Sovereign Defaults by Currency Denomination*

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ABSTRACT

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ABSTRACT

This paper explores the drivers of sovereign defaults in 100 countries over the period 1996-2012. We build a new data set of sovereign defaults and show that default events on local and foreign currency bonds are equally likely. However, we find that governments typically default under different economic and financial conditions depending on the bond's currency denomination. Using various economic and financial characteristics, we explain 55% of the variation in default probability, while the explanatory power drops to 35% when the currency denomination is ignored. We also provide evidence that the default probability on sovereign bonds is unrelated to global factors and market sentiment. Hence, such factors affect investors' compensation for holding sovereign credit risk, but not the risk itself.

1 Introduction

Investors are today paying close attention to the default risk embedded in the local sovereign debt market. Bonds denominated in local currency play an increasingly important role for sovereign issuers in emerging markets and international investors are currently holding record high levels of local currency debt (see Figure 1). This recent trend highlights the importance of identifying the drivers of default on local currency debt and of exploring whether a government's decision to default varies with the currency of indebtedness.

Figure 1 [about here]

The goal of this study is to analyze the determinants of sovereign credit risk with a detailed investigation of the default events observed over the period 1996-2012. We examine the drivers of defaults on sovereign debt by currency denomination. The approach of this paper differs from the existing literature in three important dimensions.

First, previous studies have exclusively focused on the determinants of sovereign credit ratings and sovereign spreads. On the one hand, ratings face growing criticism for their inability to adequately reflect default risk (e.g., see Xia, 2013). On the other hand, spreads observed in the bond or the credit default swap (CDS) market do not only capture default risk, but also a compensation for liquidity risk and the premium required by investors for bearing these risks (e.g., see Longstaff, Pan, Pedersen, and Singleton, 2011). Unfortunately, it is not straightforward to disentangle these different components. To circumvent these issues, we analyze the risk of default directly using observed sovereign default events.

Second, the consideration of sovereign credit spreads for emerging economies can only be used to measure default risk on foreign currency debt.[1] Therefore, most studies explicitly exclude local currency bonds from the analysis. In contrast, an investigation of observed

[1]When a government's debt is issued in local currency, one cannot subtract a risk-free rate to compute the credit spread because such a rate does not exist. Du and Schreger (2013), however, address this issue by computing a synthetic local currency risk-free rate from the cross currency swap market. In contrast, CDS contracts on emerging market debt are, thus far, almost exclusively issued for USD-denominated securities.

default rates allows us to study different types of bonds and to disentangle the analysis of sovereign default risk by currency denomination.

Third, this study explores the determinants of sovereign defaults based on a novel and comprehensive database of sovereign defaults that includes 100 countries over the period 1996-2012. For our analysis, we consider sovereign defaults on bonds denominated in local and foreign currency.[2] The details of the collected data allow us to investigate not only the decision to default but also the currency of the debt on which a government can default.

Our new database indicates the existence of 58 sovereign default events over the period 1996-2012: 31 consist of defaults on local currency bonds and 27 defaults on foreign currency bonds. For 15 events, we observe simultaneous defaults on both types of debt.

It is common belief that investing in government debt issued in local currency is close to risk-free since a government has the ability to print money and monetize its debt. However, our data set suggests that this view is quite far from reality; defaults on bonds issued in domestic currency are at least as frequent as defaults on foreign currency bonds. The most famous examples are certainly Russia in 1998 and Turkey in 1999. Defaulting on local currency debt occurs regularly because debt monetization is costly in terms of inflation and may, therefore, not always be the preferred option for the government.

We start the empirical analysis by exploring the determinants of a government's decision to default on government bonds.[3] The results suggest that a government is more likely to default on its bonds when the country exhibits i) weaker long-term economic growth, ii) higher inflation, iii) less financial development (i.e., less bank credit to firms), iv) lower real effective exchange rate (i.e., relatively overvalued currency), and v) greater original sin (i.e., inability to issue debt in local currency). These determinants have the expected signs.

[2]This paper focuses on sovereign debt owed to bondholders (referred to as "sovereign bonds") and thus excludes loans owed to private commercial banks. We define a sovereign default event by a country in default in a given year, as classified by Fitch Ratings, Moody's, or Standard and Poor's.

[3]For this analysis, we use a binary logit regression for which the dependent variable is zero for non-default (base case) and one for a default on sovereign bonds. This econometric model has been found to be successful in the explanation of firm defaults (see, for example, Shumway, 2001; Chava and Jarrow, 2004; Campbell, Hilscher, and Szilagyi, 2008).

In addition to choosing whether or not to default, governments can also decide on which sovereign debt securities to default. We thus conjecture that the decision to default should differ according to the currency of indebtedness. To this end, we analyze the characteristics that make governments more prone to default on local or foreign currency bonds with a multinomial logit model. Our empirical analysis makes several contributions to the prediction of sovereign default probabilities.

The results indicate that governments typically default under different economic and financial conditions depending on the currency in which the debt is denominated. The model can explain 55% of the variation in default probability when bonds are separated by currency, compared to 35% when the bond's currency denomination is ignored (i.e., logit regression). The increase in explanatory power highlights the importance of disentangling sovereign defaults by type of bonds.

Along this line, several variables explain sovereign defaults differently for local and foreign currency debt. For example, we find that the probability of default on foreign currency debt is high when the country exhibits disappointing long-term economic performance, the level of domestic investment is reduced, and the proportion of short-term external debt increases. However, these characteristics appear to be irrelevant for local currency debt. In contrast, countries with a low level of domestic bank credit to firms are more prone to sovereign default on local debt. The reason is that when firms rely less on bank lending, the costs of default on domestic debt in terms of a domestic contraction in credit become less severe and the default option is expected to be more favorable for the government.[4] As expected, the effect is not significant for defaults on foreign currency bonds, which are dominantly held by foreign investors. We also find that the level of inflation raises the default probability on both types of debt but has a greater effect for local currency debt. This finding suggests that high inflation is associated with a limited possibility to further increase inflation through debt monetization. Defaulting thus appears to be an optimal decision in periods of severe inflation.

[4]Acharya, Drechsler, and Schnabl (2013) and Gennaioli, Martin, and Rossi (2013) show that domestic banks, which are the major creditors of the government, may be prevented from providing liquidity and credit to firms in the case of sovereign default on local currency debt.

The results also reveal that a greater level of indebtedness is not necessarily associated with higher default risk. Countries displaying a high level of government debt even tend to benefit from low sovereign default risk on local currency debt. The reason is that the highly indebted countries tend to be those that issue the currencies most widely accepted by international investors, also called the "reserve currencies."[5] Such countries can easily increase their monetary base to make debt payments, which keeps their level of credit risk low.

Another contribution of the paper is to show that global factors do not matter for the explanation of the sovereign default probability. To investigate the role of global factors in detail, we consider in the analysis both the world and the US stock market return, the option-implied volatility index (VIX), the US Federal fund rate, the 10-year US interest rate, the US Treasury yield curve (30-year minus 3-month rates), and the bond spread of BBB firms in the US. All global factors combined help explain at most 2.6% of the sovereign default probability and none of the factors is statistically significant. When country-specific economic controls are accounted for, the additional explanatory power of these global factors appears to be negligible.

The information provided by the market-wide factors seems to be neither statistically nor economically relevant for the explanation of sovereign default risk. Yet it has been widely documented that sovereign spreads highly correlate with global measures, particularly from the US stock and Treasury bond markets.[6] The discrepancy in the results suggests that global factors do not affect sovereign credit risk per se (i.e., the probability that a government defaults), but rather the premium that international investors require for bearing such a risk (i.e., the price of default risk). Local economic, financial, and political conditions thus remain the most important influence affecting a government's decision to service debt

[5]For example, Canada, Japan, the United Kingdom, and the United States are viewed as almost risk-free, although they have an indebtedness ratio of 100%, 220%, 89%, and 123% in 2012, respectively. In comparison, the mean debt ratio of defaulters on local-currency debt is 71%.

[6]A recent literature provides strong evidence that information embedded in global factors is central for the explanation of sovereign credit spreads. See, for example, Remolona, Scatigna, and Wu (2007), Pan and Singleton (2008), Hilscher and Nosbusch (2010), Longstaff, Pan, Pedersen, and Singleton (2011), Benzoni, Collin-Dufresne, Goldstein, Helwege (2012), and Jeanneret (2013).

and thus its default probability. As a consequence, the high level of co-movements among sovereign spreads at the international level, as documented by Longstaff et al. (2011), does not necessarily translate into highly correlated probabilities of default around the world. That is, government bond prices and yields appear to be more correlated internationally than their embedded default risk. This result has important consequences for bond investors in terms of capital allocation and credit risk management.

The remainder of the paper is organized as follows. Section 2 reviews the empirical studies related to the explanation of sovereign credit risk. Section 3 describes the data and analyzes how a country's characteristics vary in and out of default. Section 4 provides an empirical investigation of sovereign defaults and presents the results. Finally, Section 5 concludes the analysis.

2 Related literature

This section provides an overview of the literature that explores the drivers of a government's default decision and the determinants of sovereign credit risk.

2.1 Sovereign default decision

The sovereign default literature started with the seminal contributions of Eaton and Gersovitz (1981) and Bulow and Rogoff (1989). These studies explore the costs of default with the aim of understanding why countries strive to repay their debt and, eventually, the existence of sovereign lending. Bulow and Rogoff (1989) suggest that countries are willing to avoid default for two main reasons. First, lenders may be able to appropriate collateral. However, in practice, the assets accessible to creditors are typically worth only a small fraction of the outstanding level of debt. The second reason is a reputation effect that could impact future borrowing opportunities. Eichengreen (1989) and Gelos, Sahay, and Sandleris (2011) test this hypothesis and find weak empirical support for a reduced access to credit after defaults.

Another body of literature views the costs of default as a long-term economic slowdown

that affects future government revenues and eventually a sovereign's wealth.[7] At the same time, governments have incentives to default, which are captured by the possibility to restructure the terms of the debt contract and thus to reduce the level of debt to service. Hence, there exists an optimal default policy that can be determined by the trade-off between the gains and the costs of default. This approach allows explaining when a country is in default and generates credit spreads that correspond to those in the data. Cosset and Jeanneret (2013) extend this literature with the introduction of governance and find that better-governed countries are less likely to default and benefit from lower borrowing costs, even though they choose to be more indebted.

With the aim of understanding how a sovereign default affects real economic activity, a recent strand of research explores the impact of a government's default on the country's banking system.[8] These studies suggest that banks hold a substantial fraction of their assets in the form of government bonds for liquidity purposes. A sovereign default would then lower bank solvency through losses on their sovereign debt holdings when haircuts are imposed on creditors. These losses would reduce credit, investment, and eventually output growth. Along these lines, Gennaioli, Martin, and Rossi (2013) predict that, while developed countries exhibit a lower probability of a sovereign default, a default in such countries would have greater economic consequences. The reason is that better institutions increase the sensitivity of credit to the banks' balance sheets, which are themselves more exposed to sovereign default when government debt holdings are higher.

Thus far, the literature on sovereign default remains largely theoretical and few empirical studies try to empirically test these models. Rather than exploring the determinants of a sovereign default decision, most studies explore the drivers of sovereign default risk, as measured by sovereign credit ratings and sovereign credit spreads, using data from secondary

[7] See, for example, Arellano (2008), Andrade (2009), Hatchondo and Martinez (2009), Yue (2010), Borri and Verdelhan (2012), and Jeanneret (2013). Empirically, sovereign defaults can be costly for economic activity for various reasons. First, debt repudiation leads to a decline in bilateral trade that hurts export-oriented firms (see Martinez and Sandleris, 2011). Second, sovereign defaults have been associated with banking crises, which result in prolonged recessions (see Reinhart and Rogoff, 2009).

[8] See, for example, Broner, Martin, and Ventura (2010), Bolton and Jeanne (2011), Acharya, Drechsler, and Schnabl (2013), Acharya and Rajan (2013), and Gennaioli, Martin, and Rossi (2013).

bond and the CDS markets.

2.2 Determinants of sovereign credit risk

We now review the empirical literature that aims at explaining the time variation in sovereign credit risk, as measured with credit spreads. These studies investigate the role of country-specific macroeconomic and financial characteristics, as well as indicators of the global financial environment.

2.2.1 Local determinants

One strand of the literature focuses on country-specific factors. Duffie, Pedersen, and Singleton (2003) show that official international reserves as well as the country's political risk play a significant role in determining sovereign bond spreads. In line with this finding, Bekaert et al. (2012) find evidence that sovereign credit risk increases with political risk, while Cosset and Jeanneret (2013) show that better-governed countries offer less default risk to investors and, consequently, bear a smaller sovereign credit risk premium. Considering another set of local factors, Hilscher and Nosbusch (2010) find that the volatility of the terms of trade increase sovereign spreads, while Eichler and Maltritz (2013) conclude that lower economic growth and greater openness, measured by the sum of exports and imports to GDP, increase sovereign default risk.

Another body of the literature highlights the role of the fiscal dimension as a determinant of sovereign credit risk. Maltritz (2012) finds that the most likely country-specific drivers of yield spreads are fiscal variables such as budget balance and government debt. Eichler and Maltritz (2013) show that higher overall indebtedness only increases short-term sovereign risk, whereas net lending, trade balance and interest rate costs only drive long-term default risk. In another recent study, Ghosh, Ostry, and Qureshi (2013) quantify a concept of fiscal space and conclude that the latter is a better predictor of government bond yields and CDS rates than the level of public debt.

2.2.2 Global factors

Sovereign credit risk appears to depend not only on a country's characteristics but also on global economic conditions. For example, several studies have found that an increase in global financial market volatility, as captured by the VIX (i.e., option-implied volatility on the S&P500), translates into a rise in the premium embedded in sovereign or CDS spreads (see Remolona et al., 2007; Pan and Singleton, 2008; Benzoni et al., 2012; Jeanneret, 2013). Longstaff et al. (2011) suggest that sovereign credit spreads are generally more related to US stocks, high-yield bond markets, global risk premia, and capital flows than they are to their own local economic measures. Similarly, Maltritz (2012) shows that global financing conditions, as measured by the US interest rate and market sentiment, influence the level of sovereign yield spreads. Georgoutsos and Migiakis (2013) and Liu and Spencer (2013) also highlight the effect of investor confidence and sentiment indicators on sovereign spreads, particularly in periods of crisis. Furthermore, Borri and Verdelhan (2012) provide evidence that the level of sovereign spreads highly depends on the price of default risk, which increases when the country under analysis presents a higher correlation with the US stock market. Recently, Badaoui, Cathcart, and El-Jahel (2013) and Monfort and Renne (2013) find strong evidence that sovereign credit spreads are not only driven by credit risk but also by the level of systematic liquidity.

The last few years have also seen a growing interest in understanding the effect of the recent international financial crisis on the determinants of the sovereign credit risk. In particular, Berndt and Obreja (2010) show that nearly half of the variation in European CDS returns is captured by a factor that mimics economic catastrophe risk. This factor became more important relative to other sources of risk during the crisis. Bernoth and Erdogan (2012) show that the government debt level and the general investor's risk aversion had a significant impact on the interest differentials at the beginning of the EMU. When the financial turmoil began, the market reaction to fiscal loosening increased considerably. Finally, Beirne and Fratzscher (2013) find that a deterioration in countries' fundamentals and the

level of contagion are the main explanations for the rise in sovereign yield and CDS spreads during the crisis, with an effect that appears to be global and thus not limited to euro area countries.

2.2.3 Original sin and currency denomination

Another important dimension of the sovereign debt market is the currency denomination. According to the Bank for International Settlements, over 92% of outstanding international debt securities were denominated in just four currencies at the end of 2012: the euro, the US dollar, the pound sterling and the Japanese yen. Countries emitting these currencies naturally account for a large proportion of global debt emissions. However, about 20,187 billion USD of debt securities denominated in these four currencies (EUR, USD, GBP and JPY) are actually issued by other countries, thus constituting what is referred to as "foreign currency debt."

Most emerging countries borrow on the international markets in foreign currency.[9] Eichengreen and Hausmann (1999) call this phenomenon the "original sin," which can arise for two main reasons. First, a government may need to raise foreign currency financing to strengthen its international reserves. Second, it can be forced to consider foreign currency borrowing only, due to its inability to issue local currency debt on the local market (Hausmann and Panizza, 2003; Eichengreen, Hausmann, and Panizza, 2005) or on the international market (Hausmann, Panizza, and Stein, 2001; Bordo and Flandreau, 2003; Eichengreen, Hausmann, and Panizza, 2007).

Indeed, in the presence of international transaction costs, international investors are not willing to hold a portfolio of currencies issued by "small countries" (Hausmann and Rigobon, 2003). According to Hausmann and Panizza (2003), the inability to borrow in its own currency is mainly explained by the size of a country's economy, which determines the extent of the local debt market. Countries with a sizeable economy are therefore favored over other

[9] See, for example, Eichengreen and Hausmann (1999), Hausmann, Panizza, and Stein (2001), and Chamon and Hausmann (2005).

countries because they can borrow abroad – i.e., from non-residents – in their own currency. This is particularly true for countries whose currency is used as international reserves by other central banks, such as most developed economies today.[10]

For these reasons, most emerging countries find it preferable to borrow in a foreign currency rather than in their local currency. However, borrowing in foreign currency exposes the sovereign state to foreign exchange risks and forces it to generate income in foreign currency. This currency mismatch raises the risk of a sovereign debt crisis, as pointed by Jeanne (2000) and Schneider and Tornell (2004). In line with this intuition, Dell'Erba, Hausmann, and Panizza (2013) find that the relationship between debt levels and spreads is amplified by the presence of large net foreign liabilities, thus confirming the previous results of Bordo and Meissner (2006). This finding suggests that debt composition matters and corroborates the original sin hypothesis that, rather than being a mere reflection of institutional weaknesses, the presence of foreign currency debt increases financial fragility and thus the risk of sovereign default.

Overall, the existing literature has highlighted the importance of country-specific characteristics, global factors, and the ability to issue debt in local currency as determinants of sovereign credit spreads. While it has become common to focus on the explanation of sovereign yield and CDS spreads (i.e., the compensation required by investors for bearing default risk), we instead directly analyze the government's decision to default on sovereign debt and disentangle the analysis by currency denomination.

3 Descriptive analysis

The goal of this study is to identify the determinants of sovereign default risk with an in-depth investigation of the default events observed over the period 1996-2012. We aim to highlight the drivers of defaults by type of sovereign debt.

[10] Countries benefitting from reserve currencies status are privileged since they can issue large share of their debt instruments to foreign investors and do not have to generate foreign currency funds to repay them.

To this end, we start by describing our database, study the characteristics of defaulting vs. non-defaulting countries, and eventually examine the determinants of sovereign default decisions.

3.1 Data and sources

The analysis of the determinants of sovereign defaults is based on a novel and comprehensive database of sovereign defaults for 100 countries over the period 1996-2012.

We have hand collected sovereign default statistics published by Fitch Ratings, Moody's, and Standard and Poor's based on several reports over the period 1996-2012. In our analysis, we focus on sovereign debt owed to bondholders and separate defaults on bonds denominated in local currency from those in foreign currency.[11] Local currency debt is typically a bond denominated in the legal tender of an issuer's country of domicile. Table 1 reports the list of sovereign defaults that we have in our database. The table includes details on the currency of default, the value of debt in default, and the type of default.

Table 1 [about here]

Following rating agencies, we consider that a sovereign default occurs when the government either fails to meet a principal or interest payment on the due date (or within the specified grace period) contained in the original terms of a debt issue. An exchange offer of new debt with less-favorable terms than the original issue and a conversion into a new currency of less than equivalent face value are also classified as default events. In addition, a rescheduling agreement of principal and/or interest are considered as default even when creditors deem them to be voluntary.

The analysis of the determinants of default requires a set of macroeconomic and financial indicators. We use a broad data set that combines various sources, including the Bank for

[11] The sovereign debt can be owed to officials or private creditors. Official creditors are international organizations, governments and government agencies, including official monetary institutions, such as the IMF, the World Bank, the regional development banks and bilateral creditors. Private creditors include private bondholders, private banks, and other private institutions that have a financial claim on the country's debt. In this study, we focus on government bonds only.

International Settlements, Datastream, the Federal Reserve of Saint-Louis, the International Financial Statistics (IMF), national authorities, and the World Bank.

Table 2 summarizes the list of variables that we consider in this study, provides the definitions, and presents the descriptive statistics.

Table 2 [about here]

In addition to the standard variables, we compute a measure of original sin, which is defined as the sovereign state's inability to borrow in its own currency. This measure is obtained, for each country, as the share of a government's overall debt issued in foreign currency. Our measure of original sin is negatively related to sovereign creditworthiness, using data on sovereign credit ratings, with a correlation of -0.67. The average level of original sin is 5.8% for developed countries and 54.1% for emerging countries.

3.2 History of defaults by type of debt

We start the analysis with a description of the historical sovereign defaults over the period 1996-2012. We define a sovereign default as the observation that a country is classified by rating agencies to be in default in a given year. In total, there are 58 sovereign defaults in our sample of 100 countries. As detailed in Table 1, we observe 4 of them in Asia, 13 in Europe, 35 in Latin America, and 6 in Middle East and Africa. Figure 2 shows the distribution of the sovereign default events over time, while Figure 3 illustrates the history of defaults when one weights defaulting countries by their share of global GDP.

Figures 2 and 3 [about here]

The sovereign defaults observed over 1996-2012 consist of 31 defaults on local currency bonds and 27 defaults on foreign currency bonds. We observe 15 simultaneous defaults on both types of debt. Most defaults occurred over the period 1996-2005, with only a few default events over the recent years. Besides Greece's default in 2012, all the sovereign defaults have concerned governments in emerging markets. Historically, the defaults that

stand out because of their economic importance are generally simultaneous defaults on local and foreign currency bonds (see Table 1). These events include Russia in 1998 (US$ 39 billion), Argentina in 2001 (US$ 144 billion), and Greece in 2012 (US$ 273 billion). Among sovereign defaults on local currency bonds only, the most important event remains Turkey in 1999 (US$ 48 billion) when the government imposed a retroactive tax on its domestic debt.

Sovereign defaults on foreign currency bonds do not appear to be more frequent than sovereign defaults on local currency bonds. This finding stands in sharp contrast to common belief. Indeed, it is generally argued that a government must buy the foreign currency in the foreign exchange market, or use its international reserves, to repay its foreign currency debt. In contrast, the government has access to potentially unlimited resources in domestic currency to repay its local currency debt.[12] Therefore, the frequency of default on local currency sovereign bonds is expected to be lower than the default frequency of foreign currency bonds. The data suggest that it is not the case. Debt monetization does not seem to always be the optimal choice of the government, thus suggesting that the avoidance of default could be associated with more severe costs (e.g., high inflation and political turmoil) than the default decision.

Overall, our database indicates that about 53% of defaults include local currency bonds. Over a longer time period, spanning the years 1800-2009, Reinhart and Rogoff (2009) identify 250 cases of sovereign defaults on foreign debt against 68 cases of sovereign defaults on domestic debt (i.e., 21% of total defaults), which are almost exclusively denominated in local currency. This comparison suggests a recent dramatic rise of defaults on debt issued in domestic currency.

3.3 Country's characteristics in default

We now analyze the economic and financial characteristics of countries in default and decompose the analysis by type of sovereign debt. We consider the period 1996-2012 and report

[12] Using such arguments, rating agencies often assign ratings to a sovereign's local currency debt that are higher for its foreign currency debt.

the results in Table 3.

Table 3 [about here]

Table 3 first presents the characteristics of countries that are not in default (see Column 1), which are compared with those of countries in default (see Column 2). Columns 3 and 4 display the country characteristics when sovereign defaults relate to local currency and foreign currency bonds. Columns 5 displays the difference in characteristics when countries are or not in default, while Column 6 reports the test statistic of the difference.

The results indicate that the GDP per capita in defaulting countries is far lower than in countries that are not in default (2,850 USD compared to 14,760 USD). In addition, long-term economic growth is greater for non-defaulters than for defaulters (2.9% vs. 0.8% per year), thus suggesting that countries in default were experiencing a lower economic performance in the past than countries that have been able to avoid a default. The level inflation is much greater in default (21.9%) than in non-default countries (6.1%) and sovereigns in default exhibit a higher indebtedness level (69.1% vs. 50.5%). Furthermore, countries in default exhibit a relatively low level of financial development measured by the level of bank credit to firms, less domestic and foreign investment, an undervalued currency, fewer international reserves, and more political instability and government ineffectiveness.[13] Finally, defaults are typically observed when short and long-term US interest rates are high. These characteristics are in line with the intuition.

This preliminary analysis highlights strong differences in country characteristics when governments default or not on their debt. However, it is important to consider a comprehensive econometric specification that controls for all economic and financial factors to be able to pin down the main drivers of sovereign default. This is the aim of the next section.

[13]To investigate the role of a country's governance, we use data on the quality of institutions created by the World Bank. In the yearly publication of the Worldwide Governance Indicators (WGI), the World Bank provides perception-based measures for various dimensions of governance (see Kaufmann, Kraay, and Mastruzzi, 2008). The index of *Political Stability* captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism (a high index value indicates low political risk). The measure of *Government Effectiveness* essentially captures the quality of public services, which relates mostly to the efficiency in collecting and spending fiscal revenue.

4 Empirical analysis

We now investigate the determinants of governments' default probability on sovereign debt. We first explore defaults on sovereign bonds and then study, in a subsequent analysis, the choice of debt on which to default. The analysis will thus differentiate sovereign bonds by currency denomination.

4.1 Default vs. non-default

We first analyze the drivers of the default probability on sovereign bonds. Following an approach commonly used to explore corporate bankruptcies, we estimate the probability that a sovereign is in default over the next year using a binary logit model.[14]

We assume that the marginal probability of default follows a logistic distribution and is given by

$$P_{t-1}(Y_{i,t} = 1) = \frac{1}{1 + \exp\left(-\alpha - \beta x_{i,t-1}\right)}, \tag{1}$$

where $Y_{i,t}$ is an indicator that equals one if the country i is in default on a government bond in year t, and $x_{i,t-1}$ is a vector of explanatory variables for the previous year. A higher level of $\alpha + \beta x_{i,t-1}$ implies a higher probability of default. We focus exclusively on defaults related to local and foreign government bonds. Standard errors are clustered at the country level (Petersen, 2009) and corrected for heteroscedasticity.

Table 4 [about here]

Table 4 reports the results of the binary logit regression for various alternative specifications. Column 1 of Table 4 reports the analysis with local economic determinants. Then, we progressively introduce additional variables into the regression model. Column 2 adds the level of domestic and foreign investment in the analysis, Column 3 includes information related

[14] Studies considering a logit model to explore corporate defaults include Martin (1977), Smith and Lawrence (1995), Shumway (2001), Chava and Jarrow (2004), and Campbell, Hilscher, and Szilagyi (2008), among others.

to foreign assets and liabilities (e.g., exchange rate return, international reserves, original sin, and short-term external debt), Column 4 incorporates two governance measures (i.e., political stability and government effectiveness), while Column 5 accounts for market-wide information, captured by the level of financial uncertainty (VIX) and the long-term US bond yield (10-year US Treasury rate). This specification provides the baseline regression results. All local variables are those of the preceding year, thus avoiding potential endogeneity and reverse causality issues.

When all factors are considered in the analysis (see Column 5), several variables seem to help explain the probability of a sovereign default. A government appears to be more likely to default on sovereign bonds when the country exhibits i) weaker long-term economic growth, ii) higher inflation, iii) less financial development (i.e., less bank credit to firms), iv) lower real effective exchange rate (i.e., relatively overvalued currency), and v) greater original sin (i.e., inability to issue debt in local currency). These determinants have the expected signs. However, the probability of default does not seem to be associated with short-term real economic growth, a country's indebtedness (total or short-term), economic development, the level of investment, international reserves, political risk, and government effectiveness. In addition, the level of interest rates and global market uncertainty (i.e., VIX) are not indicative of default risk, on average. Section 4.6 explores the importance of global factors in greater detail. Overall, the full model can explain 35% of the variation in the sovereign default probability.

4.2 Default decision

We have thus far analyzed the results that relate to the understanding of a country being in default. Equally important is the analysis of the drivers that explain why a sovereign chooses to default in a given year.[15]

Table 5 [about here]

[15]Deciding to default and being in default is not the same. When a country decides to repudiate its debt, it can stay in default for several years.

Turning our attention to the decision to default, there are 14 defaults on local currency bonds, 14 defaults on foreign currency bonds, and 7 simultaneous defaults. Table 5 reports the results of a binary logit model that investigates a government's choice to default. The results are very similar to those obtained for the analysis of countries rated as being in default (see Table 4).

Overall, the various economic and financial indicators considered in the analysis can explain 32% of the variation in sovereign default probability (see Column 5). The explanatory power is satisfactory and compares to that reported in the analysis of corporate bankruptcies (e.g., see Campbell et al., 2008). Yet a large fraction remains unexplained. This result highlights the importance of the unwillingness-to-pay dimension as a complement to the inability-to-pay captured by economic and financial fundamentals. Acharya and Rajan (2013) develop a model that provides a rationale for such a complementarity.

In this paper, we take a different approach and suggest that part of the variation remains unexplained because the drivers of the default probability could differ according to the bond's currency denomination.

4.3 Default by currency denomination

Thus far we have considered that a sovereign default probability is independent from the bond's currency denomination. In fact, there is not a single default option, but one for each kind of debt on which a country may default. Sovereign debt securities can be denominated in various currencies and thus held by different types of investors. Therefore, we formulate the hypothesis that the decision to default should differ according to the currency of indebtedness.

4.3.1 Econometric specification

The aim of this section is to analyze the characteristics that make governments more prone to be in default on local currency bonds rather than on foreign currency bonds. We thus employ a multinomial logit model to predict default probability by type of debt. The dependent variable

is zero for non-default (base case), one when a sovereign is in default on local currency bonds only, and two when a sovereign is in default on foreign currency bonds only. Simultaneous defaults on local and foreign currency bonds are excluded. We cluster standard errors at the country level (Petersen, 2009) and correct them for heteroscedasticity.

Table 6 [about here]

Table 6 reports the results for the baseline regression model (see Table 4), which includes local economic characteristics, information related to foreign exchange and the original sin, governance indicators, and market-wide factors. Values of the local variables are those of the preceding year.

4.3.2 Results

The results show that the explanation of sovereign defaults significantly differs according to the currency in which the debt is denominated. Column 1 of Table 6 indicates that the probability to be in default on local currency debt is high when i) the level of foreign direct investment coming into the country is low; ii) domestic investment is high and, and iii) when the local currency is relatively overvalued. These variables help explain sovereign defaults on local currency debt but have no effect on foreign currency debt. In contrast, several economic and financial indicators seem to explain why a country is in default on its foreign currency debt only. Table 6 (Column 2) suggests that the probability to be default on such securities increases when i) the country exhibits a disappointing long-term economic performance; ii) the level of domestic investment is reduced; and iii) the proportion of short-term external debt increases.

The default probability on both types of debt raises with the level of inflation. However, the effect is greater for local currency debt, thus highlighting a limited possibility to further increase inflation through debt monetization. In contrast, countries that exhibit a high level of political instability or poor government effectiveness do not appear to be more likely to default on either type of bonds.

We now discuss several dimensions that deserve a more detailed analysis. First, a particularly interesting factor is the level of domestic bank lending to the private sector. Because domestic banks are the major creditors of the government, they may be prevented from providing liquidity and credit to firms in the case of sovereign default on local currency debt (Acharya, Drechsler, and Schnabl, 2013). Hence, when the importance of bank lending is low, the costs of default on domestic debt in terms of a contraction in credit become less severe and the default option is expected to be more favorable for the government (see Gennaioli, Martin, and Rossi, 2013). In line with this intuition, countries with a low level of domestic bank lending (i.e., low default costs) are more prone to sovereign default. However, this relation should only be relevant for the analysis of local currency debt, as foreign creditors dominantly hold foreign currency bonds. As expected, the effect is highly significant for local currency debt but not for foreign currency bonds.

Second, the results show that a greater level of indebtedness is not necessarily associated with higher default risk. On the one hand, the total level of government debt has no influence on the default probability on foreign currency debt. While countries defaulting on foreign debt typically exhibit a greater debt-to-GDP ratio (80%) than non-defaulters (50%), the relation is not statistically significant when a country's economic and financial factors are accounted for. The reason is that the level of debt is itself an endogenous choice of the government and thus related to the country's characteristics. On the other hand, sovereign default risk in local currency debt is reduced when a country displays a higher level of government debt. This relation arises because most indebted countries are typically those that issue reserve currencies, being those mostly widely accepted by international investors. For example, Canada, Japan, the United Kingdom, and the US, which can be viewed as almost default risk-free, have an indebtedness level of 100%, 220%, 89%, and 123% in 2012, respectively. These values are much larger than the mean debt ratio (71%) of defaulters on local-currency debt. Countries with reserve currencies (i.e., high indebtedness) have greater ability to print money to make debt payments and thus benefit from a low level of credit risk.

Finally, the data indicate that a country's original sin has no significant impact on the

sovereign default probability. That is, countries that issue debt predominantly in their own currency, such as most developed economies, are not less exposed to sovereign risk. The number of defaulting countries that are able to issue domestic currency bonds, as reported in Table 1, clearly shows that debt of these countries shall not be viewed as risk-free. In addition, the recent 2010-2012 European debt crisis has highlighted the special case of countries belonging to an economic and monetary union, particularly in terms of loss of sovereignty over monetary policies and the difficulty in recoursing to debt monetization.

Overall, the results highlight the importance of disentangling sovereign bonds by currency denomination. Governments typically default under different economic and financial conditions depending on the type of debt. Moreover, the explanatory power of the model raises from 35% (Table 4, Column 5) to 55% when bonds are separated by currency. This is a substantial increase.

4.4 Sovereign default predictions

The models analyzed in this paper are designed to forecast a sovereign default at a horizon of 1 year, as the country variables correspond to those of the preceding year. Table 7 reports the prediction accuracy of the different models. We start with the consideration of the logit model developed in Section 3. Under the baseline specification, the model correctly predicts 99.6% of the non-default observations and 20% of the defaults. We then use the country's rating of the previous year as an additional source of public information. For each country and year, we consider the most severe rating grade provided by Fitch Ratings, Moody's, and Standard and Poor's. The model can explain 34% of the defaults when the rating is additionally included in the analysis.

Results further improve when we disentangle defaults on bonds in local and foreign currency, as suggested in Section 4.3. The multinomial logit approach allows to explain 28% of the sovereign defaults. The consideration of the information provided by a country's rating raises the prediction rate to 56%. In comparison, the unconditional prediction probability of a default is 2%. The overall forecast accuracy of the model is thus reasonable.

Table 7 [about here]

4.5 Emerging markets vs. developed economies

The analysis thus far has considered both developed and emerging economies. As a robustness check, we now focus exclusively on emerging markets, excluding countries classified as developed economies by Morgan Stanley Capital International.

We present in Column 6 (Tables 4 and 5) the baseline logit specification reported in Column 5 (Tables 4 and 5) but applied to emerging markets exclusively. The results for emerging countries are very close to the results provided for the whole sample. This similarity suggests that the reported results essentially capture default risk in emerging countries, since, over the sample period, most developed economies were relatively less concerned by the decision to default on their debt. This situation is, however, currently undergoing a dramatic change, as recently illustrated by the European sovereign debt crisis that started in 2010 and the downgrading of US debt in August 2011. While the analysis of sovereign default risk today should no longer be limited to the emerging world, emerging economies have consisted the bulk of sovereign defaults in the past 60 years and thus provide valuable guidance and insights for the understanding of sovereign credit risk in the future.

4.6 Global factors

We investigate in this section the importance of global factors in the explanation of sovereign default risk.

A recent literature provides strong evidence that variations in sovereign credit spreads can be largely attributed to changes in common factors across countries. Notably, the option-implied volatility index (VIX) and the level of US interest rates are found to be key factors in the explanation of sovereign credit spreads (see, e.g., Remolona et al., 2007; Pan and Singleton, 2008; Hilscher and Nosbusch, 2010; Longstaff et al., 2011; Benzoni et al., 2012; Jeanneret, 2013).

The results reported in Table 4 (Column 5) suggest that the consideration of the US interest rate and the VIX does not help explain defaults on sovereign bonds. Moreover, the model's additional explanatory power when both factors are included appears to be negligible.

However, in order to investigate the role of global factors in greater details, we analyze several other dimensions. We further consider both the world and the US stock market return, the US Federal fund rate, the US Treasury yield curve, and the bond spread of BBB firms in the US. Table 8 provides an analysis of these global factors. We progressively consider stock market factors (Column 1), bond market factors (Column 2), and finally combine all factors (Column 3).

Table 8 [about here]

Results show that all these global factors help explain at most 2.6% of the sovereign default probability (see Column 3, Table 8) and none of the factors is statistically significant, with or without country-specific economic controls (Columns 3 and 4).[16] It is generally viewed that the long-term US Treasury rate increases the costs of new foreign currency debt, which is mostly denominated in US dollar, thereby raising default risk (see Eichler and Maltritz, 2013). However, Table 4 indicates that the probability of being in default is not related to the level of US interest rates. This result may then question the importance of the rollover risk story for sovereign bonds.

Overall, the information provided by the global factors appears to be irrelevant for the explanation of sovereign default risk. However, as previously mentioned, sovereign spreads are known to highly correlate with global indicators, particularly with the VIX. This discrepancy suggests that global factors, such as the level of financial uncertainty in the US, influence sovereign credit spreads through the price of default risk only. That is, the level of global uncertainty affects investors and thus the compensation that they require for bearing a given default risk (i.e., high risk-neutral default probability), but not the risk itself (i.e., physical default probability). For example, both the average sovereign spread and the VIX are high in

[16] This level of explanatory power should be viewed as an upper bound because the global factors are not orthogonal to the local factors.

2002 and 2009 (see Figure 4), although few countries have defaulted in those years. Badaoui, Cathcart, and El-Jahel (2013) show that sovereign CDS spreads are highly driven by the level of systematic liquidity, which is correlated with global factors. Hence, their results suggest that the increase in sovereign spreads during the recent financial crisis was mainly due to a surge in the liquidity premium rather than a rise in default risk.

Figure 4 [about here]

Local economic, financial, and political conditions thus remain the most important influence affecting a government's decision to service debt and thus its default probability. As a consequence, the high correlation in sovereign spreads around the world, due to the influence of global factors, should not necessarily be indicative of a high correlation between default probabilities across countries.

5 Conclusion

This paper provides new evidence that the determinants of sovereign default probability strongly vary with the currency of indebtedness. The novel approach of this study is to identify the country characteristics that explain when governments are more likely to default on local or foreign currency bonds. To this end, we consider a sample of 100 countries over the period 1996-2012, which spans several crises in emerging and developed markets.

Sovereign debt in local currency is often viewed to present a low default risk level because governments have the possibility to monetize their debt when the fiscal situation deteriorates. In contrast, debt denominated in foreign currency is generally seen as relatively risky given the volatility of exchange rates and the impossibility to print a foreign currency. Despite common belief, we provide evidence in this paper that local and foreign currency debt present a similar default rate, thus suggesting that both types of debt are equally risky. Most important, our results show that a government's default decision significantly differs according the currency denomination.

The empirical analysis of sovereign defaults by type of debt also has strong implications for the assessment of default risk in countries that share a common currency. Members of a monetary union exhibit the features of both local and foreign currency issuers. On the one hand, they benefit from issuing debt in the domestic currency but, on the other hand, they individually do not have the power to control the currency supply in the case of a crisis. This is the experience that Greece has learnt recently. To the best of our knowledge, this paper provides a first contribution to the understanding of sovereign default risk by currency denomination. This line of research should be extended to shed new light on credit risk matters specific to monetary zones, among other issues. This agenda is left for future research.

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Figure 1: **Government Debt in Emerging Markets by Currency Denomination.** This figure displays the evolution the local currency government debt market in emerging countries. The upper panel illustrates the relative size of local currency and USD-denominated government debts. The lower panel decomposes the local currency government debt market by regions. The data consist of the market value of government debts included in the JP Morgan's emerging bond indices.

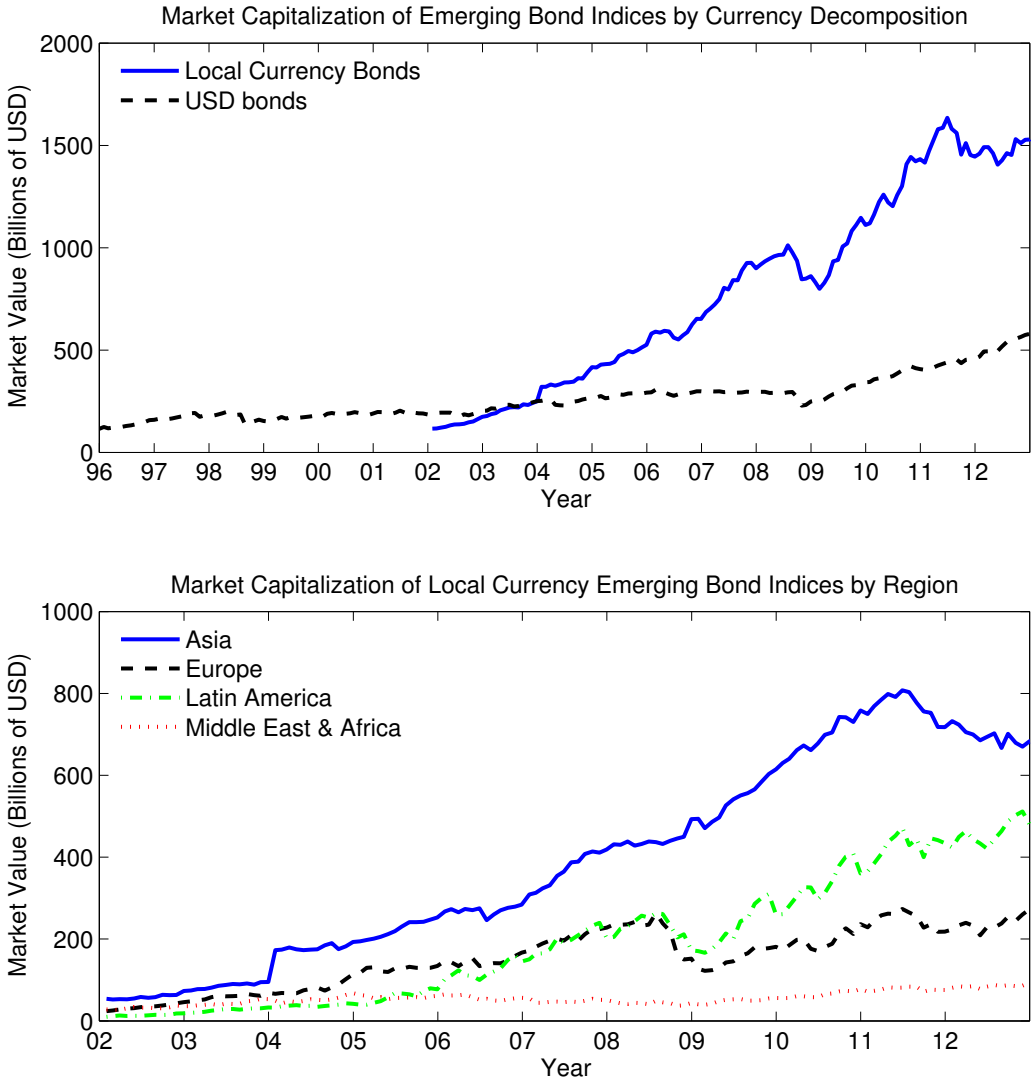

Figure 2: **History of Sovereign Defaults by Currency Denomination**. This figure illustrates the sovereign default events observed in 100 emerging and developed countries over the period 1996-2012. The analysis disentangles defaults on sovereign bonds in local and foreign currency. The upper panel displays the sovereign default rates by currency denomination, while the lower panel highlights the evolution of the relative of importance of defaults by type of sovereign debt. The list of sovereign defaults is reported in Table 1.

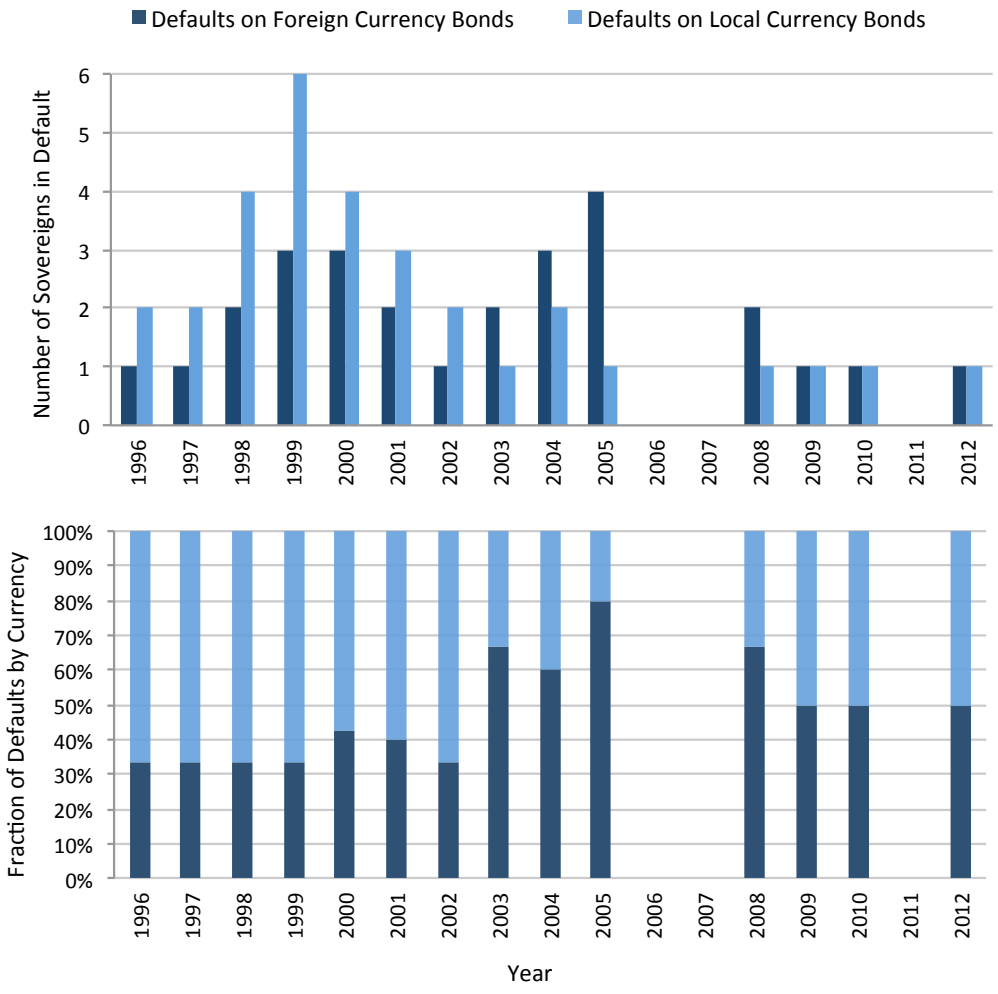

Figure 3: **Share of Countries in Default Weighted by Economic Importance.** This figure displays the share of countries in default weighted by their share of world GDP over the period 1996-2012. The figure breaks down the analysis of sovereign bond defaults by currency denomination. The analysis covers 100 emerging and developed countries. The list of sovereign defaults is reported in Table 1.

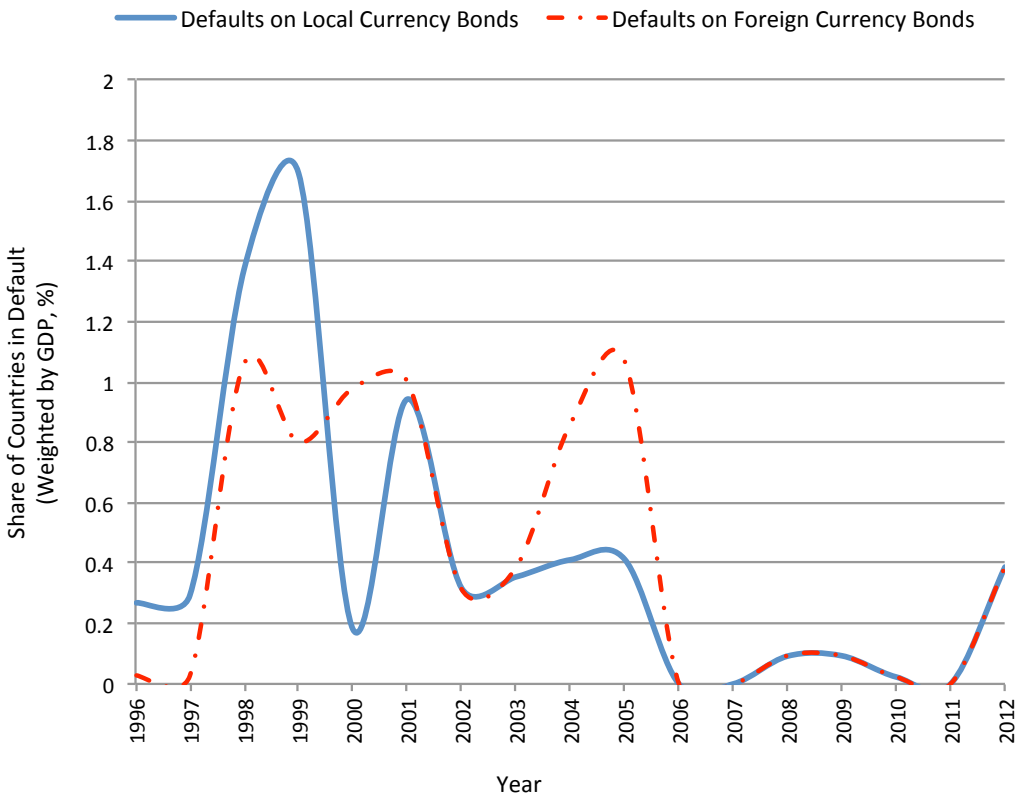

Figure 4: **Bond Default Rate, Sovereign Spreads, and Financial Uncertainty.** This figure compares the fraction of governments in default over the period 1996-2012 (upper panel) with the average sovereign spread in emerging countries (middle panel) and the level of financial uncertainty, as measured by the CBOE option-implied volatility index in the US (lower panel). The list of sovereign defaults is reported in Table 1.

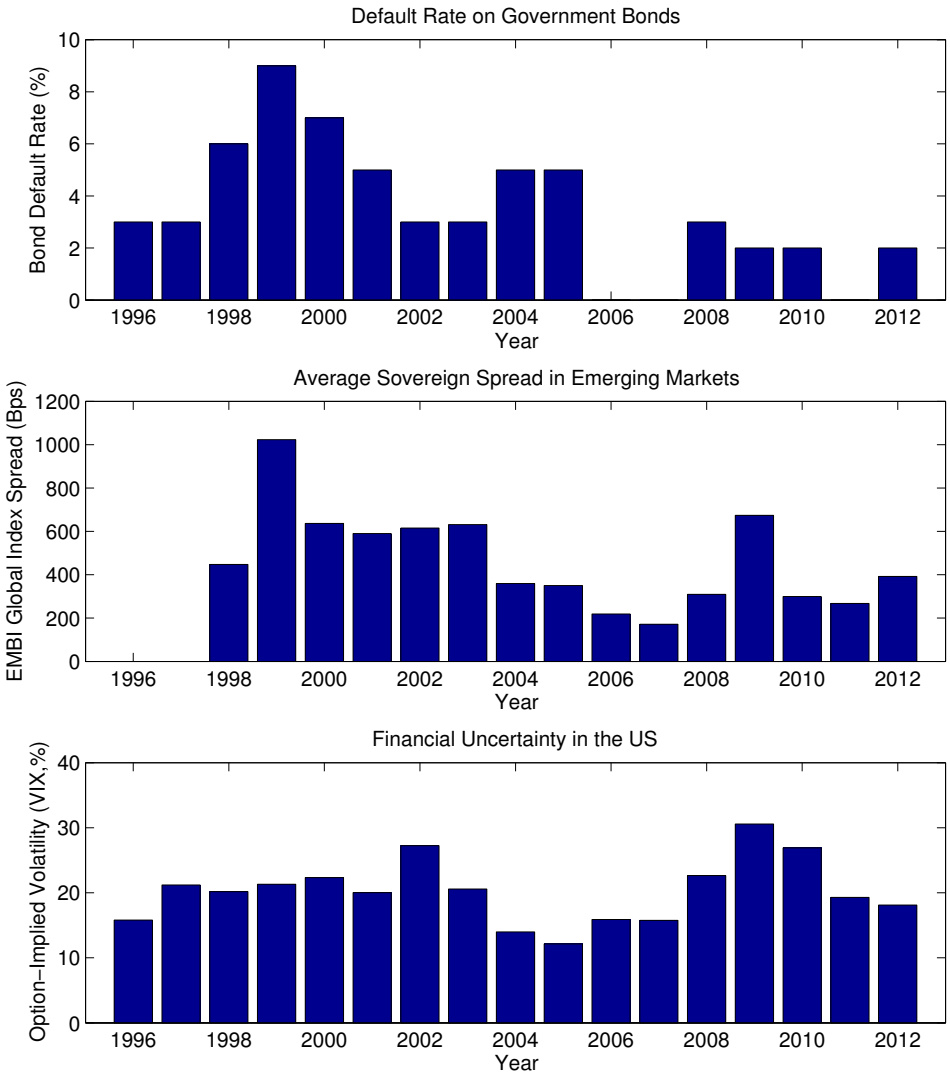

Table 1 : **List of Sovereign Defaults.** The table provides the list of sovereign defaults on local (LC) and foreign (FC) currency bonds in our data set, which consists of 100 emerging and developed economies over the period 1996-2012. Values of debt in default are hand-collected from reports of Fitch Ratings, Moody's, and Standard and Poor's, and from Beers and Nadeau (2014) when otherwise unavailable. The table indicates the type of default, which includes distressed exchange (DE), debt swap (DS), imposed tax (IT), and missed payment (MP).

Country	Years in Default	Currency of Default	Type of Default	Total Debt			Defaulted Debt		
				USD Millions	% of GDP	Share of FC Debt	USD Millions	% of Total Debt	% of GDP
ASIA									
Mongolia	1997-2000	LC	MP	693	60.78	83.78%	11	1.59%	0.96%
EUROPE									
Greece	2012	LC, FC	DE	437970	163.47	8.78%	273200	62.38%	101.97%
Russian Federation	1998-1999	LC	MP	389221	143.65	41.31%	8300	2.13%	3.06%
	1998-2000	FC	MP	389221	143.65	81.06%	30400	7.81%	11.22%
Ukraine	1998-2000	LC, FC	MP, DE	15657	37.38	70.84%	6900	44.07%	16.47%
LATIN AMERICA									
Argentina	2001-2005	LC, FC	MP, DE, DS	166801	62.05	54.60%	144100	86.39%	53.60%
Bolivia	1996-1997	FC	DE	4734	64.00	98.08%	16	0.34%	0.22%
Dominican Republic	1999-2001	LC	DE	4663	21.75	79.68%	11	0.24%	0.05%
	2005	FC	DE	7049	21.01	98.37%	1622	23.01%	4.84%
Ecuador	1999-2000	FC	MP, DE	16783	99.34	14.87%	6604	39.35%	39.09%
	1999	LC							
	2008-2009	LC, FC	MP, DE	13734	25.34	9.09%	3200	23.30%	5.90%
El Salvador	1996	LC	MP,DE	3293	31.92	76.83%	40	1.21%	0.39%
Jamaica	2010	LC, FC	DE	18272	131.63	52.79%	7900	43.24%	56.91%
Suriname	2000-2002	LC	MP	697	78.38	41.69%	25	3.58%	2.81%
Uruguay	2003	FC	DE	11426	102.10	88.63%	5400	47.26%	48.25%
Venezuela	1996-1998	LC	MP	32518	46.10	86.15%	270	0.83%	0.38%
	2004-2005	FC	MP	43377	38.57	66.53%	1622	3.74%	1.44%
MIDDLE EAST & AFRICA									
Cameroon	2004	LC	MP, DE	9831	62.32	84.34%	1000	10.17%	6.34%
Nigeria	2001	FC	MP	37925	86.72	74.73%	1200	3.16%	2.74%
	2004-2005	FC	MP	47112	53.63	76.29%	30	0.06%	0.03%
Turkey	1999	LC	IT	100732	40.33	52.07%	48280	47.93%	19.33%
Seychelles	2008	FC	MP, DE	1242	131.10	36.25%	300	24.16%	31.68%

Table 2 : **Descriptive Statistics of the Variables.** The table provides the definitions and descriptive statistics of the variables considered in this study. The data set consists of 100 emerging and developed economies and the sample period spans 1996-2012. The frequency of the data is yearly. All values are winsorized at 1% and variables are annualized when applicable.

Variable	Definition	Mean	Med	Std	Min	Max	Obs
DOMESTIC ECONOMY							
Real GDP growth	Real GDP growth	0.039	0.040	0.036	-0.078	0.132	1700
5-year real GDP growth	Real GDP growth per capita (%, 5-year avg)	0.028	0.025	0.027	-0.040	0.115	1700
Bank credit to private	Bank credit to private sector (% of GDP)	0.681	0.500	0.566	0.000	2.636	1700
Domestic investment	Gross domestic investment (% of GDP)	0.233	0.220	0.070	0.081	0.500	1679
Exchange rate return	Real effective exchange rate (% change)	0.009	0.008	0.070	-0.240	0.232	1700
GDP per capita	GDP per capita (10,000 USD)	1.446	0.588	1.743	0.026	8.599	1698
Government debt	General government debt (% of GDP)	0.509	0.434	0.346	0.027	1.792	1688
Inflation rate	Consumer price index (% change)	0.065	0.037	0.089	-0.014	0.591	1697
EXTERNAL ASSETS AND LIABILITIES							
Foreign investment	Inflow of foreign direct investment	0.044	0.028	0.059	-0.049	0.353	1700
International reserves	International reserves incl. gold (% of GDP)	0.178	0.135	0.170	0.007	0.984	1698
Original sin	Foreign currency debt (% of total debt)	0.414	0.374	0.345	0.000	1.000	1652
Short-term external debt	Short-term external debt (% of external debt)	0.298	0.223	0.235	0.000	0.953	1700
GOVERNANCE INDICATORS							
Political stability	Political stability index	0.147	0.257	0.872	-1.972	1.522	1685
Government effectiveness	Government effectiveness index	0.452	0.214	0.914	-1.019	2.227	1673
GLOBAL FACTORS							
World stock market return	MSCI global equity index (% change)	0.059	0.109	0.198	-0.435	0.316	1700
US stock market return	S&P 500 stock price index (% change)	0.069	0.128	0.185	-0.385	0.310	1700
VIX	Implied volatility of S&P 500 index options	0.202	0.202	0.047	0.121	0.306	1700
US corporate bond spread	BofA Merrill Lynch US corporate BBB spread	0.023	0.021	0.016	0.009	0.078	1600
US Fed fund rate	Effective Federal fund rate	0.028	0.022	0.023	0.001	0.064	1700
US Treasury rate	10-year US Treasury rate	0.045	0.044	0.012	0.019	0.066	1700
US Treasury yield curve	US Treasury slope (30-year rate - 3-month rate)	0.152	0.135	0.143	-0.095	0.379	1700

Table 3 : **Country Characteristics in Sovereign Default.** This table presents the economic and financial characteristics of countries in default and decomposes the analysis by debt's currency denomination. The data set consists of 100 emerging and developed economies over the period 1996-2012. The table first displays the characteristics of countries that are not in default (see Column 1), which are compared with those of countries in default (see Column 2). Columns 3 and 4 display the country characteristics when sovereign defaults relate to local and foreign currency bonds, respectively. Columns 5 provides details about the difference between Columns 1 and 2, while Column 6 reports robust *t*-statistics of the difference. The symbols *, ** and *** indicate the coefficient's significance at the 90, 95 and 99% confidence levels, respectively.

	No Default	Default			(1) - (2)	
		All	LC Bond	FC Bond	Difference	*t*-statistic H_0: (1)=(2)
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	1642	58	31	27		
DOMESTIC ECONOMY						
Real GDP growth	0.039	0.031	0.019	0.034	0.007	1.332
5-year real GDP growth	0.029	0.008	0.005	0.000	0.021***	5.112
Bank credit to private	0.691	0.257	0.252	0.257	0.434***	5.004
Domestic investment	0.234	0.201	0.210	0.176	0.033***	3.050
Exchange rate return	0.009	-0.008	-0.025	-0.009	0.018*	1.632
GDP per capita	1.476	0.285	0.317	0.332	1.192***	4.449
Government debt	0.505	0.691	0.712	0.803	-0.187***	-3.507
Inflation rate	0.061	0.219	0.224	0.195	-0.158***	-11.91
EXTERNAL ASSETS AND LIABILITIES						
Foreign investment	0.045	0.019	0.012	0.026	0.026***	2.843
International reserves	0.179	0.123	0.107	0.119	0.056***	2.144
Original sin	0.419	0.748	0.729	0.722	-0.323**	-6.038
Short-term external debt	0.302	0.156	0.136	0.181	0.146***	4.042
GOVERNANCE INDICATORS						
Government effectiveness	0.476	-0.444	-0.414	-0.454	0.919***	6.601
Political stability	0.162	-0.413	-0.297	-0.616	0.574***	4.288
GLOBAL FACTORS						
US stock market return	0.069	0.068	0.084	0.055	0.001	0.049
US Fed fund rate	0.028	0.037	0.037	0.032	-0.009***	-2.602
US Treasury rate	0.045	0.050	0.050	0.047	-0.005***	-2.796
US Treasury yield curve	0.153	0.125	0.112	0.151	0.028	1.258
VIX	0.202	0.199	0.208	0.196	0.004	0.499
World stock market return	0.059	0.051	0.066	0.054	0.008	0.262
US corporate bond spread	0.023	0.021	0.021	0.022	0.002	0.855

Table 4 : **Logit Regressions Explaining Sovereign Default Probability.** This table reports the results of a logit estimation used to explain sovereign default probability. The dependent variable is zero for non-default (base case) and one if a country is in default in a given year. Values of local variables are those of the preceding year. The analysis considers annual data for 100 emerging and developed countries over the period 1996-2012. Standard errors are clustered at the country level (Petersen, 2009) and corrected for heteroscedasticity. Robust *z*-statistics are reported in parentheses. The symbols *, ** and *** indicate the coefficients' significance at the 90, 95 and 99% confidence levels, respectively.

	Economic Variables	With Investment	With FX Factors	With Governance	Baseline Model	Emerging Markets
	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP growth	-0.99	-0.36	-0.10	0.18	-0.24	-0.27
	(-0.17)	(-0.06)	(-0.01)	(0.03)	(-0.04)	(-0.04)
5-year real GDP growth	-29.29**	-28.17**	-26.18**	-24.09**	-24.52**	-24.42**
	(-2.56)	(-2.50)	(-2.21)	(-2.01)	(-2.09)	(-2.09)
Government debt	0.55	0.55	0.55	0.60	0.60	0.62
	(0.96)	(0.91)	(0.96)	(1.03)	(1.04)	(1.07)
Inflation rate	3.81***	3.15**	2.98**	3.01**	3.30**	3.29**
	(2.78)	(2.37)	(2.14)	(2.05)	(2.45)	(2.45)
GDP per capita	-0.35	-0.42	-0.20	-0.03	-0.08	0.05
	(-0.94)	(-0.96)	(-0.53)	(-0.07)	(-0.20)	(0.12)
Bank credit to private	-2.91*	-2.98*	-3.06**	-2.63	-2.85*	-2.69
	(-1.84)	(-1.83)	(-1.97)	(-1.58)	(-1.66)	(-1.43)
Foreign investment		-10.34	-11.36	-11.43	-11.60	-11.23
		(-1.57)	(-1.63)	(-1.58)	(-1.63)	(-1.56)
Domestic investment		-2.89	-2.62	-2.83	-2.85	-2.78
		(-0.55)	(-0.47)	(-0.61)	(-0.61)	(-0.59)
Exchange rate return			-4.24*	-4.27**	-4.16*	-4.11*
			(-1.94)	(-2.02)	(-1.89)	(-1.85)
International reserves			-2.62	-2.19	-2.68	-2.90
			(-0.70)	(-0.64)	(-0.71)	(-0.75)
Original sin			1.34**	1.07*	1.06*	1.08*
			(2.02)	(1.77)	(1.72)	(1.78)
Short-term external debt			1.57	1.88	2.01	1.93
			(1.03)	(1.17)	(1.20)	(1.13)
Political stability				0.20	0.20	0.19
				(0.60)	(0.60)	(0.54)
Government effectiveness				-0.72	-0.64	-0.59
				(-1.01)	(-0.90)	(-0.83)
US Treasury rate					-13.61	-12.01
					(-0.73)	(-0.67)
VIX					-1.51	-1.54
					(-0.33)	(-0.34)
Constant	-2.64***	-1.64	-2.58*	-2.83**	-1.76	-1.89
	(-3.88)	(-1.33)	(-1.69)	(-2.00)	(-0.87)	(-0.94)
Observations	1584	1566	1538	1512	1512	1151
LR Chi-square	81.09	89.42	183.6	211.9	254.9	238.3
Pseudo R-square	0.301	0.314	0.346	0.348	0.350	0.311

Table 5 : **Logit Regressions Explaining Decisions to Default on Sovereign Bonds.** This table reports the results of a logit estimation used to predict the decision to default on sovereign bonds. The dependent variable is zero for non-default (base case) and one if a country declares default in a given year. Values of local variables are those of the preceding year. The analysis considers annual data for 100 emerging and developed countries over the period 1996-2012. Standard errors are clustered at the country level (Petersen, 2009) and corrected for heteroscedasticity. Robust *z*-statistics are reported in parentheses. The symbols *, ** and *** indicate the coefficients' significance at the 90, 95 and 99% confidence levels, respectively.

	Economic Variables	With Investment	With FX Factors	With Governance	Baseline Model	Emerging Markets
	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP growth	-8.33	-7.31	-8.41	-8.52	-10.02	-9.59
	(-1.28)	(-1.14)	(-1.20)	(-1.30)	(-1.41)	(-1.43)
5-year real GDP growth	-25.98***	-23.97***	-18.14**	-15.58*	-17.23**	-17.83**
	(-2.92)	(-2.74)	(-2.03)	(-1.80)	(-2.04)	(-2.15)
Government debt	0.31	0.18	0.22	0.24	0.27	0.27
	(0.59)	(0.32)	(0.31)	(0.34)	(0.41)	(0.41)
Inflation rate	2.59*	2.05	1.77	1.71	2.73	2.76
	(1.78)	(1.37)	(1.08)	(0.96)	(1.58)	(1.60)
GDP per capita	-0.45	-0.43	-0.37	-0.12	-0.30	-0.03
	(-1.22)	(-1.16)	(-1.10)	(-0.31)	(-0.72)	(-0.10)
Bank credit to private	-1.33	-1.45	-1.34	-0.99	-1.61	-1.34
	(-1.29)	(-1.42)	(-1.42)	(-1.22)	(-1.60)	(-1.19)
Foreign investment		-5.56	-6.83	-6.27	-7.70	-7.05
		(-0.80)	(-0.94)	(-0.88)	(-1.05)	(-1.00)
Domestic investment		-5.62	-5.50	-5.37	-5.29	-4.86
		(-0.91)	(-0.77)	(-0.86)	(-0.83)	(-0.76)
Exchange rate return			-1.49	-1.68	-1.11	-1.09
			(-0.68)	(-0.79)	(-0.46)	(-0.47)
International reserves			-8.47*	-7.79*	-10.14**	-10.54**
			(-1.74)	(-1.75)	(-2.04)	(-2.12)
Original sin			1.29*	0.97	1.02	1.05
			(1.91)	(1.48)	(1.42)	(1.46)
Short-term external debt			1.92	2.40	3.08	2.81
			(0.88)	(1.12)	(1.39)	(1.26)
Political stability				0.07	0.03	-0.01
				(0.18)	(0.07)	(-0.02)
Government effectiveness				-0.80	-0.52	-0.42
				(-1.37)	(-0.86)	(-0.72)
US Treasury rate					-46.28**	-41.53**
					(-2.06)	(-2.00)
VIX					-6.86	-6.97
					(-1.38)	(-1.38)
Constant	-3.35***	-1.90	-2.19	-2.60	1.21	0.87
	(-5.71)	(-1.29)	(-1.14)	(-1.54)	(0.60)	(0.43)
Observations	1584	1566	1538	1512	1512	1151
LR Chi-square	96.23	91.65	144.5	191.2	180.8	140.4
Pseudo R-square	0.212	0.223	0.262	0.265	0.290	0.260

Table 6 : **Multinomial Logit Regressions Explaining Sovereign Default Probability by Currency Denomination.** This table reports the results of a multinomial logit model used to explain sovereign default probability by currency denomination. The dependent variable is zero for non-default (base case), one for a country in default on local currency bonds, and two for for a country in default on foreign currency bonds. Values of local variables are those of the preceding year. The analysis considers annual data for 100 countries over the period 1996-2012. Standard errors are clustered at the country level (Petersen, 2009) and corrected for heteroscedasticity. Robust *z*-statistics are reported in parentheses. The symbols *, ** and *** indicate the coefficients' significance at the 90, 95 and 99% confidence levels, respectively.

	All Countries		Emerging Markets	
	LC Defaults	FC Defaults	LC Defaults	FC Defaults
	(1)	(2)	(3)	(4)
Real GDP growth	8.95	8.37	8.95	8.37
	(1.00)	(0.58)	(0.99)	(0.58)
5-year real GDP growth	15.33	-37.90**	15.33	-37.89**
	(1.05)	(-2.47)	(1.05)	(-2.47)
Government debt	-1.80*	-0.07	-1.80*	-0.07
	(-1.81)	(-0.08)	(-1.80)	(-0.08)
Inflation rate	11.89***	5.01**	11.89***	5.01**
	(2.59)	(2.12)	(2.59)	(2.12)
GDP per capita	-1.74	-3.41	-1.74	-3.40
	(-0.68)	(-1.52)	(-0.67)	(-1.52)
Bank credit to private	-31.36***	-0.18	-31.36***	-0.18
	(-2.74)	(-0.15)	(-2.73)	(-0.15)
Foreign investment	-24.84***	5.90	-24.84***	5.90
	(-3.20)	(0.78)	(-3.20)	(0.78)
Domestic investment	19.58*	-18.50**	19.58*	-18.50**
	(1.90)	(-2.53)	(1.90)	(-2.52)
Exchange rate return	-8.72**	-4.62	-8.72**	-4.62
	(-2.22)	(-1.15)	(-2.22)	(-1.15)
International reserves	-4.43	-0.44	-4.43	-0.45
	(-0.49)	(-0.11)	(-0.49)	(-0.11)
Original sin	-0.89	1.16	-0.89	1.16
	(-0.50)	(0.95)	(-0.50)	(0.95)
Short-term external debt	-0.50	6.30**	-0.50	6.30**
	(-0.13)	(1.97)	(-0.13)	(1.96)
Political stability	0.50	-0.33	0.50	-0.33
	(0.84)	(-0.68)	(0.84)	(-0.68)
Government effectiveness	-0.70	-1.20	-0.70	-1.20
	(-0.58)	(-0.96)	(-0.58)	(-0.96)
US Treasury rate	-23.24	-8.13	-23.24	-8.13
	(-0.83)	(-0.14)	(-0.83)	(-0.14)
VIX	0.50	-21.61*	0.50	-21.61*
	(0.06)	(-1.74)	(0.06)	(-1.74)
Constant	-4.11	0.99	-4.11	0.99
	(-0.81)	(0.36)	(-0.81)	(0.35)
Observations	1497		1136	
LR Chi-square	1941		1923	
Pseudo R-square	0.550		0.527	

Table 7 : **Sovereign Default Predictions.** This table reports the prediction accuracy of the logit and the multinomial logit regression models. The logit regression model explores the probability that a country is in default in a given year, while the multinomial logit separates defaults on local and foreign currency bonds. The results of these models are reported in Tables 4 and 6, respectively. In both cases, we compare the results of the baseline model with those of a specification that additionally includes the country's rating. Local variables and ratings are those of the preceding year. The analysis considers annual data for 100 countries over the period 1996-2012.

	Logit		Multinomial Logit	
	Baseline Model	With Rating	Baseline Model	With Rating
Number of observations	1512	1338	1497	1324
Pseudo R-square	0.350	0.564	0.550	0.693
NON-DEFAULTS				
Observations	1472	1306	1472	1306
Fraction correctly predicted	0.996	0.997	0.998	0.997
DEFAULTS				
Observations	40	32	25	18
Fraction correctly predicted	0.200	0.344	0.280	0.556

Table 8 : **Global Factors and Sovereign Bond Default Probability.** This table reports the results of a logit estimation used to explain sovereign default probability using global factors. The dependent variable is zero for non-default (base case) and one if a country has defaulted on a bond on a given year. The analysis considers annual data for 100 emerging and developed countries over the period 1996-2012. Standard errors are clustered at the country level (Petersen, 2009) and corrected for heteroscedasticity. Robust *z*-statistics are reported in parentheses. The symbols *, ** and *** indicate the coefficients' significance at the 90, 95 and 99% confidence levels, respectively.

	Stock Market Factors (1)	Bond Market Factors (2)	All Global Factors (3)	With Local Variables (4)
World stock market return	-1.37		2.68	3.89
	(-0.67)		(0.93)	(1.21)
US stock market return	1.25		-2.90	-3.79
	(0.48)		(-1.10)	(-1.20)
VIX	-1.90		-0.40	-1.28
	(-0.50)		(-0.07)	(-0.27)
US Fed fund rate		6.32	1.24	20.96
		(0.45)	(0.07)	(1.20)
US Treasury rate		27.96	45.54	-26.47
		(1.50)	(1.22)	(-0.73)
US Treasury yield curve		-0.20	-0.34	0.39
		(-0.27)	(-0.40)	(0.39)
US corporate bond spread		-1.93	-4.14	33.68
		(-0.11)	(-0.15)	(1.09)
Constant	-3.28***	-5.10***	-5.59***	-2.65
	(-4.02)	(-7.52)	(-3.28)	(-0.94)
Inclusion of Local Variables	No	No	No	Yes
Observations	1700	1600	1600	1512
LR Chi-square	0.955	8.166	14.62	365.6
Pseudo R-square	0.00165	0.0230	0.0258	0.366