Analyzing Determinants of Foreign Credit Demand for Sovereign Bonds*

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Abstract

This paper aims to investigate the economic determinants of foreign credit demand for sovereign bonds in selected emerging and advanced countries. Furthermore, it is an objective to understand what causes a greater impact on this demand: the country's domestic macroeconomic fundamentals or the external global environment. To this end, using data on share of foreign demand for sovereign bonds, an econometric analysis will be conducted with panel data from 2004 to 2019 for 45 emerging and advanced markets. The main findings show that both domestic fundamentals and the external environment affect the foreign participation in sovereign debt, but results vary depending on the degree of development and the channel through each variable affect our dependent variable. We find that domestic fundamentals seem to be related with the increase in foreign participation for both group of economies, but with different magnitudes and interpretation. For some variables, it is more related to the foreign demand of sovereign bonds and, for others, associated with the bond supply. The degree of development also seems to be important to the external environment. For some variables (US nominal interest rate), the 'search for yield' plays a major role for the bond demand. But, for others (as the FX volatility and the VIX Index), the global demand is related with foreign investors' risk aversion. Finally, we found that, in times of global turmoil, domestic fundamentals matter less for foreign attractiveness than in times when the global volatility is low.

Keywords: Sovereign Debt; Foreign Credit Demand; Public Debt.

J.E.L. codes: F34; G12; G15; O11

1 Introduction

After the Global Financial Crisis (GFC) in 2008, a great wave of indebtedness began. All countries severely increased their debt levels (Kose et al. (2020)). As an illustration, by 2018, according to the International Monetary Fund (IMF) World Debt Database[1], global debt has reached 226% of GDP, representing an amount of 188 trillions of US dollars. Emerging and developing economies saw indebtedness grow 54 percentage points (p.p.) in 8 years, reaching 170% of their GDP. Low-income countries reached 67% of debt over GDP in 2018, that figure being 48% in 2010. A different situation was seen on advanced economies, once they have maintained a ratio of around 265% debt to GDP, the same level since 2010. This situation has shown the need for emerging and advanced markets to develop their sovereign bond markets to facilitate public debt financing and management. And, in addition, it exposed that countries need to attract foreign investors to increase their financing possibilities.

Investors, when allocating their resources in foreign countries, can look for diversification of assets, stability, or higher returns (Levy and Lerman (1988)). Each country provides investments that can be useful to fulfill one of these objectives. Some countries deliver higher relative returns, accompanied by a higher risk, while other countries may have lower and more stable returns. However, even with all countries presenting advantages and disadvantages for foreign investors, some are more attractive than others, and this attractiveness depends on both internal and external factors.

Internal factors are related to country's macroeconomic fundamentals. On one hand, economies with macroeconomic stability can be attractive to investors, as their assets will present lower risk (Burger and Warnock (2006)). On the other hand, countries with worse fundamentals can also be attractive (IMF (2011))[2], which is the case of some emerging countries. The reason is that, even with degraded fundamentals, assets from these countries must deliver higher returns to compensate the investors for the risk. In this way, investors can take advantage of the variability of assets around the world to diversify their resources.

The external factors that can attract or alienate the foreign investors are related to the global economic environment. Depending on the global economic scenario, agents can increase or decrease their investments abroad (Broner et al. (2011)). In times of economic expansion, more agents invest abroad, while in times of turmoil agents retract and leave

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[1] Data from Mbaye et al. (2018). Accessed in Jan/2021 through https://blogs.imf.org/2019/12/17/new-data-on-world-debt-a-dive-into-country-numbers/.

[2] IMF, 2011. Global Financial Stability Report, October 2011, IMF, Washington D.C.

foreign countries to invest domestically.

Economic retractions, when they occur, are large and volatile, causing a greater impact in emerging countries compared to advanced ones. Thus, in a time of global crisis, there is a strong outflow of foreign capital from emerging countries in a way that can significantly damage these countries' financing. When analyzing sovereign bonds, which are the focus of this study, it is important to understand the incentives for governments to provide a good bond market. If the country offers attractable bonds, the demand for them increases, which may decrease the cost of borrowing to the government (Andritzky (2012); Arslanalp and Poghosyan (2016); Jaramillo and Zhang (2013); Warnock and Warnock (2009)). In addition, with greater demand, there is greater divestment of investors, which should increase the liquidity of securities (WorldBank and IMF (2001)).

In this context, one can ask which factors are important in attracting foreign creditor's demand for sovereign debt. Are macroeconomic fundamentals the main drivers to increasing foreign demand for countries' domestic debt or is the global environment the main factor that could lead to a higher market access for external investors? This paper aims to analyze the different impacts of domestic fundamentals and external variables on the participation of foreign creditors in government bonds, depending on different scenarios, level of countries' development and time periods. To this issue, we employ an empirical analysis using panel data to understand the relation between a set of explanatory variables and the foreign participation in sovereign debt.

Results show that both domestic and external environment are important to the foreign demand in sovereign bonds. However, the interpretation depends on both countries' degree of development and the channel through which explanatory variable affect the foreign participation in the economies' debt. While good domestic fundamentals as the level of GDP per capita seems to be related with the demand for sovereign bonds, other variables as the current account and government indebtedness are more associated with the supply of sovereign bonds. When it comes to external variables, we interpret that the 'search for yield' plays a role for some variables as the US nominal interest rate, while the 'search for safety' is our interpretation for others. And finally, we find that, in times of global turmoil, when the volatility of global markets is high, domestic fundamentals matter less for foreign attractiveness, which could be an indication that risky markets are more subject to global environment than safer economies.

This paper is divided in 7 sections. Section 1 is this Introduction. In Section 2 we provide some related literature in capital flows and sovereign bond issuance. Section 3 describes the data used in this study. In Section 4 we provide some trends and stylized

facts on foreign demand for sovereign bonds from both Advanced and Emerging Markets. Section 5 describes the empirical analysis, along with Section 6 for robustness checks. Section 7 concludes the paper.

2 Literature Review

Discussions on the determinants of foreign demand for countries' sovereign bonds are widely addressed in the literature. The main topics are related to foreign creditors; growth; debt overhang; debt tolerance and – by the supply side – sovereign issuance. Therefore, those subjects are the ones that most concern to this work and that will be thoroughly examined before proceeding to a proper data analysis.

Initially, countries' ability to attract foreign investors to local currency bonds was studied by Burger and Warnock (2006). By analyzing data from 49 countries concerning size and development of debt markets, their study shows a positive relation between a history of low inflation (accounting for stable monetary and fiscal policies) and more developed bond markets. Important to notice that the main contribution goes in the direction of rejecting the idea of a "original sin" (Eichengreen et al. (2002)), which means that, for emerging economies, the demand for local bonds would be related with endogenous factors, such as inflation, instead of exogenous ones. Subsequently, Brutti and Sauré (2013) studied the importance of derivatives market for the quality of a bond market. Testing the empirical adherence of the secondary market theory – i.e., the enforcement to honor its debt that the government is put through when there is a secondary market –, the authors have confirmed the importance of the secondary channel to the sustained presence of foreign allocation in local debt. Notice that both works underline the importance of safe and controlled internal conditions for bond markets' development.

Additionally, when it comes to growth, the literature does not advocate for a linear relation as the ones seen above. In fact, the relationship between debt and growth was first found to be non-linear by Reinhart and Rogoff (2010). Building upon the phenomenon of debt intolerance (Reinhart et al. (2003)) – i.e., the idea that emerging economies could struggle to grow and attract foreign investors at levels of debt to GDP as low as 15% –, Reinhart and Rogoff (2010) analyzed macroeconomic data from 44 countries through almost two hundred years and concluded that a 90% debt to GDP ratio can be detrimental for growth. It seems to be this way because, once nations reach its historical level of indebtedness, risk premiums rise quickly, preventing growth and putting away foreign investors.

Similar conclusions were provided by Kumar and Woo (2010). Beyond arguing that higher initial levels of debt can cause subsequent reductions in real GDP growth, the authors – who relied on a panel regression composed of 38 countries spanning over forty years – also discriminated effects between emerging and advanced markets. According to them, emerging economies would have greater difficulties to manage higher levels of indebtedness, thus presenting more accentuated losses in terms of GDP growth. It is important to mention that channels that are responsible for restraining growth, as Kumar and Woo (2010) points out, are higher long-term interest rates; uncertainty; higher taxes; and inflation. Although not apparent at first, one might see now why discussions about the relationship between debt and growth – and its non-linearity – are paramount to the objectives of this paper: once certain levels of indebtedness impacts growth, interest rates and inflation, it should also influence foreign attractiveness for sovereign debt - as presented before.

Another concept widely discussed in the academia must be explored here. Debt overhang refers to a loan burden so large that the country can not take any additional debt to finance itself. Krugman (1988) notes the trade off for creditors when facing a debt overhang: financing or forgiving. Also, Deshpande (1997) discusses how a situation of debt overhang can discourage investment. Finally, Reinhart et al. (2012) punctuated the main episodes in history about debt overhang.

Overall, despite the diverse effects and relations one can see when investigating different macroeconomic fundamentals, the bottom line so far is that they do matter if one wishes to assess the determinants of foreign demand for sovereign bonds. Beyond that, it is also necessary to account for the supply side of sovereign debt – i.e., bond issuance. With that in mind, Presbitero et al. (2015) highlighted the importance of dividing the analysis of determinants of international sovereign bonds into two categories: internal factors and external ones. Regarding the first, one can easily assume that they are the same as the ones already shown here: macroeconomic fundamentals (*per capita* income, sound monetary and fiscal policies and indebtedness). It shouldn't be different after all; countries might issue bonds when there are investors seeking them. Apart from that, the study also underpins global factors. Their work compound by 104 emerging and developing markets from 1995 to 2013 showed that amidst positive global scenario, spreads from international sovereign bonds were lower and, in general, investors would seek riskier and better rewarding assets – such as developing economies' bonds.

Within the same issue, Alexandrino da Silva et al. (2021) investigate what factors - country-specific macro economic fundamentals and/or external variables - have contributed

to the surge in bond issuance by low-income countries' access to international capital markets. Their policy study argues that the impact of some of the variables impacting bond issuance appears to reflect a country's need to issue bonds for external financing (the 'supply side' of bond issuance), while others appear to correlate more through their impact on investors' appetite for a country's debt (the 'demand side' in their assessment). Inspired by them, we also provide an analysis of the duality between supply and demand in our variables and try to understand how the interpretation of our results depends on each economies' degree of development.

Lastly, analyzing the spread in sovereign bonds that certain countries are obliged to offer, the literature studies the emerging countries and the determinants of that spread. First, Hartelius et al. (2008) discusses whether the spread from emerging countries is more related to the country's fundamentals or to global liquidity - same duality seen in bond issuance. The authors conducted a study using panel data for 33 emerging countries. To analyze the spread, the EMBI (Emerging Market Bond Index) and the EMBI Global were used[3]. This study concluded that country fundamentals are important for determining spread, but that external factors such as global volatility and US interest rates also have a major impact. Then, on the same topic, David et al. (2019) debated in a paper whether fiscal policy significantly impact the sovereign spread. To this end, a panel analysis was carried out for 22 emerging countries. The conclusion of the study was that the sovereign spread of countries that adopt policies of austerity end up decreasing drastically.

Acquainted with the most prominent literature on sovereign bond's influencing factors until now, it is possible to build upon it focusing on the research objective expressed in Section 1, that is, determine which variables better explain the external demand. In this spirit, it is important to highlight the developed work from Arslanalp and Tsuda (2014a) and Arslanalp and Tsuda (2014b). The authors, in addition to having compiled the database used in this article, carried out several analyses on foreign participation in the bond market. It was noted that, as of 2010, there was a great flow of foreign capital to the emerging securities market. Moreover, they concluded that countries with a lower debt to GDP ratio were more attractive to foreign investors, which seems to corroborate with Reinhart et al. (2012) findings but, nevertheless, will be once more tested here.

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[3]Both indexes provided by JPMorgan. More informations at https://www.jpmorgan.com/insights/research/indices/product.

3   Data

To assess empirically the matter treated here, a comprehensive database was gathered. It is composed by foreign credit demand figures and both domestic and external fundamentals that accounts for advanced and emerging countries.

With respect to foreign demand for sovereign debt, it was used the database provided by Arslanalp and Tsuda (2014a) and Arslanalp and Tsuda (2014b). The authors provide estimates of investor holdings of government debt of 48 advanced and emerging economies, from which we use 45 of them. The complete list of countries can be seen at Table 1 - where the division between emerging and advanced markets also follows Arslanalp and Tsuda (2014a) and Arslanalp and Tsuda (2014b). Furthermore, data was annualized through the quarters' average of the year.

From the database provided by Arslanalp and Tsuda (2014a) and Arslanalp and Tsuda (2014b), the main variables used refer to the amount of foreign capital allocated in countries' sovereign debt. Foreign capital is divided into three classes: foreign official sector, foreign banks and foreign nonbanks, based on the definition used in the IMF's International Financial Statistics (IFS)[4]. These three variables will be used in terms of the GDP of each country, so that we can standardize them according to the size of each economy.

Besides that, macroeconomic and financial data, which will be used to provide insights about foreign demand for sovereign bonds, were obtained from the IMF's World Economic Outlook Database (WEO) published in October 2020 [5].The annual variables included in our base are: GDP per capita, debt-to-GDP rate, inflation, lending borrowing rate and nominal interest rate. Important to notice that not all the 45 countries analysed in this study have complete information about its nominal interest rate available at IMF's World Economic Outlook. Thus, the missing data was obtained directly from their respective the central banks[6].

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[4]Foreign official sector holdings consist in government securities held by foreign central banks. Foreign bank holdings are commercial banks asset positions estimated by Arslanalp and Tsuda (2014b) and Arslanalp and Tsuda (2014a) from BIS Locational Banking Statistics and foreign nonbanks holdings are estimated as the difference between total foreign holdings and the ones from foreign official sector and foreign banks. More details at Arslanalp and Tsuda (2014b), Arslanalp and Tsuda (2014a) and https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b.

[5]Complete data was obtained at https://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020.

[6]European Central Bank: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html;
Central Bank of Egypt: https://www.cbe.org.eg/en/EconomicResearch/Statistics/Pages/TimeSeries.aspx;
Reserve Bank of Australia: https://www.rba.gov.au/chart-pack/interest-rates.html;
Central Bank of India: https://www.centralbankofindia.co.in/English/;

Table 1: List of compounding countries divided by development stage

Advanced Markets (AM)	Emerging Markets (EM)
Australia	Argentina
Austria	Brazil
Belgium	Bulgaria
Canada	Chile
Czech Republic	China
Denmark	Colombia
Finland	Egypt
France	Hungary
Germany	India
Greece	Indonesia
Ireland	Malaysia
Italy	Mexico
Japan	Peru
South Korea	Philippines
Netherlands	Poland
New Zealand	Romania
Portugal	Russia
Slovenia	South Africa
Spain	Thailand
Sweden	Turkey
Switzerland	Ukraine
United Kingdom	Uruguay
United States	

Moreover, World Bank's Worldwide Governance Indicators (WGI)[7] was collected with the aim of understanding whether governance institutions can impact foreign investors as suggested in the literature. To this sense, we have included the annual percentile rank indexes of (i) control of corruption; (ii) political stability; and (iii) rule of law.

Bank of Indonesia: https://www.bi.go.id/en/statistik/indikator/bi-7day-rr.aspx;
Bank of Japan: https://www.boj.or.jp/en/mopo/mpmdeci/mpr_all/index.htm/;
National Bank of Ukraine: https://bank.gov.ua/en/monetary/stages/archive-rish;
Banco Central de Reserva Del Perú: https://estadisticas.bcrp.gob.pe/estadisticas/series/anuales;
Sveriges Riksbank: https://www.riksbank.se/en-gb/statistics/search-interest--exchange-rates/reference-rate/.

[7]Complete data was obtained at http://info.worldbank.org/governance/WGI.

Finally, we also use as external factors the annualized mean of CBOE[8] Volatility Index (VIX) as a proxy for volatility in global financial markets, together with the standard deviation of the exchange rate (FX Volatility), in order to check whether countries with steadier exchange rate can attract foreign investors.

The list of main variables referring to macroeconomic and financial data, external factors, foreign capital allocated to sovereign debt and government indexes are shown in Table 2. As well as their statistics on the number of observations, mean, standard deviation, minimum and maximum.

Table 2: Summarized Statistics

	N	Mean	St. Dev.	Min	Max
Domestic Fundamentals					
Debt-to-GDP (%)	720	57.357	36.290	7.472	203.136
Foreign Debt Participation (% of GDP)	720	22.435	21.731	0.476	160.143
Foreign Part. Except Officials (% of GDP)	720	13.090	12.009	0.014	74.865
GDP per capita (thousand USD)	720	25.034	20.297	0.639	88.903
Inflation (%)	718	3.695	4.666	−2.535	53.832
(+) Lending (-) Borrowing (% of GDP)	720	−2.409	3.508	−32.076	7.909
Nominal Interest Rate (%)	708	4.058	5.167	−0.750	59.252
Control of Corruption*	630	70.674	23.841	11.374	100.000
Political Stability*	630	58.123	27.224	2.427	100.000
Rule of Law*	630	71.389	23.536	18.750	100.000
Current Account (% of GDP)	712	−0.047	4.966	−23.907	16.295
External Factors					
US VIX	720	18.197	6.173	11.091	32.583
DXY Index	720	97.359	46.481	24.083	182.667
FX Volatility	720	14.628	76.968	0.000	865.169

* Higher percentile, better institutions

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[8]Chicago Board Options Exchange

4 Stylized Facts

To illustrate and motivate this study, we present some stylized facts from our data. Three major trends can be observed: (i) the level of indebtedness behaves in different paths when we look in distinct group of countries and years; (ii) countries that have developed in terms of macroeconomic fundamentals had more foreign attractiveness in their sovereign bonds and (iii) this improvement on bond attractiveness was negatively related with turmoils in the global environment.

As discussed in Section 1, indebtedness has not only grown for emerging (EM) and advanced markets (AM), but also became one of the most important sources of government financing, especially after the Global Financial Crisis (GFC). In this sense, it is important to understand how this increase in indebtedness occurred. In Figure 1, we can observe the evolution of the debt-to-GDP ratio over the years for advanced and emerging countries. For the advanced, the level of indebtedness increased significantly after the GFC, but as of 2014, the slope has turned to be negative. In the case of the emerging countries, the growth suffered a less expressive growth, but it has not stopped growing until the end of our observations.

Figure 1: Debt Ownership vs Debt Denomination
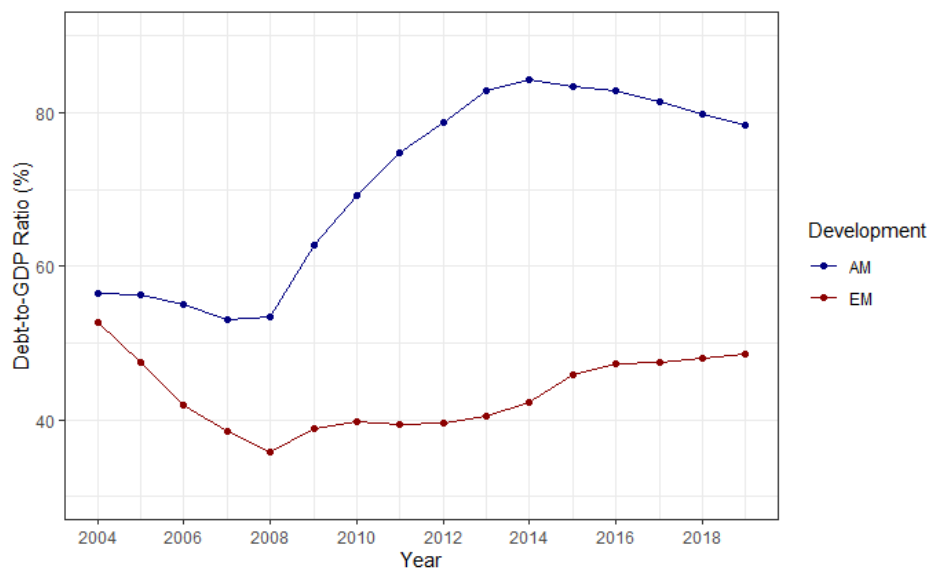
It is also important to look at the most indebted countries over the years to understand what kind of countries end up contracting more debt. Figure 2 shows how the indebted-

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ness of the countries in our database developed throughout the years. In summary, it is observed that before the GFC, there were more emerging economies in the Top 10 indebted countries than advanced economies. This trend, however, has changed after 2008: In 2019, only 2 emerging countries were included in the Top 10 Debt to GDP ratio economies.

Figure 2: Top 10 Indebted Economies Evolution
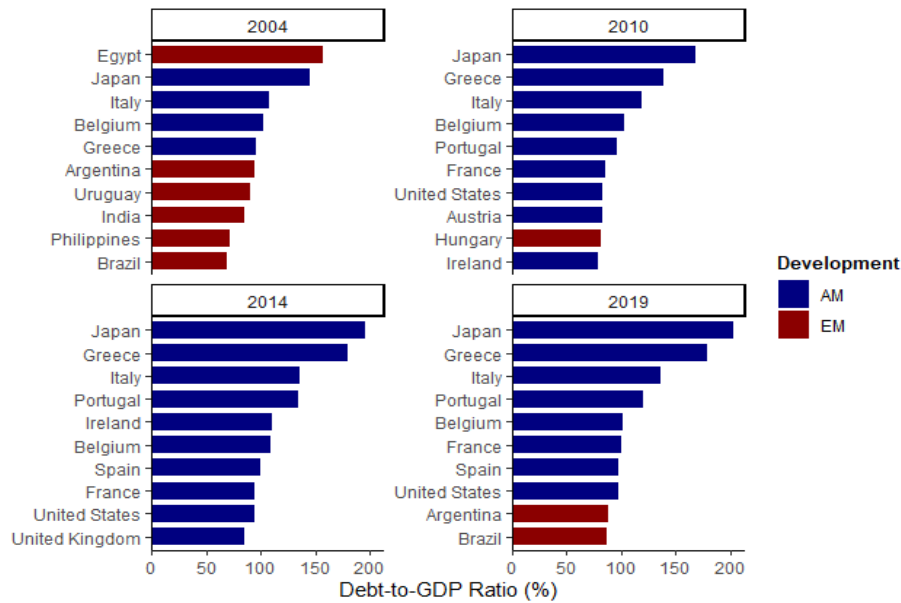
At this point, one might ask how was it possible that advanced markets successfully managed to wipe out their emerging peers off of the Top 10 indebtedness rank. One possible correlation for that can be delivered when analyzing foreign participation in public debt. In fact, we can see some changes over the years by Figure 3. Even before GFC, the average amount of foreign capital invested in sovereign debt, in terms of GDP, has grown shyly for advanced countries, but emerging economies were watching a decrease in its external investors. Even though the participation of bondholders henceforth started to increase in EM, the distance between the two groups only rose from 2008 and 2014 - which could be related with the movement seen in Figure 2.

That being said, it is clear that foreign participation in debt has always been greater for advanced countries, thus, it is possible to suppose that agents prefer the advanced ones. But as this participation is increasing for emerging markets and decreasing for advanced ones in more recent times, it is also possible to infer that agents have been more willing to invest in emerging countries.

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Figure 3: Evolution of Foreign Participation in Sovereign Debt in terms of GDP for Advanced (AM) and Emerging Markets (EM)
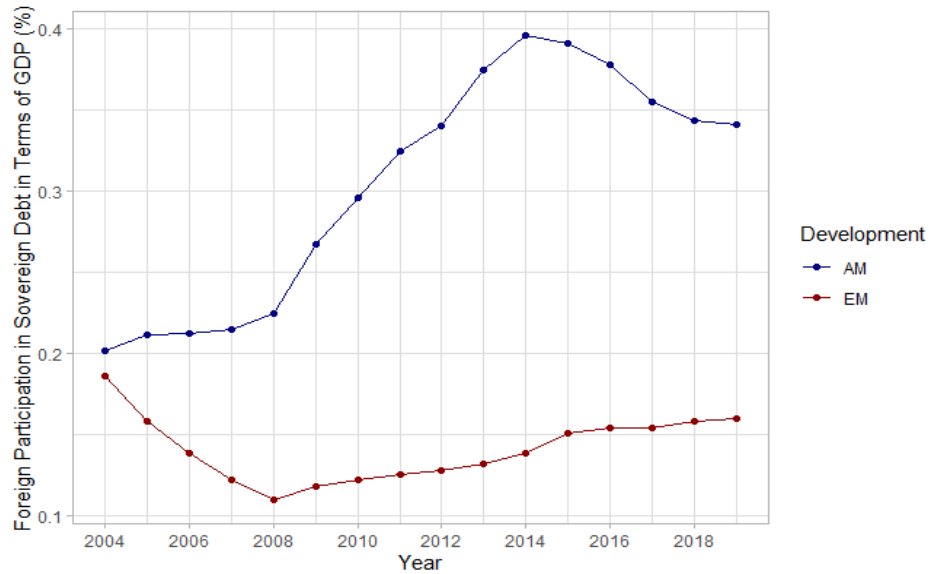
Corroborating with the fact that, on average, the advanced countries receive a greater inflow of foreign capital in the debt, we observe that the countries with the largest foreign participation in the debt are the advanced ones. As shown in Figure 4, in the four moments shown, forwards occupy the vast majority of the positions in the top 10 ranking of countries with more foreign capital in debt.

Besides the fact that Figure 4 might suggest that development level is the main determinant of indebtedness, one must not forget to account for the others determinants. In fact, as seen in Section 2, domestic fundamentals should be related with the investors' demand for each country.

A clear example of important macroeconomic fundamental related with foreign debt participation is the annual average of inflation rate. Countries with a history of inflation crises may alienate investors, as inflation is expected to erode yields. Analyzing Figure 5, it can be seen that countries that had lower inflation rates between 2004 and 2019 were able to achieve higher levels of foreign participation in sovereign debt. Conversely, countries with higher inflation did not reach such high levels of foreign participation. Moreover, Figure 5 also shows some correlation between the level of GDP per capita and foreign participation. It suggests that not only is the inflation negatively related with foreign participation, but also that countries with higher GDP per capita are located in top shares of foreign demand.

Figure 4: Top 10 Economies' Foreign Debt Participation Evolution

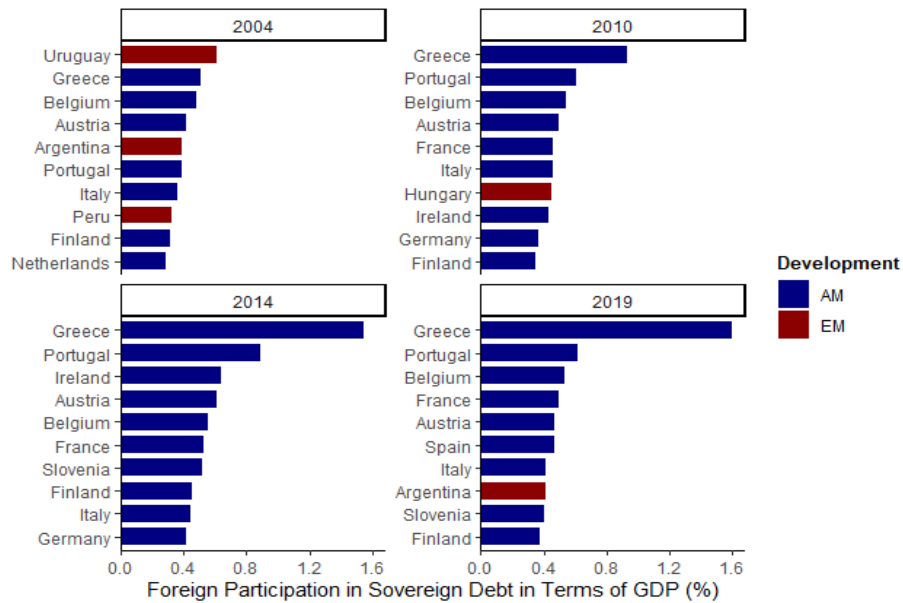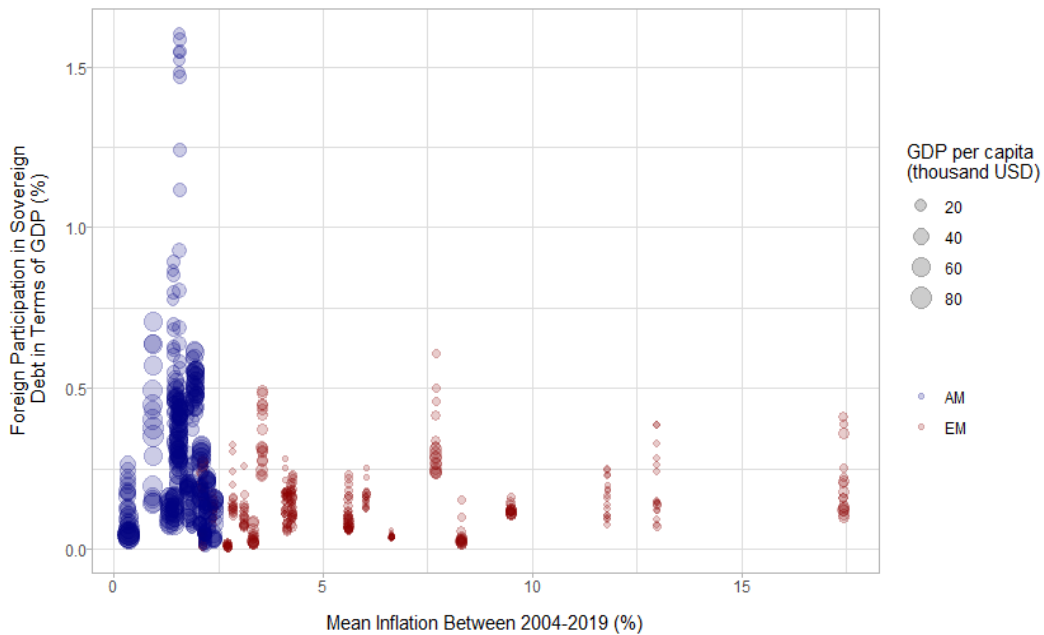Figure 5: Foreign Participation in Sovereign Debt (% GDP) for Advanced (AM) and Emerging Markets (EM) and Annual Average Inflation Between 2004 and 2019

Between domestic fundamentals and external determinants, exchange rate volatility is also a variable that is associated with the decision of the foreign investor. An exchange rate with greater volatility is related with a more unstable macroeconomic environment -

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this can easily be seen again in Figure 6, in which higher volatility levels also represents those countries with small rank of Rule of Law. Therefore, it seems that exchange rate volatility is negatively correlated with foreign demand in sovereign bonds, but only for advanced markets. Thus, as we can see in Figure 6, countries with lower exchange rate volatility reach higher levels of foreign debt participation, while the opposite occurs for countries with higher levels of volatility.

Figure 6: Foreign Participation in Sovereign Debt (% GDP) for Advanced (AM) and Emerging Markets (EM) and FX Volatility* = ln(FX Volatility · 10,000). Size of observations represents Rule of Law rank.
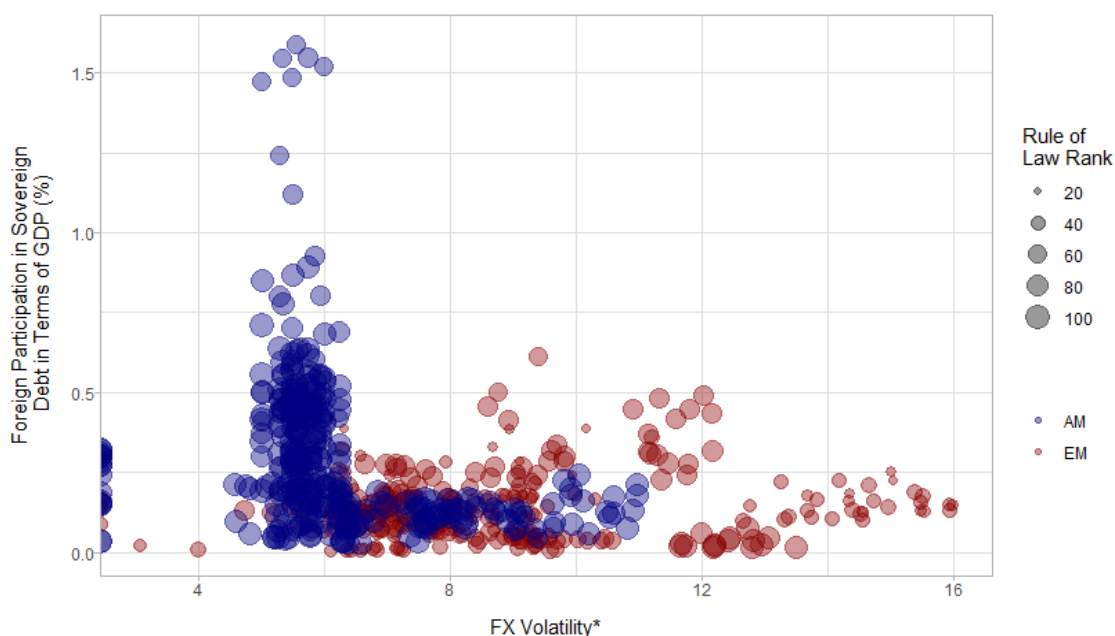
Finally, analyzing external factors - and thinking of them as the moments that the global economy pass through -, one variable that can be used for this purpose is the CBOE VIX Index as proxy for the volatility of global financial markets. If we analyze Figure 7 it is observed that after the GFC the index fell dramatically, while foreign participation in the sovereign debt of emerging countries started to grow. For advanced countries, this participation also increased, until 2015, when it started to fall. Therefore, this movement leads us to the conclusion that after the GFC, in a less volatile world, investors became less risk averse, which can be related with the increase of risk appetite to emerging countries, and less attracted by advanced ones.

Figure 7: VIX Index and Foreign Participation in Sovereign Debt (% GDP) for Advanced (AM) and Emerging Markets (EM)
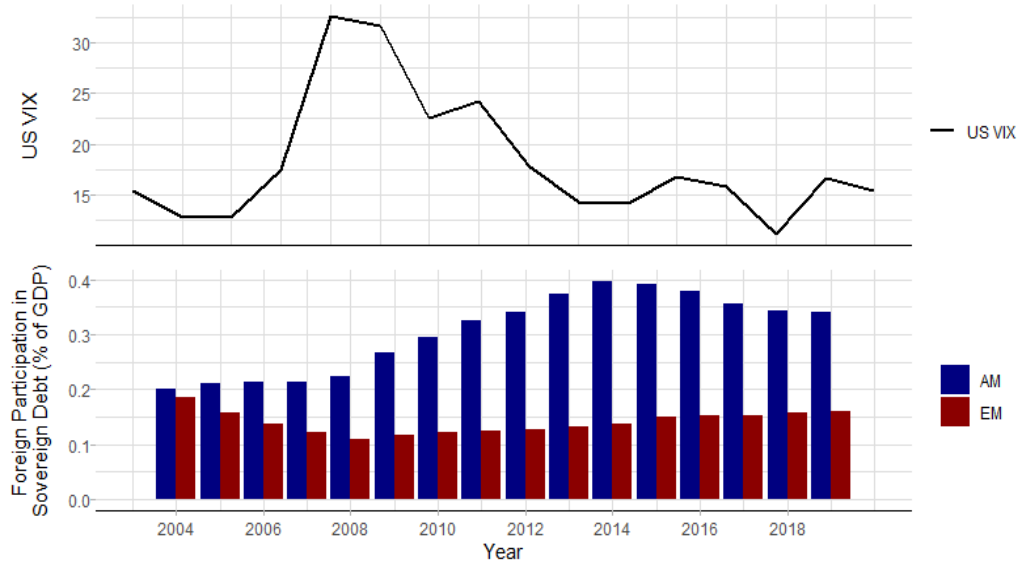
Therefore, after looking deeper at our data, there is indeed a notable relation between domestic fundamentals, the global environment and the sovereign bond attractiveness in our selected advanced and emerging economies. Moreover, foreign participation responds differently to our variables depending on the countries' development and time periods. Given that, in the next section we provide an empirical analysis in order to check if there are statistical evidences that these stylized facts and trends are in fact significant.

5   Empirical Analysis

5.1   Methodology

Once having understood both past works on the matter in Section 2 and taking the historical and empirical approach in Section 4 as motivation, it is possible to move forward and introduce the statistical scope of this research. The methodology consists of regressions with panel data, utilizing within and pooled models that are compared in order to obtain the most appropriate model. The advantages of using panel data are the possibility to follow the evolution of several countries over time, being able to capture the specific effects of each country and each period of time. In addition, the database was divided between

emerging and advanced countries, with the objective of carrying out econometric analysis for these two groups separately.

In the empirical analysis, the dependent variable analyzed is the foreign participation in a country's external debt, in terms of its GDP. Foreign participation in debt is the sum of the amount of debt issued by the country and which is in the hands of non-official foreign agents. Important to notice that we exclude foreign official sector once it represents securities held by other central banks and official loans. In our assessment, those investors could have different motivations in buying sovereign bonds rather than purely yield seeking or safe investment.

Also important to notice that countries with larger economies must issue more debt and, to control this effect, foreign participation in debt has been divided by GDP. Thus, the model dependent variable expresses how much of the debt issued by a country attracted foreign investors - i.e., the demand from foreign investors -, but corrected by the size of the economy.

With respect to regressors, the main objective here is to assess which factors are related with foreign participation, therefore explanatory variables are divided into two vectors: (i) domestic fundamentals - such as inflation, policy rate, debt to GDP ratio, current account and others; and (ii) external factors, e.g., exchange rate volatility and the CBOE VIX Index.

The specification of the main model follows the subsequent equations:

$$ForeignPar_{it} = \alpha_i + \gamma_t + \sum \beta_n \cdot Domestic_{i,(t-1;t-3)} + \sum \beta_k \cdot External_{it} + \varepsilon_{it} \qquad (1)$$

Where $ForeignPar_{it}$ is the foreign participation in a country's sovereign debt for each economy i and year t. $External_{it}$ are the contemporaneous values of our external global variables, α_i corresponds to possible country fixed effects and γ_t possible year fixed effects. Also, in an attempt to deal with possible endogeneity issues, we followed Presbitero et al. (2015). With respect to the vector of domestic fundamentals $Domestic_{i,(t-1;t-3)}$, we use the average of three subsequent lags in order to avoid endogeneity to the extent possible[9]. All variables are detailed in Table 2. In the case of external factors, we let them contemporaneous since we consider the VIX Index and the US nominal rate fast-moving, following the approach used in Alexandrino da Silva et al. (2021). Moreover, our identi-

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[9]However, we do acknowledge that our empirical strategy still keep endogeneity issues, which we will let to further research.

fication strategy will look at both fixed effects model and also a pooled OLS in order to check which of our explanatory variables can affect the foreign demand for the countries' sovereign bond. In the absence of a clear identification strategy, the results in these models do not imply causality, but rather a correlation.

5.2   Main results

The main results are summarized on Tables 3 and 4 below. We have divided regressions by the degree of developing in our database: Advanced and Emerging Markets. Each column represents a different identification strategy. Column 1 considers only country fixed effects, column 2 only time fixed effects, column 3 two-ways fixed effects and column 4 the pooled OLS model.

Outcomes are heterogeneous depending on countries' development when it comes to external factors. The first interesting result relies on external factors. Table 3 shows that, for advanced markets, an increase of 1 standard deviation of exchange rate, as a proxy for the FX volatility, is statistically significant and related with a decrease of 0.250 p.p. on the percentage of foreign participation in sovereign debt when we consider time fixed effects. The signal and magnitude are maintained when we look at pooled OLS identification. However, emerging markets goes in the opposite direction: Table 4 shows that when we consider both time fixed effects and pooled OLS models, 1 standard deviation increase in exchange rate is associated with a increase of 0.013 p.p. in foreign participation. This goes in direction with Figure 6, when there is a clear negative relation between the FX volatility and the foreign demand of bonds only for advanced markets, while emerging economies shows the inverse slope.

Another interesting result is the VIX coefficient, that represents the volatility in global financial markets. In the country fixed effects model, we have distinct signals on emerging and advanced markets: A higher VIX Index is related with a lower demand for bonds in the former, while it does not show statistical significance for the latter. This also confirms, at least partially, the rationale explored in Section 4, by Figure 7. It seems that, in turbulent times, when volatility is high, bondholders are more risk averse, preferring to withdraw funds from more unsecured economies, represented by the group of emerging countries.

We can also explore the results on the US nominal rate. For emerging markets, when we consider the country fixed effects model, Table 4 shows that an 1 p.p. increase in the US nominal interest rate is statically significant related with 0.388 p.p. decrease in the foreign participation in sovereign debt. One possible interpretation from it is that investors are

led by the 'search for yield' when deciding in which market to allocate its money.

Table 3: Advanced Markets Dynamic Panel Regressions (mean of t-3 lags)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
Debt-to-GDP $_{(t-3)}$	0.050	0.131***	0.082	0.134***
	(0.047)	(0.027)	(0.054)	(0.026)
ln(GDP per capita) $_{(t-3)}$	21.537***	−3.383	24.220***	−3.508
	(6.894)	(2.543)	(7.763)	(2.518)
Nominal Interest $_{(t-3)}$	0.654	−2.491***	−0.950*	−1.574**
	(0.508)	(0.894)	(0.522)	(0.788)
Inflation $_{(t-3)}$	0.854	3.938***	1.494	3.266***
	(0.932)	(1.281)	(1.103)	(1.122)
Current Account Balance $_{(t-3)}$	−0.356	−0.465**	−0.355	−0.467***
	(0.232)	(0.183)	(0.231)	(0.178)
FX Volatility $_{(t-3)}$	0.047	−0.250***	0.021	−0.246***
	(0.029)	(0.045)	(0.031)	(0.045)
US Nominal Rate	0.162			−0.416
	(0.539)			(0.666)
VIX US	0.047			0.240
	(0.123)			(0.158)
Constant				39.247
				(28.295)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	286	286	286	286
R^2	0.110	0.343	0.088	0.327
Adjusted R^2	0.009	0.298	−0.057	0.307

Notes: ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 4: Emerging Markets Dynamic Panel Regressions (mean of t-3 lags)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
Debt-to-GDP $_{(t-3)}$	0.227***	0.196***	0.190***	0.196***
	(0.021)	(0.019)	(0.021)	(0.019)
ln(GDP per capita) $_{(t-3)}$	2.711***	5.954***	−1.478	5.923***
	(0.902)	(0.587)	(1.341)	(0.579)
Nominal Interest $_{(t-3)}$	−0.085	−0.758***	−0.025	−0.745***
	(0.092)	(0.154)	(0.089)	(0.153)
Inflation $_{(t-3)}$	0.133	0.466***	0.085	0.454***
	(0.097)	(0.167)	(0.095)	(0.169)
Current Account Balance $_{(t-3)}$	−0.081	−0.201***	−0.114**	−0.202***
	(0.051)	(0.054)	(0.050)	(0.054)
FX Volatility $_{(t-3)}$	0.005	0.013***	0.004	0.013***
	(0.005)	(0.002)	(0.004)	(0.002)
US Nominal Rate	−0.388**			0.354
	(0.170)			(0.267)
VIX US	−0.134***			0.022
	(0.036)			(0.054)
Constant				−50.551***
				(5.976)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	266	266	266	266
R^2	0.520	0.470	0.366	0.500
Adjusted R^2	0.463	0.431	0.260	0.484

Notes:
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

With respect to domestic fundamentals, the two subgroups converge in effects. First of all, in the country fixed effects model, a rise in the income level is associated significantly with a larger share of foreign investors for both emerging and advanced economies - a result already expected that goes in line with the preexisting economic literature (Eichen-

green et al. (2002); Presbitero et al. (2015)). However, the magnitude of the effect is quite different: in advanced markets, an increase of 1 percent in the three year average *per capita* income is related with a rise in the foreign share of 0.21 p.p.; the same increase in *per capita* income in emerging economies is associated with only 0.02 p.p. higher foreign share.

Similar results are seen at policy rates. When considering the year fixed effects model, advanced economies with a 1 p.p. increase in three-year average interest rate are associated with a decrease of -2.49 p.p. in foreign investor's participation on sovereign debt. On the other hand, the same increase of policy rates in emerging economies are related with a decrease of 0.75 p.p. While it seems to be against the 'search for yield' argument described earlier, a higher policy interest rate in these economies could be associated with the monetary policy environment in each country. That is, knowing that interest rate can be a mechanism to deal with inflation shocks, it makes sense in some points of view to have this coefficient positive.

Now, with respect to Debt to GDP and current account balance coefficients, our results point to the same direction for both group of countries in terms of magnitude and significance. For advanced markets, a 1 p.p. higher debt to GDP ratio is associated with 0.13 p.p. increase in foreign investors' participation in sovereign debt, when we consider the time FE and the pooling OLS models. The results show higher magnitude and more significance for emerging markets: When looking at time FE identification, an 1 p.p. increase in indebtedness is related with a 0.196 p.p. higher foreign participation. The current account goes in the other direction: For both EM and AM groups of countries, a higher current account balance is associated with lower foreign participation. We interpret these results as supply-side variables: Both current account balance and debt to GDP ratio are associated with the financial needs to issue bonds, which can be one of the factors that have led to an increase in foreign participation.

Finally, we have the results on inflation. For both group of countries, we find positive and statistical significance for the inflation coefficient when we look at both time FE and pooling OLS identifications. As discussed in Section 2, we were expecting that a higher inflation could be related with a reduction in the foreign participation, representing the effect of bad fundamentals in the attractiveness of foreign investors. However, other interpretation could be that inflation represent a story of growth: Given that, in the covered period, these economies have shown a steep increase in terms of GDP, inflation could be the realization of it. Another explanation goes in direction to composition and denomination of debt: A higher share of foreign participation is associated with a higher share of

real bonds. Inflation can be associated to a higher supply of price-related bonds[10].

From a broader perspective, results shown in tables 3 and 4 point to two main facts: i) Domestic fundamentals, although in disproportional magnitudes, affect countries in the same direction, however their development level is - which seems to corroborate with some part of the literature reviewed in Section 2; and ii) While emerging economies are negatively affected by a deterioration in global conditions - in respect with foreign participation in sovereign debt - advanced ones seems to be insulated from the same issue.

Such conclusions, although intuitive they may sound, are passive to further inquiry. In this spirit, Section 6 proposes a robustness analysis by interacting global conditions with fundamentals for both advanced and emerging markets.

6   Robustness Analysis

Aiming to generate a more robust analysis of the results, it is necessary to think about other specifications for the econometric model. In this session, new specifications were tested for both advanced and emerging economies. All robustness regressions are controlled by the same domestic fundamentals used in Section 5.2.

Our results have shown that, for emerging economies, global market volatility is negatively correlated with the foreign participation in sovereign debt, while sounder macroeconomic fundamentals show a positive correlation with the attractiveness of external investors. In order to check whether stronger country-specific fundamentals are affect by global conditions, we add an interaction between the VIX US, the rule of law and GDP growth in our regression specifications.

Tables 5 and 6 shows results when we run the foreign participation with the rule of law percentile rank and the VIX Index. While we do not have statistical significant results for emerging markets, for advanced ones we have that better institutions are related with a sounder foreign participation in all identifications. However, when we run the interaction with the VIX, the coefficients go in the opposite way: Good institutions matter less for foreign attractiveness amidst global financial turmoil. This can be an indicator that solid macroeconomic fundamentals do not necessarily help advanced economies in terms of external participation of sovereign debt during turbulent times. However, the VIX coefficients show a positive and statistical relevance: Which can be an indication that, when

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[10]Sunder-Plassmann (2020) studies the relation between debt composition and denomination, and it stated that emerging economies usually allocate a higher share for foreign participation in real bonds.

global markets are more volatile, risk appetite is usually very low, which leads to a flight to safety in direction to advanced markets portfolio.

We do the same analysis with GDP growth, finding similar results: While for emerging markets our results do not show any statistical significance, advanced economies confirms the rationale that, in times of low risk-appetite, foreign investors prefer advanced markets portfolio: While a higher GDP growth itself is associated with higher foreign participation, when we interact with the VIX Index, it looses its contribution to bond attractiveness. These results are shown in Tables 7 and 8.

Table 5: Fundamentals under Volatility - Advanced Markets (t-1 lagged variables)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
Rule of Law $_{(t-1)}$	1.894***	0.553**	1.867***	0.544**
	(0.353)	(0.235)	(0.353)	(0.249)
Rule of Law $_{(t-1)} \cdot VIX_{US}$	-0.023***	-0.035***	-0.024***	-0.036***
	(0.007)	(0.011)	(0.007)	(0.012)
VIX US	2.188***			3.786***
	(0.713)			(1.133)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	315	315	315	315
R^2	0.242	0.454	0.229	0.426
Adjusted R^2	0.168	0.417	0.116	0.411

Notes: ***Significant at the 1 percent level.
                            **Significant at the 5 percent level.
                            *Significant at the 10 percent level.

Table 6: Fundamentals under Volatility - Emerging Markets (t-1 lagged variables)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
Rule of Law $_{(t-1)}$	0.130	0.059	0.117	0.061
	(0.353)	(0.235)	(0.353)	(0.249)
Rule of Law $_{(t-1)} \cdot VIX_{US}$	0.0004	0.001	0.001	0.0005
	(0.007)	(0.011)	(0.007)	(0.012)
VIX US	−0.189			−0.227
	(0.713)			(1.133)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	284	284	284	284
R^2	0.574	0.268	0.463	0.311
Adjusted R^2	0.529	0.213	0.378	0.291

Notes: ***Significant at the 1 percent level.
                                            **Significant at the 5 percent level.
                                            *Significant at the 10 percent level.

Table 7: Growth under Volatility - Advanced Markets (mean of t-3 lagged variables)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
GDP Growth $_{(t-3)}$	2.584**	1.850	4.037***	0.742
	(1.112)	(1.402)	(1.137)	(1.256)
GDP Growth $_{(t-3)} \cdot VIX_{US}$	−0.135**	−0.128	−0.221***	−0.064
	(0.054)	(0.079)	(0.056)	(0.067)
VIX US	0.350*			0.627**
	(0.182)			(0.245)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	264	264	264	264
R^2	0.128	0.303	0.124	0.301
Adjusted R^2	0.020	0.255	−0.024	0.279

Notes: ***Significant at the 1 percent level.
                                            **Significant at the 5 percent level.
                                            *Significant at the 10 percent level.

Table 8: Growth under Volatility - Emerging Markets (mean of t-3 lagged variables)

	Foreign Participation in Sovereign Debt (% GDP)			
	(1)	(2)	(3)	(4)
GDP Growth $_{(t-3)}$	−0.312	−1.271	−0.436	−1.498
	(1.112)	(1.402)	(1.137)	(1.256)
GDP Growth $_{(t-3)} \cdot VIX_{US}$	0.011	−0.0001	0.020	0.018
	(0.054)	(0.079)	(0.056)	(0.067)
VIX US	−0.245			−0.104
	(0.182)			(0.245)
Country FE	Yes	No	Yes	No
Year FE	No	Yes	Yes	No
N	250	250	250	250
R^2	0.553	0.379	0.395	0.401
Adjusted R^2	0.496	0.333	0.289	0.381

Notes:
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

7   Conclusion

This paper investigates which factors were relevant to the recent increase in the participation of foreign investors in sovereign debt. To this issue, we have built a complete database for both advanced and emerging markets and find that both group of economies respond to the external and domestic conditions, playing a role in the foreign attractiveness for these economies. However, results vary depending on the degree of development, and the channel through which explanatory variables affect our dependent variables.

While domestic fundamentals seems to be related with the increase of foreign participation in sovereign debt for both group of economies, it differs in terms of magnitude and interpretation. While some explanatory variables as the level of GDP per capita and nominal policy interest rate show statistical significant results for all economies, it seems to be more relevant to advanced markets than domestic markets. We interpret the former result from the demand perspective: Sounder macroeconomic fundamentals associated with higher foreign participation. For the latter, it could be related with the monetary policy environment in each country. Both GDP per capita and nominal interest rate are

associated here with the demand for these countries' bonds.

However, our results also have shown coefficients associated the supply side of our story. As an illustration, the results on debt to GDP and current account show that, while the former is related with higher foreign participation, the current account shows statistical and negative coefficients. Our interpretation is that both variables correspond to the financial needs to bond issuance: A higher indebtedness and a lower current account balance can be an alarm to the urge to issue, which can be a mechanism to increase the foreign participation of sovereign debt. Results on inflation were different to the expected, but it could also represent the supply of bonds when we look at debt denomination.

For external variables, results also depend on the degree of development. Our results show that the interpretation of the coefficients on FX volatility and the US nominal policy rate vary in both magnitudes and significance. For the case of exchange rate volatility, our results confirm the rationale described in Section 4 that, in advanced economies, there is a negative correlation between the FX volatility and the foreign demand of bonds, while emerging economies show the inverse slope. For the US nominal rate, results have shown that the 'search for yield' argument holds: The foreign participation in emerging economies are negatively correlated with an increase in the US policy rate.

Moreover, with the aim to analyze how the global environment affect our dependent variable, the VIX US Index results have shown that, in times of global turmoil, the foreign participation in sovereign debt is increased for advanced markets and decreased in emerging markets, which can be an indication that, in turbulent times, bondholders are more risk averse, directing their investments to safer economies. Also, in times of crises, domestic fundamentals as the rule of law percentile rank and GDP growth matter less for foreign attractiveness, reinforcing our argument of 'search of yield' in sovereign markets.

We acknowledge that we have a time frame restriction in our panel and further research would be necessarily to extend the analysis as more data becomes available. Also, one step would be to infer causality in our analysis rather than correlation.

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Appendix A   Stylized Facts

A.1   Inflation Intervals and Foreign Participation

Figure 8: Foreign Participation in Sovereign Debt (% GDP) in AM and EM and Inflation intervals
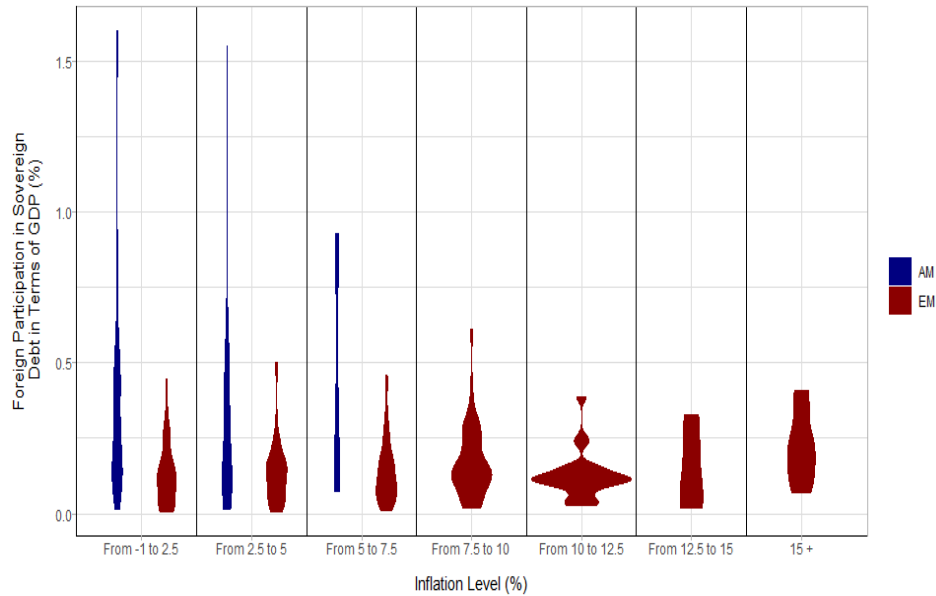
A.2   Mean GDP growth and Foreign Participation

Figure 9: Foreign Participation in Sovereign Debt (% GDP) in AM and EM and GDP growth

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