32	Past default	10,641	*0,000*	-9,065	*0,000*	1,577	*0,047*	1018	25%
						Reserves (% of STED)	0,027	*0,033*	-0,028	*0,030*	0,000	*0,120*		
External Debt (% of exports)	1	0,0	336,9		35	Past default	-1,741	*0,072*	30,206	*0,000*	28,465	*0,000*	1246	92%
						External Debt (% of exports)	0,013	*0,092*	-0,003	*0,775*	0,011	*0,157*		
Share of ext. debt in public debt	1	14,5	59,0		38	Past default	0,037	*0,974*	7,620	*0,044*	7,658	*0,043*	536	77%
						Share of ext. debt in public debt	0,033	*0,152*	-0,017	*0,332*	0,016	*0,584*		
Sovereign interest rate spreads	1	0,3	63,3		31	Past default	2,487	*0,038*	5,935	*0,350*	8,421	*0,190*	713	98%
						Sovereign interest rate spreads	0,335	*0,001*	-0,316	*0,001*	0,019	*0,168*		
Estimations done with m= 2														
Terms of trade	1	547,2	-5,9	6,7	31	Past default	2,578	*0,004*	4,045	*0,000*	6,623	*0,000*	1112	30%
						Terms of trade	-0,044	*0,557*	-0,012	*0,880*	-0,056	*0,030*		
Inflation	1	1135,1	-0,3	29,4	29	Past default	2,174	*0,001*	10,828	*0,000*	13,002	*0,000*	1451	14%
						Inflation	0,170	*0,004*	-0,167	*0,005*	0,003	*0,001*		
Interbank rate	1	24,7	0,9	7,9	122	Past default	-0,647	*0,292*	3,961	*0,008*	3,314	*0,007*	364	38%
						Interbank rate	-0,021	*0,455*	-0,026	*0,180*	-0,047	*0,069*		

TABLE 3 – First PSTR estimations - Estimations results for m=1 and m=2

Note : Here, we only report the results of the estimations of Table 2 that make sense, i.e. where there is convergence of the parameter's estimation and where each regime contains enough observations. For each estimation presented, the number of observations is reported on column 13, the number of transition functions on column 2, the shape γ of the transition function in column 3 (smooth if $\gamma \to 0$, abrupt if $\gamma \to \infty$), the transition thresholds c in column 4 and the number of iterations needed to estimated this parameters in column 5. The slopes of each explanatory variable are reported on columns 7, 9 and 11 (with the corresponding p-values in columns 8, 10 and 12). β_i is the slope corresponding to the explanative variable $x_{it} = (dummy; q_{it})$. For m=1, the observations for which the threshold variable is inferior to the threshold c (whose part in the sample is reported on column 14) are broadly characterized by the slope β_0, and others by the slope $\beta_0 + \beta_1$ (slopes corresponding to the extreme observations). For m=2, c is of dimension 2. In this case, the observations for which the threshold variable is between the two threshold values (whose part in the sample is reported on column 14) are broadly characterized by the slope β_0, and others by the slope $\beta_0 + \beta_1$ (slopes corresponding to the extreme observations). In actual fact, each observation is characterized by a specific slope, which varies smoothly between the slopes associated to the extreme observations.

Countries that are likely to be confronted to a current sovereign default of a higher amount are those which already defaulted at least once during the 5 preceding years *and* whose macroeconomic environment is more fragile, i.e. with the following characteristics (for m=1) :

- a huge depreciation of their currency by more than 43% (changes measured on a year-on-year basis) ;
- a deep recession with a real GDP growth below -3.4% ;
- a fiscal deficit higher than 10.4% ;
- a ratio of debt service over fiscal revenues above 11.3% ;
- a high exchange rate risk (measured by total international reserves as share of total short-term debt below 97%) ;
- a high currency mismatch (with total external debt accounting for more than 337% of total exports) ;
- the external debt representing more than 59% of the sovereign debt ;
- increased short-term interest rate spreads (63.3% above the US three-months rate).

When we consider the estimates with $m = 2$ (Table 3), three additional variables are able to discriminate into significantly different regimes : the terms of trade, inflation and interbank rates [10]. Table 3 provides evidence that a country that was confronted to a default during the past five years is likely to increase the current amount of debt in default even more if it faces adverse conditions characterized by :

- extreme change in the terms of trade (with either a decrease by more than 5.9% or an increase by more than 6.7%) ;
- extreme inflation conditions (a year on year change of less than -0.3% or above 29%). This finding leads us to nuance Reinhart and Rogoff's argument according to which inflation and past default are causes of "serial defaults" in the emerging countries. Here, past defaults seem to importantly increase the potential of a current sovereign default, especially if a country experiences a situation of deflation or hyperinflation. Inflation pressures within a range of moderate inflation rates are a "pushing" factor to a new default, but only to a lesser extent. It can be seen that, in our sample, only 3% of the observations are in the deflation regime [11], which means that hyperinflation is what really matters ;
- low or high interbank rate (below 0.9% or above 8%).

After having confirmed that a PSTR provides a consistent model allowing for heterogeneity in the explanation of the amount of potential sovereign default, we focus on determining which variables are able to discriminate observations into distinct vulnerability regimes, in a more comprehensive framework. We therefore consider a combination of different explanatory variables (instead of determinants taken individually). This gives a better picture of the key factors that influence the amount of debt default.

3.2 Four main sources of vulnerability

As mentioned above, we now consider models with several explanatory variables in the right-hand side of our equations. As we are interested in highlighting different regimes of vulnerability along some discriminating threshold variables, we focus on models with m=1. We ran regressions with different transition variables. Among them, four appeared to be robust (in terms of the relevance of the estimated coefficients and distribution of observations within the different regimes) : the ratio of debt service over fiscal revenues, domestic savings as share of GDP, international reserves as share of short-term external debt, and external debt over exports. These four lines of approach are brought out to be the ones able to discriminate between groups of observations presenting different features in terms of sovereign debt vulnerability. The fact that they all refer to the capability of emerging market countries to protect themselves against default is therefore not surprising.

Table 4 shows the results of the tests for these four threshold variables, while Table 5 contains our main regressions. We now comment the main conclusions from Table 5.

10. We do not consider the regressions for which the identification of regimes was meaningless (for example because the estimated thresholds were very close), because this implied a situation with very few observations in one regime (for example exchange rate, domestic savings and EMBI). We also neglect the regressions for which the estimated values of γ was small so that they behave like linear homogenous models (for example, S&P rating)

11. which is characterized by an annual inflation rate inferior to -0.3%.

Dependent variable : amount of debt being in default (% of GDP)						
				Fisher Statistic : p-value		
	m	**N**	**r=0 vs r=1**	**r=1 vs r=2**	**r=2 vs r=3**	**r=3 vs r=4**
Interests payments on public revenue	m=1	612	0,000	0,000	**0,019**	
Gross domestic savings	m=1	755	0,000	0,000	**0,043**	
International reserves on STED	m=1	624	0,000	**0,189**		
External debt on exports	m=1	764	0,000	0,000	**0,160**	

TABLE 4 – PSTR estimations - Tests regarding the number of regimes (m=1)

Note : For each threshold variable tested, the estimation is done for m=1 (constraining to $r_{max} = 3$), and the countries whose required information was available less than 3 years were not taken into account. The number of observations included is mentionned in column 3. For each threshold variable, we test $H_0 : r = i$ against $H_1 : r = i + 1$ until the p-value of the Fisher Statistic (presented in columns 4, 5, 6 and 7) is superior to α. α is set to 0.05 for r=0 and divided by 2 at each new iteration, to favour parcimony (doing this, we follow a method suggested by the authors of GTD). The bold p-values correspond to the estimations the more likely accepted.

Dependent variable : amount of debt being in default (% of GDP)																				
Estimations done with m= 1																				
	r	**γ**	**c**	**Iterations**		**β_0**	**p-value**	**β_1**	**p-value**	**β_2**	**p-value**	**$\beta_0+\beta_1$**	**p-value**	**$\beta_0+\beta_2$**	**p-value**	**$\beta_0+\beta_1+\beta_2$**	**p-value**	**N**	**P_0**	**P_1**	**P_2**
Interest exp. (% of public revenue)		7429,9	9,0		Past default	**-0,792**	***0,407***	-0,879	*0,502*	0,999	*0,581*	**-1,672**	***0,129***	0,207	*0,914*	**-0,673**	***0,482***	612	47%	18%	35%
		3,7	13,8		Exchange rate	**-0,074**	***0,023***	0,327	*0,000*	-0,257	*0,000*	**0,253**	***0,000***	-0,332	*0,000*	**-0,004**	***0,820***				
	2			140	Inflation	**0,179**	***0,005***	-0,055	*0,614*	-0,057	*0,595*	**0,124**	***0,143***	0,122	*0,361*	**0,067**	***0,163***				
					Public debt	**0,168**	***0,000***	-0,022	*0,503*	-0,048	*0,231*	**0,146**	***0,000***	0,120	*0,032*	**0,098**	***0,005***				
					Ext.debt/Exports	**0,035**	***0,016***	-0,040	*0,007*	0,006	*0,376*	**-0,004**	***0,546***	0,041	*0,007*	**0,002**	***0,713***				
					S&P rating	**-0,519**	***0,004***	0,241	*0,100*	0,122	*0,431*	**-0,278**	***0,063***	-0,398	*0,071*	**-0,156**	***0,286***				
Domestic Savings (% of GDP)		3203,1	21,7		Past default	**-0,834**	***0,187***	-1,836	*0,204*	1,454	*0,280*	**-2,669**	***0,032***	0,620	*0,686*	**-1,215**	***0,025***	755	44%	10%	46%
		21,7	24,6		Exchange rate	**0,002**	***0,916***	0,047	*0,288*	-0,027	*0,552*	**0,049**	***0,246***	-0,026	*0,593*	**0,021**	***0,255***				
	2			135	Inflation	**0,030**	***0,345***	0,361	*0,000*	-0,150	*0,119*	**0,391**	***0,000***	-0,120	*0,241*	**0,241**	***0,000***				
					Public debt	**0,041**	***0,106***	0,078	*0,023*	-0,071	*0,009*	**0,119**	***0,000***	-0,030	*0,386*	**0,048**	***0,000***				
					Ext.debt/Exports	**0,000**	***0,925***	0,075	*0,000*	-0,086	*0,000*	**0,076**	***0,000***	-0,086	*0,000*	**-0,011**	***0,016***				
					S&P rating	**-0,221**	***0,038***	-1,007	*0,000*	0,977	*0,000*	**-1,227**	***0,000***	0,757	*0,000*	**-0,250**	***0,001***				
Reserves (% of STED)		121,9	78,5		Past default	**4,966**	***0,153***	-5,494	*0,127*			**-0,528**	***0,408***					624	12%	88%	
					Exchange rate	**0,111**	***0,225***	-0,119	*0,192*			**-0,008**	***0,604***								
	1			23	Inflation	**-0,107**	***0,355***	0,239	*0,055*			**0,131**	***0,004***								
					Public debt	**0,262**	***0,002***	-0,189	*0,017*			**0,073**	***0,000***								
					Ext.debt/Exports	**0,001**	***0,906***	0,001	*0,939*			**0,002**	***0,625***								
					S&P rating	**-0,705**	***0,004***	0,545	*0,007*			**-0,160**	***0,169***								
External Debt (% of exports)		23,0	385,0		Past default	**-0,695**	***0,064***	20,292	*0,000*	-6,491	*0,028*	19,597	*0,000*	**-7,186**	***0,014***	**13,106**	***0,000***	764	91%	6%	3%
		126,8	258,3		Exchange rate	**0,027**	***0,162***	0,367	*0,007*	-0,342	*0,014*	0,394	*0,004*	**-0,315**	***0,023***	**0,052**	***0,037***				
	2			114	Inflation	**0,108**	***0,019***	0,097	*0,751*	0,261	*0,236*	0,205	*0,508*	**0,369**	***0,085***	**0,465**	***0,006***				
					Public debt	**0,042**	***0,000***	0,009	*0,796*	0,225	*0,000*	0,051	*0,179*	**0,267**	***0,000***	**0,276**	***0,000***				
					Ext.debt/Exports	**-0,005**	***0,235***	0,016	*0,453*	-0,001	*0,918*	0,011	*0,609*	**-0,006**	***0,626***	**0,010**	***0,571***				
					S&P rating	**-0,069**	***0,295***	-1,928	*0,013*	-0,586	*0,122*	-1,997	*0,010*	**-0,655**	***0,091***	**-2,583**	***0,000***				

TABLE 5 – PSTR estimations - Estimations results (m=1)

Note : For each estimation presented, the number of observations is reported on column 19, the number of transition functions on column 2, the shape γ of the transition function in column 3 (smooth if $\gamma \to 0$, abrupt if $\gamma \to \infty$), the transition thresholds c in column 4 and the number of iterations needed to estimated this parameters in column 5. The slopes of each explanatory variable are reported on columns 7, 9, 11, 13, 15 and 17 (with the corresponding p-values in columns 8, 10, 12, 14, 16 and 18). β_i is the slope corresponding to the explanative variable x_{it} refered to in column 6. The observations for which the threshold variable is inferior to the lowest threshold c (whose part in the sample is reported on column 20) are broadly characterized by the slope β_0 (slope corresponding to the extreme observations). If c_i and c_j are respectively being the lowest and the highest threshold, the observations for which the threshold variable is superior to the lowest threshold but inferior to the highest (whose part in the sample is reported on column 21) are broadly characterized by the slope $\beta_0 + \beta_i$ and others by the slope $\beta_0 + \beta_i + \beta_j$ (slopes corresponding to the extreme observations). In actual fact, each observation is characterized by a specific slope, which varies smoothly between the slopes associated to the extreme observations.

Threshold variable 1 : Debt service as share of fiscal revenues

The model distinguishes between three regimes : one is characterized by a low level of debt service (which amounts for less than 9% of fiscal revenues), a regime of high level of debt service (where the latter weighs more than 14% of fiscal revenues), and an intermediate regime. We indicate below the explanatory variables that seem to be key determinants of the amount of debt default within each regime :

Regime 0 debt service lower than 9% of public revenues	Regime 1 debt service between 9% and 14% of public revenues	Regime 2 debt service higher than 14% of public revenues
Exchange rate (-) Inflation (+) Public debt (+++) Ext.debt on exports (+) S&P rating (-)	Exchange rate (+) Public debt (++)	Public debt (+)

TABLE 6 – Dependent variable : amount of sovereign debt being in default
Note : For each regime, defined by the thresholds presented in Table 5, the significant determinants of the amount of debt being in default are reported here. When the associated slope is positive (resp. negative), they are reported with a + (resp. -) sign. When a determinant is significant in different regimes with the same sign, the number of +/- signs reported informs on the importance of the slope from one regime to another.

47% of the observations are located in the low debt burden regime. In this regime, the following factors yields an increase in the amount of potential sovereign default : a nominal appreciation of the domestic currency, an increase in inflation, in public debt and in the ratio of external debt as share of total exports, a poor S&P rating. 35% of the observations are located in the high debt burden regime and there, public debt is the main driver of higher default. In the intermediate regime (18% of the observations), public debt and the exchange rate are the main determinants of sovereign default (with for the former an influence that is lower compared to the low debt burden regime). For the observations in this regime, a currency depreciation induces a currency mismatch which makes it more likely to default importantly. It is no longer the case once debt service on public revenues is inferior to a certain threshold (in regime 0). Finally, it is seen from the table above that the number of determinants that significantly affect the amount of debt decreases as we go from the low to the high debt burden regimes. This illustrates the fact that, when debt service is under control, the determinants of debt default are clearly identified. This is not the case when debt service becomes too heavy.

Threshold variable 2 : Domestic savings ratio

Along the domestic savings' axis, the three vulnerability regimes and the key determinants of debt default in each regime can be represented as follows :

Regime 0 domestic savings lower than 22% of GDP	Regime 1 domestic savings between 22% and 25% of GDP	Regime 2 domestic savings higher than 25% of GDP
	Past default (- -) Inflation (++) Public debt (++) Ext.debt on exports (+)	Past default (-) Inflation (+) Public debt (+) Ext.debt on exports (-)
S&P rating (-)	S&P rating (- -)	S&P rating (-)

TABLE 7 – Dependent variable : amount of sovereign debt being in default
Note : For each regime, defined by the thresholds presented in Table 5, the significant determinants of the amount of debt being in default are reported here. When the associated slope is positive (resp. negative), they are reported with a + (resp. -) sign. When a determinant is significant in different regimes with the same sign, the number of +/- signs reported informs on the importance of the slope from one regime to another.

44% of the observations in the estimation sample are located in the low savings ratio regime, characterised by a domestic savings ratio lower than 22% of GDP. In this regime, having a weak S&P rating is the key determinant of the amount of debt default. 46% of the observations belong to the high savings ratio regime (when the saving ratio is above 25%) where the following variables are found to rise the amount of sovereign default : a high inflation and debt ratio, a low external debt over exports ratio, a bad S&P rating. Interestingly, we also find that a country that did default during the preceding five years tends to decrease its current amount of debt in default. This could illustrate a "learning process", which goes against the "serial default" view : when they are able to (i.e. when their domestic savings are high enough), countries having recently defaulted are less inclined to default again because they learn from their errors. We obtain a similar conclusion for the intermediate regime. Finally, we also see that external debt tends to increase the amount of potential default when domestic savings are intermediate, but do not anymore once domestic

savings are high enough to build a safety buffer.

Threshold variable 3 : International reserves as a share of short-term external debt

Regime 0	Regime 1
Reserves lower than 79% of STED	Reserves higher than 79% of STED
	Inflation (+)
Public debt (++)	Public debt (+)
S&P rating (-)	

TABLE 8 – Dependent variable : amount of sovereign debt being in default
Note : For each regime, defined by the thresholds presented in Table 5, the significant determinants of the amount of debt being in default are reported here. When the associated slope is positive (resp. negative), they are reported with a + (resp. -) sign. When a determinant is significant in different regimes with the same sign, the number of +/- signs reported informs on the importance of the slope from one regime to another.

Here we have two regimes. 12% of the observations are assigned into the regime 0 when the reserve ratio falls below 79%. In this regime, we identify a high debt ratio and a weak S&P rating as the main factors of higher sovereign default. 88% of the observations lie in the regime 1 (when the international reserves account for more than 79% of total exports) in which a high inflation rate and public debt ratio are found to increase sovereign debt.

Threshold variable 4 : External debt as ratio of total exports

Regime 0	Regime 1	Regime 2
external debt lower than 258% of exports	external debt lower between 258% and 385% of exports	external debt higher than 385% of exports
	Past default (-)	Past default (+)
	Exchange rate (-)	Exchange rate (+)
Inflation (+)		Inflation (++)
Public debt (+)	Public debt (++)	Public debt (+++)
		S&P rating (-)

TABLE 9 – Dependent variable : amount of sovereign debt being in default
Note : For each regime, defined by the thresholds presented in Table 5, the significant determinants of the amount of debt being in default are reported here. When the associated slope is positive (resp. negative), they are reported with a + (resp. -) sign. When a determinant is significant in different regimes with the same sign, the number of +/- signs reported informs on the importance of the slope from one regime to another.

The observations switch between three regimes. A large majority (91%) are classified into a regime in which the external debt ratio remains below 258%, while a minority (3%) are in the extreme regime characterized by the highest external debt vulnerability with a ratio jumping above 385%. The remainder 6% are located in an in-between regime (external debt ratio between 258% and 385%). Comparing the two extreme regimes, the estimates suggest that more variables matter to impact sovereign default when external debt is high compared to total exports. Specifically, a currency depreciation, higher inflation and public debt ratio, a poor S&P rating and past defaults during the preceding five years, all concur to increase the weight of sovereign debt default when external debt ratio exceeds 385%. In the low external debt regime, only inflation and public debt ratio are key determinants of default (to a lesser extent than in the other extreme regime).

3.3 Time-varying effects and countries' heterogeneity

Our estimates are also to be interpreted in terms of time-varying dynamics of the vulnerability regimes across time (by seeing how the countries move from a regime to another, or by pointing possible situations characterized by statu-quo). Making cross-country comparisons is also worthy to point for potential heterogeneous situations, notably between countries located in the same geographical area.

Figures A.1 to A.4 in Appendix 2 show, for each country, the dynamics of the vulnerability regimes for the four vulnerability axes presented above. Different numbers (from 0 to 2) [12] and colours (green, orange and red) are used to signal whether a given year a country was situated in an priori low, medium or high vulnerability regime according to the vulnerability axes highlighted in the previous section. For each of the four threshold variables, the threshold values estimated above define the regimes in which each observation can be classified. Here, we consider that a country is "a priori" more vulnerable (in red) if debt burden (as a share of public revenue) is higher, domestic savings (as a share of GDP) are lower, international reserves (as a share of short-term external debt) are lower and external debt (as a

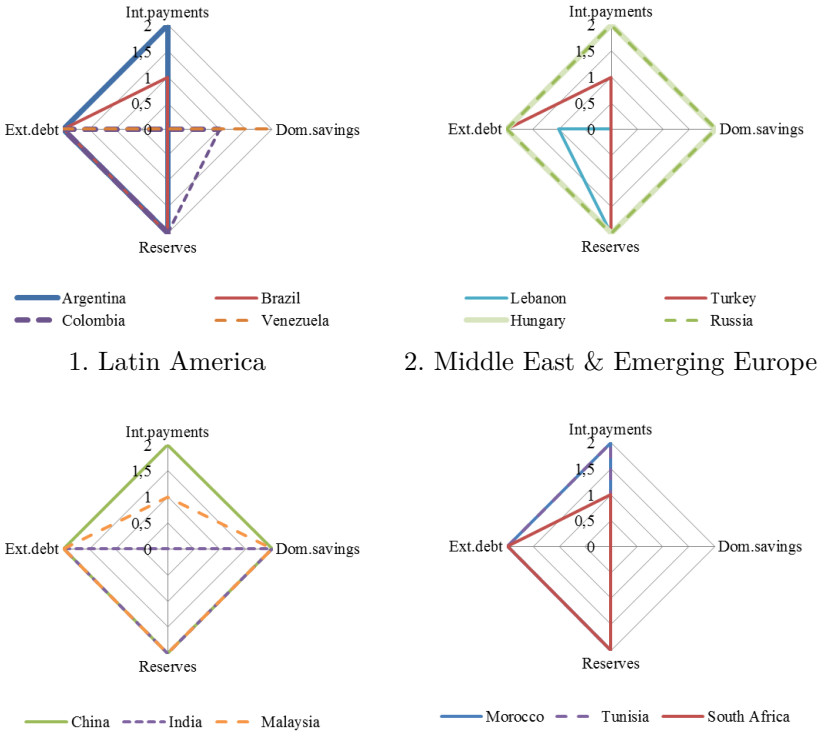
12. corresponding to the regime numbers mentioned in Tables 6 to 9.

share of exports) is higher.

Considering debt service, it seems that, since 2000, the countries have succeeded in hedging themselves against states where sovereign debt is less under control (in the sense that the determinants of sovereign default are less identified). However, there remains some differences in trajectories, with some countries now completely insulated from high debt burden (for example Chile and Morocco), while others are still in a debt spiral (for instance, Egypt, India and Israel).

Turning to domestic savings, Figure A.2 strongly suggests that the vulnerability regimes are "absorptive" in the sense that rarely does a country move durably from a regime to another. Therefore, if a country is highly vulnerable in terms of having a too low saving rate, it remains stuck to this situation and moves to a less vulnerable situation very slowly.

Concerning external debt and international reserves, it is seen that only a few countries experience a situation of high vulnerability that does not improve over the years (for instance, Argentina, Lebanon, Pakistan).



1. Latin America

2. Middle East & Emerging Europe

3. Asia

4. Africa

FIGURE 2 – Vulnerability mapping

Note : For a given variable, the smaller the surface, the higher the degree of a priori vulnerability in terms of that variable. A country is considered to be a priori more vulnerable if debt burden (as a share of public revenue) is higher, domestic savings (as a share of GDP) are lower, international reserves (as a share of short-term external debt) are lower and external debt (as a share of exports) is higher. They are classified on a scale of a priori vulnerability (0 to 2) according to their location based on the estimated threshold values.

Next, we consider cross-country heterogeneity. Figure 2 portrays the multidimensional aspect of countries' vulnerability, by selecting for purpose of illustration some countries in different geographical areas. For a given variable, the smaller the surface, the higher the degree of a priori vulnerability in terms of that variable (as defined above). The countries are classified on a scale of a priori vulnerability (0 to 2) according to their location based on the estimated threshold values [13]. A graph could be made for each year, but we show here a figure based on the last year of available observation.

It is noteworthy that, in terms of vulnerability, countries located in the same geographical area do not necessarily share the same characteristics. For instance, Russia, Hungary and China are not in any of the a priori vulnerability

13. For interest payments and external debt, the values of the regimes have been inversed for this example, so as to have a regime 0 corresponding to the a priori most vulnerable regime and a regime 2 to the a priori less vulnerable one, for each of the four variables of interest.

regimes identified. Brazil, Turkey and South Africa share similar characteristics (sound situation in terms of external debt and external reserves, but more fragile if we consider domestic savings and to a lesser extent debt service). A similar argument applies for Argentina, Morocco and Tunisia.

These results go in the direction of *Reinhart and Rogoff* (2013, [14]), who argue that we can't consider developed countries to be completely different from emerging ones anymore. In fact, more than the broad classifications that are currently used ("developed" countries versus "emerging" ones), these vulnerability profiles and the classification of countries into them shows that what really matters are the economic features of the countries to identify the determinants of the potential default the country is exposed to.

4 Conclusion

In this article, we contribute to the literature according to three aspects. First, we focus, not only on the occurrence, but also on the amount of sovereign debt being in default, relative to the country's GDP. Second, our empirical analysis is based on a nonlinear panel data model that allows regime-switching dynamics and heterogeneous effects of the determinants on sovereign debt being in default, whereas the literature essentially assumes homogeneous effects of the determinants of sovereign default. Finally, we manage to highlight four variables that are able to determine distinct vulnerability regimes and provide evidence that the variables influencing the amount of debt default vary across these regimes.

It appears that, taken together, debt service over fiscal revenues, domestic savings, international reserves on short-term external debt, and external debt on exports give an accurate insight on the emerging country's determinants of sovereign default. These lines of approach allow *i)* to see if some emerging countries, reinforcing their economic fundamentals, have succeeded in moving from one regime to another through time, therefore evolving in their behavior in terms of potential default ; *ii)* to gather countries together according to their similar profile in terms of sensibilities to specific economic variables.

Ultimately, this article allows to nuance the conclusions regarding the determinants of sovereign default in emerging countries. As this "group" of countries precisely stands out through a great diversity, our findings enable to highlight some subgroup's specificities. One possible extension to this work could be to investigate further, looking at the reaction to specific shocks, depending on each group's features. Some institutional aspects could also be added, as they do not significantly come out here, also they are one of the important aspects through which emerging countries differ from developed ones.

A Appendix

A.1 Data

Number	Country	Code	Geographic area
1	Algeria	AA	Africa
2	Argentina	AG	Latin America
3	Brazil	BR	Latin America
4	Bulgaria	BL	Emerging Europe
5	Chile	CL	Latin America
6	China	CH	Asia
7	Colombia	CO	Latin America
8	Croatia	CT	Emerging Europe
9	Czech Republic	CZ	Emerging Europe
10	Egypt	EY	Africa
11	Estonia	EO	Emerging Europe
12	Greece	GR	Emerging Europe
13	Hong Kong	HK	Asia
14	Hungary	HN	Emerging Europe
15	India	IN	Asia
16	Indonesia	ID	Asia
17	Israel	IS	Middle East
18	Kenya	KN	Africa
19	Korea	KO	Asia
20	Kuwait	KW	Middle East
21	Latvia	LV	Emerging Europe
22	Lebanon	LB	Middle East
23	Lithuania	LN	Emerging Europe
24	Malaysia	MY	Asia
25	Mauritius	MU	Africa
26	Mexico	MX	Latin America
27	Morocco	MC	Africa
28	Nigeria	NG	Africa
29	Pakistan	PK	Asia
30	Peru	PE	Latin America
31	Philippines	PH	Asia
32	Poland	PO	Emerging Europe
33	Qatar	QA	Middle East
34	Romania	RM	Emerging Europe
35	Russia	RS	Emerging Europe
36	Saudi Arabia	SI	Middle East
37	Singapore	SP	Asia
38	Slovakia	SX	Emerging Europe
39	Slovenia	SJ	Emerging Europe
40	South Africa	SA	Africa
41	Taiwan	TW	Asia
42	Tanzania	TN	Africa
43	Thailand	TH	Asia
44	Tunisia	TU	Africa
45	Turkey	TK	Middle East
46	Ukraine	UR	Emerging Europe
47	United Arab Emirates	UA	Middle East
48	Uruguay	UY	Latin America
49	Venezuela	VE	Latin America
50	Vietnam	VI	Asia

Table A.1 – Selected Emerging markets countries

Item	Source	Description => Treatment	Definition	Time period
Terms of trade	World Bank, World Development Indicators	Trade Indexes, Net barter terms of trade index (2000 = 100) => Y/Y % change	Net barter terms of trade index is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000.	1981-2013 except for BL, CT, CZ, EO, GR, HN, IS, KW, LV, LB, LN, PO, QA, RM, RS, SI, SX, SJ, UR, UA, VI (81-01). TW non available.
Exchange rate	World Bank, World Development Indicators	Exchange Rates & Prices, Official exchange rate (LCU per US$, period average), USD => Y/Y % change	Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).	1981-2013 except for BL, TK (86-13), VI (87-13), AG (89-13), PE (90-13), SJ (92-13), BR, LV, LN, CT (93-13), EO (94-10), CZ, RS, SX, UR (94-13), SJ (06-13), SX (08-13) and GR (81-00). TW non available.
Portfolio Equity flows	World Bank, World Development Indicators	Capital & Financial Account, Portfolio equity, net inflows (BoP), Current Prices, USD => % of GDP	Portfolio equity includes net inflows from equity securities other than those recorded as direct investment and including shares, stocks, depository receipts (American or global), and direct purchases of shares in local stock markets by foreign investors. Data are in current U.S. dollars. Missing values have been replaced by linear interpolation when there was a lack of less than 5 years.	1980-2013 except for IS (82-13), SA (85-13), IS, PK, TU (88-13), CL, MX, TK (89-13), KO (90-13), IN (91-13), AG, VE (92-13), KN (93-12), CT, CZ, EO, HN, ID, KN, LN, MC, PE, SX (93-13), CO, MU, RS (94-13), UR, PO (95-13), UR, PH, LV, BL (96-13), CH, RM, SJ (97-13), GR (99-13), UY (00-13), HK (98-13), MY (02-09), LB (03-13), NG (05-12), VI (05-13), KW (06-13), EY (97-12), QA (11-13). AA, SI, TN, TW, UA non available.

Table A.2 – Sources of data : Capital account and foreign exchange variables

Item	Source	Description => Treatment	Definition	Time period
Real GDP growth	International Monetary Fund, World Economic Outlook	Gross domestic product, constant prices, Chg Y/Y	IMF/WEO general methodological notes : Annual percentages of constant price GDP are year-on-year changes.	1980-2013 except for CT, RS, UR, LV, SJ, SX (93-13), EO, SX (94-13), CZ, LN (96-13).
Nominal GDP	Oxford Economics	GDP, nominal, local currency	In billions for AG, CL, CH, CO, CZ, GR, HN, IN, I, KO, MX, RM, RS, SX, TH, VE, VI. In millions for the other countries.	1980-2013 except for AA, CO, EY, EO, IS, KN, LV, LB, KW, LN, MU, MC, NG, PK, PE, QA, SJ, TU, UR, UY, VI (88-13), PO (89-13), RM, RS (90-13), CT, HN (91-13), CZ, SX (93-13). TN non available.
Nominal GDP	Oxford Economics	GDP, millions USD		1980-2013 except for AA, CO, EY, EO, IS, KN, LV, LB, KW, LN, MU, MC, NG, PK, PE, QA, SI, SJ, TU, UR, UY, VI (88-13), PO (89-13), RS (90-13), HN (91-13), CT (92-13), CZ, SX (93-13). TN non available.
CPI	International Monetary Fund, World Economic Outlook	Inflation, average consumer prices, Chg Y/Y	IMF/WEO general methodological notes : Annual percentages of average consumer prices are year-on-year changes.	1980-2013, except for CH (90-13), RS, LV, UR, SJ (93-13), EO, SX, CT (94-13), CZ (96-13), LN (00-13)
Interest payments	Oxford Economics	Central government, interest expenditure, local currency => % of public revenues	In billions for AG, CL, CH, CO, CZ, GR, HN, IN, I, KO, MX, RM, RS, SX, TH, VE, VI. In millions for the other countries.	1980-2013 except for PH (86-13), BL, CL, ID, PK, PE, SA, UY, TU (90-13), KN, EY (91-13), AG, CT, RS (92-13), KW (93-07), CZ, SJ (93-13), LV (94-13), EO, GR, HN (95-13), BR (97-13), UR (99-13), LN, IS, LB (00-13), PO (01-13), MC, PH, RM (02-13), CO, SX (03-13), QA (04-13), HK (05-13), AA (06-13), MU, TH (09-13). NG, SI, TN, UA, VI non available.
General government debt	International Monetary Fund, World Economic Outlook	General government gross debt, % of GDP	IMF-WEO general methodological notes : Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future.	1990-2013 except for GR (80-13), IN, AA, TU (91-13), AG (93-13), PK, PH (94-13), PO, CZ, SJ, CH, EO (95-13), TH, CO, MX (96-13), UR, HN, TW, SX (97-13), VE, KN (98-13), RS, LV, UA, SI (99-13), BR, ID, BL, LN, PE, SA, RM, BL, MU, NG, IS, LB (00-13), TN, TK, HK, UY, VI (01-13), EY, CT (02-13).
Public balance	Oxford Economics	Government balance, % of GDP		1980-2013 except for MU, PE, NG, QA, PK, MC, CO, KN, IS, KW, TU, UY, VI (88-13), LV (90-13), EY, HN, LN (91-13), AG, CT, LB, SI, UR (92-13), RS, SX, SJ, CZ, AA (93-13), UA (94-13), EO (95-13), BR (97-13). TN non available.
	Eurostat	General government deficit/surplus, % of GDP	For all countries except PO.	1994-2013
General government revenues	Oxford Economics	General government revenues (% of GDP)		1980-2013 except for CO, KN, MU, MC, NG, PK, QA, IS, KW, SI, TU, UY, VI (88-13), PE, CL (89-13), LV, RM (90-13), EY, HN, LN (91-13), AG, UR CT, LB (92-13), CZ, RS, SX, SJ, AA (93-13), UA (94-13), EO, PO (95-13), BR (97-13). TN non available.
General government expenditure	Oxford Economics	General government expenditure (% of GDP)		1980-2013 except for CO, KN, MU, MC, NG, PK, PE, QA, IS, KW, SI, TU, UY, VI (88-13), CL (89-13), LV, RM (90-13), EY, HN, LN (91-13), AG, UR CT, LB (92-13), CZ, RS, SX, SJ, AA (93-13), UA (94-13), EO, PO (95-13), BR (97-13). TN non available.
Domestic savings	World Bank, World Development Indicators	Shares of GDP & Other, Gross domestic savings (% of GDP)	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	1980-2013 except for LV (80-11),VE (80-12), NG (81-13), CH (82-13),VI (86-13), RS, UR (89-13), LN (90-11), CZ, RM, TN, LB, PO, SX (90-13), QA (94-11), CT, EO, SJ (95-13), UA (01-13). TW non available.

Table A.3 – Sources of data : Economic variables (intern)

Note : As some observations were clearly aberrant, we deleted them from the raw data described above. It was for example the case for observations whose information on GDP growth and GDP was not consistent, and for those where public balance (% of GDP) was inferior to -100 or superior to 100.

Item	Source	Description => Treatment	Definition	Time period
Sovereign debt in default	Bank of Canada (David T. Beers and Jean-SÃ©bastien Nadeau)	Million US$	Estimates of stocks of government obligations in default, including bonds and other marketable securities, bank loans, and official loans in default, valued in U.S. dollars, for the years 1980 to 2013.	1980-2013 except for MU (85-13), MC, NG, CO, EY, KN, LB, PE, TU, UY, VI (88-13), PO (89-13), TN (13). No default on this period for CH, CZ, EO, HK, HN, IS, KO, LN, MY, QA, SP, SI, SX, TW, UA.
International reserves	World Bank, International Debt Statistics	Total reserves (includes gold), Current Prices, millions USD => % of STED	Total reserves comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year-end (December 31) London prices. Data are in current U.S. dollars. Aggregation Method : Sum. Millions USD except for UA, SJ, SP, SI, QA, KW, IS, HK, GR, CT, CZ, EO, HN, SX, PO, KO (US $).	1980-2013 except for CL, NG, VE, UY (80-11), CH (82-13), PO (86-08), LN (92-11), BL, UR (92-13), CT (93-08), LV, RS (93-11), EO, CZ (93-13), SX (93-06), SA (94), VI (95-13), SI (96-13), HN (00-13), SP (03-13), IS (06-13). GR, HK, KW, QA, SJ, TW, UA non available.
Total short-term external debt (STED)	World Bank, World Development Indicators	Debt Outstanding, External debt stocks, short-term (DOD), Current Prices, USD	Short-term external debt is defined as debt that has an original maturity of one year or less. Available data permit no distinction between public and private nonguaranteed short-term debt.	1980-2013 except for CL, UY (80-11), CH, HN (82-13), BL (85-13), PO (86-08), VI (87-13), RS, LN (92-11), UR (92-13), LV (93-11), SX (93-06), CT (93-07), SA (94-13). GR, QA, SJ, UA,HK, KW non available.
	Oxford Economics	External debt, short-term, millions USD		1992-2013 except for KO, TW (80-13), EO, CZ (93-13), SI (96-13), SP (03-13), IS (06-13).
External debt (% of Exports)	Oxford Economics	External debt, total, share of exports		1980-2013 except for CH, BL (81-13), ID (83-13), SA (87-13), PK, MC, NG, CO, EY, PE, MU, KN, AA, LB, TU, UY, VI (88-13), PO (89-13), RS (90-13), HN (91-13), LV, EO, UR (92-13), SX, CZ, LN, CT (93-13), IS (95-13), SI (96-13), QA, KW (97-13), UA (99-13), HK (02-13), GR, SP (03-13). TN, SJ non available.
General government external debt	Oxford Economics	External debt, millions USD => % of General Government debt	For all countries except AA,CO,EY, EO, IS, LV, LN, MU, MC, NG, PE, RM, SP, SX, SJ, TU, UR, and UY.	1980-2013 except for CH (81-13), PO (89-13), HN (91-13), RS (92-13), CZ (93-13), SA (94-13), CT (98-13), BL (99-13), SJ (01-13), HK (02-13), GR (03-13), CO (04-13). UA, KN, PK, QA, TN, KW, LB, SI, SP, VI non available.
	World Bank QEDS	Gross External Debt, General Government, Overall, Total, Current Prices, millions USD => % of General Government debt		1999-2013 except for EO, IS (98-13), TU (03-13), CO, PE, LV, LN, SX, UR, UY (04-13), EY (05-13), RM (09-13), MC (10-13), NG, MU (12), AA (13).

TABLE A.4 – Sources of data : Economic variables relative to default and external debt
Note : As some observations were clearly aberrant, we deleted them from the raw data described above. It was for example the case for observations whose information on reserves on short-term external debt was not consistent, and for those where the share of external debt in general government debt was higher than 100%.

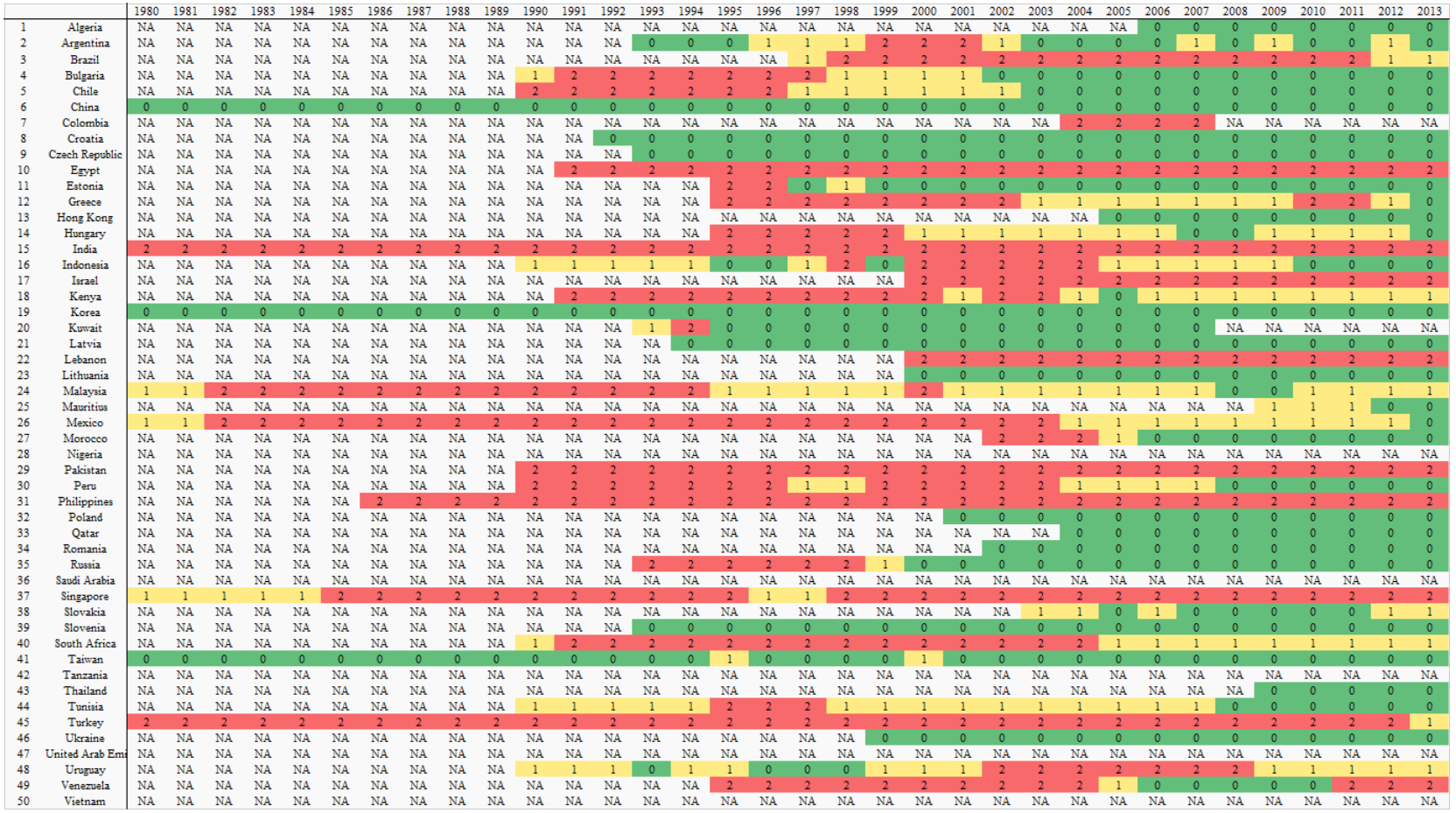
TABLE A.5 – Sources of data : Institutional variables

Item	Source	Description => Treatment	Definition	Time period
Rule of law indicator	World Bank, World Development Indicators		Rule of Law (RL) : capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	1996-2013. For 1997, 1999 and 2001, means of the years before and after have been taken for each country.
Government effectiveness indicator	World Bank, World Development Indicators		Government Effectiveness (GE) : capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	1996-2013. For 1997, 1999 and 2001, means of the years before and after have been taken for each country.
Control of corruption indicator	World Bank, World Development Indicators		Control of Corruption (CC) : capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	1996-2013. For 1997, 1999 and 2001, means of the years before and after have been taken for each country.
Corruption Perception Index	Transparency		Missing values have been replaced by linear interpolation when there was a lack of less than 5 years.	1995-2013 except for BL, EO, LV, MU, EY, MC, PE, TN, UR (98-13), CZ, EY, HK, KN, NG, PO, RS, TW (96-13), IS, RM, UY, VI (97-13), TU (98-13), CT, LN, SJ (99-13), SX (00-13), AA, LB, KW, QA, SI, UA (03-13), QA (04-13).

TABLE A.6 – Sources of data : Financial variables

Item	Source	Description => Treatment	Definition	Time period
Emerging markets bond index (blended spreads)	JP Morgan	JPM EMBI, blended spreads	Bond index. CL is given the Latin America EMBI; CZ, EO, GR, LV, LN, RM, SX, SJ, the Europe EMBI; KN, MU, MC, TU, AA, TN the African EMBI; QA, UA, IS, SI, KW the Middle East EMBI; and IN, KO, TW, TH, SP, HK the Asia EMBI.	1994-2013 except for BR, BL, CH, SA, PO (95-13), CT, MY, TK (97-13), AA, CL, CB, CZ, EO, GR, KN, LV, LN, MU, MC, PE, RM, RS, SX, SJ, PH, TN, TH, TU (98-13), HN, IS, KW, LB, QA, SI, UA (99-13), UR (01-13), EY, PK, UY (02-13), ID (05-13), VI (06-13).
S&P rating		Credit rating, average, (0=D and 22=AAA)	Rating on foreign currency long-term debt. Countries which were first rated only after 1990 get a constant rating before (corresponding to their first rating). AA gets the rating of TU, TN the rating of KN, UA the rating of QA, MU the rating of SA.	1990-2013
Interbank rates	Essentially National/Central Banks	Interbank overnight		1988-2013 except for SP (88), PH (90), TH (91), CB (92-07), CZ (93), MY, PO (94), CL, HN, PE (96), ID (97), LV (98), IN, LN (99), RM (00), CH (02), BL (04), HK (06), CT, TK, EY (07), IS (08). AG, BR, EO, GR, KN, KO, MU, MX, MC, PK, QA, RS, SX, SJ, SA, UA, VE, SI, LB, KW, AA, TU, UY, VI non available.
Lending rate	World Bank, World Development Indicators	Interest Rates, Lending interest rate (%) => lending rate - deposit rate	Missing values have been replaced by linear interpolation when there was a lack of less than 5 years.	1980-2013 except for GR (80-03), MC (80-05), PO (80-06), MU (81-13), LB (82-13), VE (84-13), CB, ID, PE (86-13), MY (87-13), HN (89-13), HK (90-13), SJ, BL (91-13), EO, CT (92-13), LN (93-10), CZ, LV, MX, SX, UR, VI (93-13), AG, RM, AA (94-13), RS (95-13), BR (97-13), PK (04-13), SX (08-13), SJ (09-13), UA (80-84 & 91-01), QA (80-94 & 04-13), TU (80-89). TW, TK, SI non available.
Deposit rate	World Bank, World Development Indicators	Interest Rates, Deposit interest rate (%) => lending rate - deposit rate	Missing values have been replaced by linear interpolation when there was a lack of less than 5 years.	1980-2013 except for UA (80-84 & 99-01), TU (80-88), GR (80-05), MC (80-91 & 98-13), SJ (80 -09), MU (81), LB (82), IS (83-12), VE (84), CB (86), SI (87-08), PE (88), PO (89-06), HK (90), BL, SJ (91), CT (92), LN (93-10), SX (93-08), CZ, LV, UR, VI (93), EO, RM (94), RS (95), PK (04). TW, IN non available.
Sovereign interest rates	International Monetary Fund, International Financial Statistics and National sources	Interest Rates, Government securities, Treasury bills	Missing values have been replaced by linear interpolation when there was a lack of less than 5 years.	1980-2013 except for TH (81-88 & 02-13), TK (87-92 & 00-07), IS (84), HN (88-13), PO (92-11), BL, HK, NG, PK (92-13), CZ, TN (93-13), UY (94-13), BR, LV, LN, RS (95-13), RM (96-13), EY (97-13), SJ (99-13), VI(00-13), MU (01-13), RS (03-13), IN (08-13),SI (10-13), SP (80-12), CL, ID, VE (12-13). AG, CH, CO, EO, KO, MC, QA, PE, SX, TW, UR, UA, TU, CT non available.

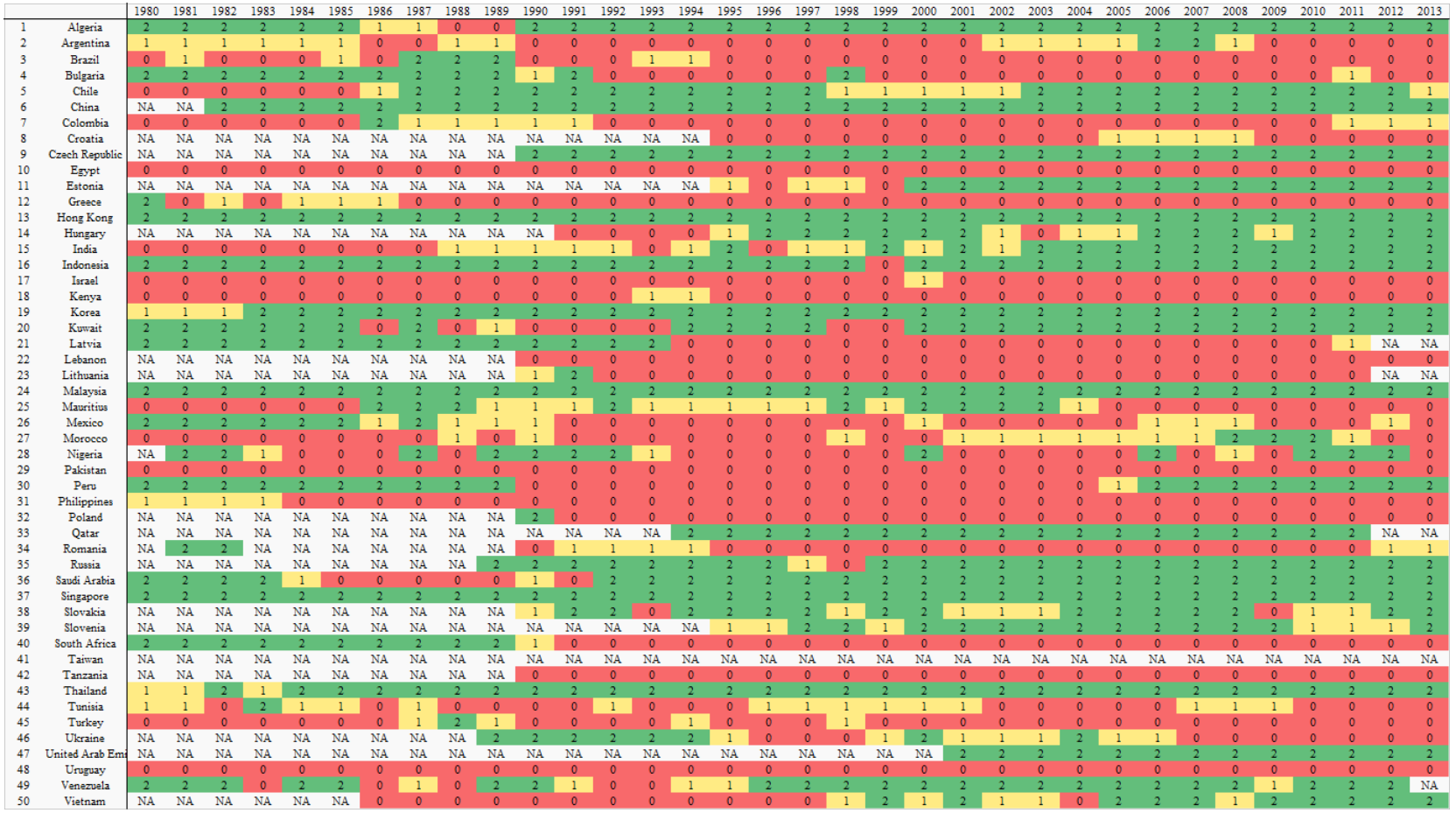
A.2 Evolution of the countries within the vulnerability regimes



		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Algeria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0
2	Argentina	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	1	1	1	2	2	2	1	0	0	0	0	1	0	1	0	0	1	0
3	Brazil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
4	Bulgaria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	2	2	2	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
5	Chile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
6	China	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Colombia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	NA	NA	NA	NA	NA	NA
8	Croatia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Czech Republic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Egypt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Estonia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Greece	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2	1	0
13	Hong Kong	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0
14	Hungary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	1	1	1	1	1	1	1	0	0	1	1	1	1	0
15	India	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Indonesia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	0	0	1	2	0	2	2	2	2	2	1	1	1	1	1	0	0	0	0
17	Israel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	Kenya	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	1	2	2	1	0	1	1	1	1	1	1	1	1
19	Korea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Kuwait	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
21	Latvia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Lebanon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	Lithuania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Malaysia	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	0	0	1	1	1	1
25	Mauritius	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	0	0
26	Mexico	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0
27	Morocco	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	1	0	0	0	0	0	0	0	0
28	Nigeria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	Pakistan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
30	Peru	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	1	1	2	2	2	2	2	1	1	1	1	0	0	0	0	0	0
31	Philippines	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
32	Poland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Qatar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0
34	Romania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0
35	Russia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Saudi Arabia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37	Singapore	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
38	Slovakia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	0	1	0	0	0	0	0	1	1
39	Slovenia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	South Africa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
41	Taiwan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
42	Tanzania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
43	Thailand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0
44	Tunisia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
45	Turkey	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
46	Ukraine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	United Arab Emi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
48	Uruguay	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	0	1	1	0	0	0	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1
49	Venezuela	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	1	0	0	0	0	0	2	2	2
50	Vietnam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

FIGURE A.1 – Vulnerability regimes - Central government interest payments (% of public revenues)

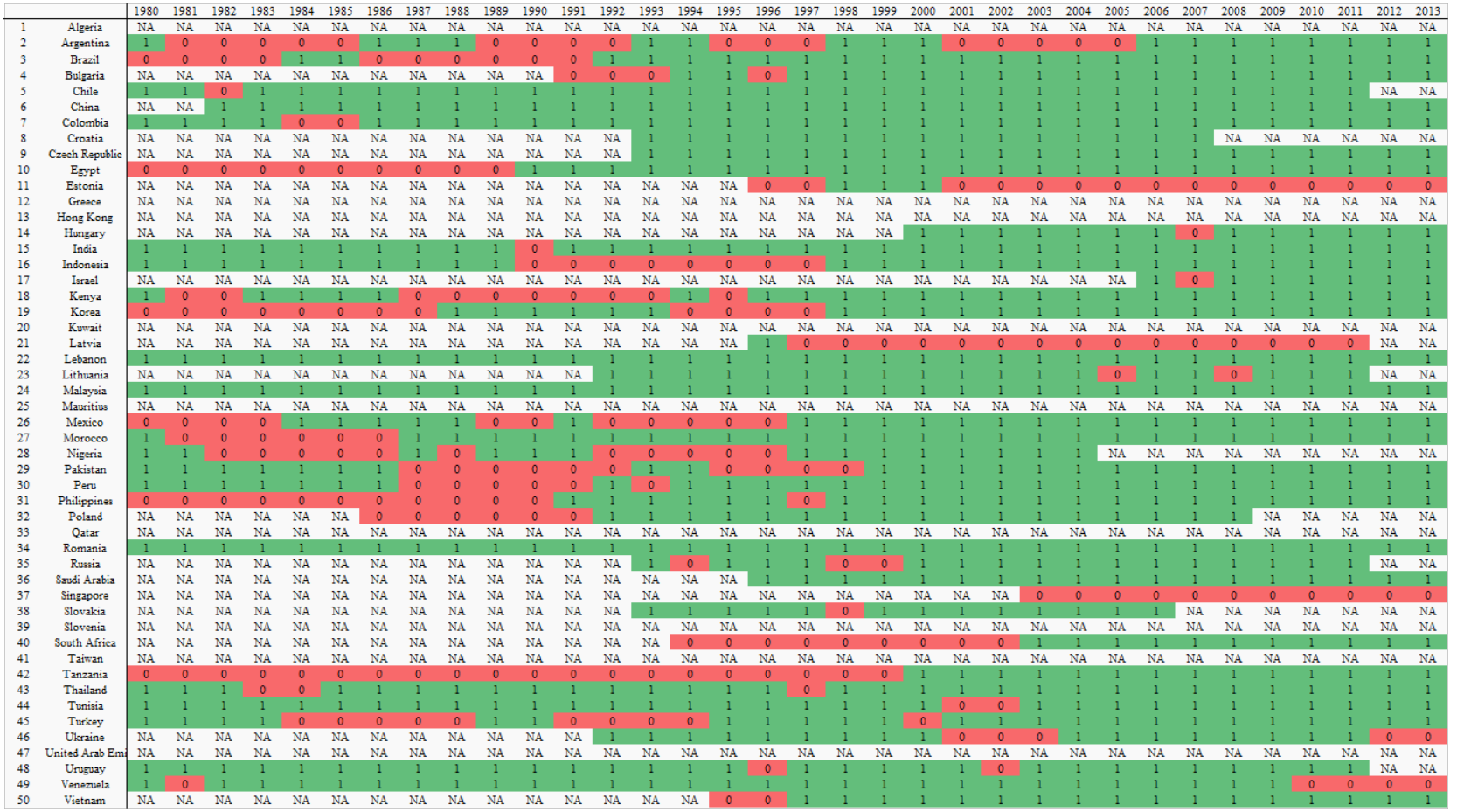
Note : The table reports the regime to which the observations belong to, for each country and each year. For the "interest payments" model, the three regimes (0, 1 and 2) are delimited by interest payments of 3,7% and 13,8% of public revenues (see Table 5). Green (respectively red) cells correspond to observations characterized by lower (respectively higher) interest payments as a share of public revenues."NA" observations are those for which information on interest payments is not available.



		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Algeria	2	2	2	2	2	2	1	1	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	Argentina	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	1	0	0	0	0	0
3	Brazil	0	1	0	0	0	1	0	2	2	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Bulgaria	2	2	2	2	2	2	2	2	2	2	1	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
5	Chile	0	0	0	0	0	0	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1
6	China	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Colombia	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
8	Croatia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0
9	Czech Republic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
10	Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Estonia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Greece	2	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Hong Kong	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Hungary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	1	2	2	2	2	2	2	1	0	1	1	2	2	2	1	2	2	2	2
15	India	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	2	0	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2
16	Indonesia	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Israel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Kenya	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Korea	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Kuwait	2	2	2	2	2	2	0	2	0	1	0	0	0	0	0	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	Latvia	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	NA	NA
22	Lebanon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Lithuania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA
24	Malaysia	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
25	Mauritius	0	0	0	0	0	0	2	2	2	1	1	1	2	1	1	1	1	1	2	1	2	2	2	2	1	0	0	0	0	0	0	0	0	0
26	Mexico	2	2	2	2	2	2	1	2	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0	1	0
27	Morocco	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	2	2	2	1	0	0
28	Nigeria	NA	2	2	1	0	0	0	2	0	2	2	2	2	1	0	0	0	0	0	0	2	0	0	0	0	0	2	0	1	0	2	2	2	0
29	Pakistan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Peru	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	2	2
31	Philippines	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	Poland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Qatar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	NA	NA
34	Romania	NA	2	2	NA	NA	NA	NA	NA	NA	NA	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
35	Russia	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
36	Saudi Arabia	2	2	2	2	1	0	0	0	0	0	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
37	Singapore	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
38	Slovakia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	2	0	2	2	2	2	1	2	2	1	1	1	2	2	2	2	2	0	1	1	2	2
39	Slovenia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	1	1	1	2
40	South Africa	2	2	2	2	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	Taiwan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42	Tanzania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Thailand	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
44	Tunisia	1	1	0	2	1	1	0	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0
45	Turkey	0	0	0	0	0	0	0	1	2	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	Ukraine	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	1	0	0	0	1	2	1	1	1	2	1	1	0	0	0	0	0	0	0
47	United Arab Emi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2	2	2
48	Uruguay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	Venezuela	2	2	2	0	2	2	0	1	0	2	2	1	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	NA
50	Vietnam	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	1	1	0	2	2	2	1	2	2	2	2	2

FIGURE A.2 – Vulnerability regimes - Domestic savings (% of GDP)

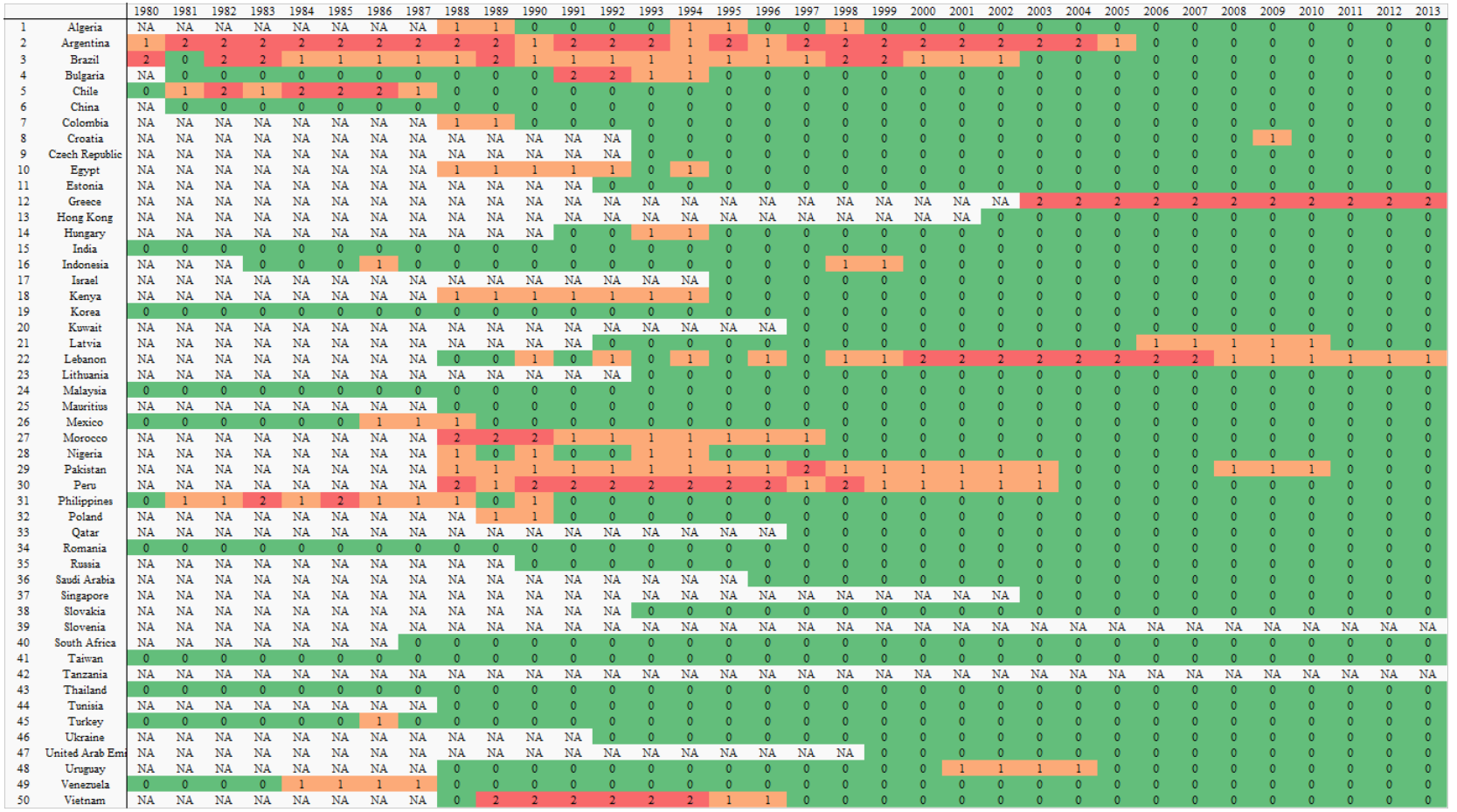
Note : The table reports the regime to which the observations belong to, for each country and each year. For the "domestic savings" model, the three regimes (0, 1 and 2) are delimited by domestic savings of 21,7% and 24,6% of GDP (see Table 5). Green (respectively red) cells correspond to observations characterized by higher (respectively lower) domestic savings as a share of GDP."NA" observations are those for which information on domestic savings is not available.



		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Algeria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	Argentina	1	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1
3	Brazil	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Bulgaria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Chile	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	NA	NA
6	China	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Colombia	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Croatia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	NA	NA	NA	NA	NA	NA
9	Czech Republic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	Egypt	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	Estonia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Greece	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13	Hong Kong	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	Hungary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	0	1	1	1	1	1	1
15	India	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	Indonesia	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	Israel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	1	1	1	1	1	1
18	Kenya	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	Korea	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	Kuwait	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21	Latvia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA
22	Lebanon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	Lithuania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	NA	NA
24	Malaysia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	Mauritius	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26	Mexico	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27	Morocco	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
28	Nigeria	1	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	Pakistan	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
30	Peru	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
31	Philippines	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	Poland	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	NA	NA	NA	NA	NA
33	Qatar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
34	Romania	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	Russia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	NA	NA
36	Saudi Arabia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	Singapore	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
38	Slovakia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	0	1	1	1	1	1	1	1	1	NA	NA	NA	NA	NA	NA	NA
39	Slovenia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
40	South Africa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
41	Taiwan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42	Tanzania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
43	Thailand	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
44	Tunisia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1
45	Turkey	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
46	Ukraine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0
47	United Arab Emi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
48	Uruguay	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	NA	NA
49	Venezuela	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
50	Vietnam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

FIGURE A.3 – Vulnerability regimes - Foreign reserves (% of short-term external debt)

Note : The table reports the regime to which the observations belong to, for each country and each year. For the "foreign reserves" model, the two regimes (0 and 1) are delimited by foreign reserves of 78,5% of short-term external debt (see Table 5). Green (respectively red) cells correspond to observations characterized by higher (respectively lower) foreign reserves as a share of short-term external debt."NA" observations are those for which information on foreign reserves is not available.



		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Algeria	NA	NA	NA	NA	NA	NA	NA	NA	1	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Argentina	1	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0
3	Brazil	2	0	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
4	Bulgaria	NA	0	0	0	0	0	0	0	0	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Chile	0	1	2	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	China	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Colombia	NA	NA	NA	NA	NA	NA	NA	NA	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Croatia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
9	Czech Republic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Egypt	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Estonia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Greece	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	2	2	2
13	Hong Kong	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0
14	Hungary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	India	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Indonesia	NA	NA	NA	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Israel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Kenya	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Korea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Kuwait	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Latvia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0
22	Lebanon	NA	NA	NA	NA	NA	NA	NA	NA	0	0	1	0	1	0	1	0	1	0	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1
23	Lithuania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Malaysia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Mauritius	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Mexico	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Morocco	NA	NA	NA	NA	NA	NA	NA	NA	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Nigeria	NA	NA	NA	NA	NA	NA	NA	NA	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Pakistan	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0
30	Peru	NA	NA	NA	NA	NA	NA	NA	NA	2	1	2	2	2	2	2	2	2	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
31	Philippines	0	1	1	2	1	2	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	Poland	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Qatar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	Russia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Saudi Arabia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	Singapore	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0
38	Slovakia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	Slovenia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
40	South Africa	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	Taiwan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	Tanzania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
43	Thailand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	Tunisia	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Turkey	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	Ukraine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	United Arab Emi	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	Uruguay	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
49	Venezuela	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	Vietnam	NA	NA	NA	NA	NA	NA	NA	NA	0	2	2	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FIGURE A.4 – Vulnerability regimes - External debt (% of exports)

Note : The table reports the regime to which the observations belong to, for each country and each year. For the "external debt" model, the three regimes (0, 1 and 2) are delimited by external debt of 126,8% and 258,3% of exports (see Table 5). Green (respectively red) cells correspond to observations characterized by lower (respectively higher) external debt as a share of exports."NA" observations are those for which information on external debt is not available.

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Amundi Working Paper

WP-049-2015

April 2015

Written by Amundi.

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