

The Determinants of Bond Market Development: Further Evidence from Emerging and Developed Countries

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Abstract

The objective of this paper is to empirically investigate the structural, financial, developmental, institutional, and macroeconomic determinants of bond market development for a sample of 22 emerging and developing countries over the period 1990-2013. We employ both the Prais-Winston and system GMM procedures to tackle the problems of endogeneity among the explanatory variables and our measure of bond market development, group-wise heteroscedasticity, and contemporaneous cross-sectional and serial correlations in the residuals. Our results suggest that a combination of structural, financial and institutional factors seem to exert a significant effect on bond markets. Indeed, economic size, trade openness, investment profile, GDP per Capita, bureaucratic quality, and size and concentration of banking system are positively related to bond market development, while interest rate volatility and fiscal balance are negatively associated with the development of bond markets. Those results are robust to the inclusion of developed countries' bond markets, international bonds issuers, and to possible structural breaks.

JEL Classifications: G0, G1, G23, G28, H6

Keywords: Bond Markets, Government Securities, Corporate Securities, Dynamic panel, GMM estimation

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1. Introduction

Soon after the Asian financial meltdown in 1997-1998, academics, policy makers, business people and practitioners alike, resumed an old debate on the issue of promoting the development of domestic bond markets in less developed and emerging economies. This became apparent in the middle of a wave of banks and corporates defaults in Asia at that time. So why having more developed and resourceful bond markets in emerging and developing countries? Developing emerging bond markets and in particular a corporate bond market can produce some important and tangible benefits for a number of reasons.

First, these economies are more prone to financial instability and when a crisis hits, they usually face up to a liquidity dry up and capital outflow, leading to a hefty bank run and stock market collapse (Grandes and Peter, 2013). When there was a massive capital flight from many emerging markets in the late 1990s, one hard lesson was that their financial systems had relied too heavily on bank lending and made little effort to spur other forms of finance like domestic bond securities. Quoting Alan Greenspan, Chairman of America's Federal Reserve, in 1999, "The lack of a spare tire is of no concern if you do not get a flat. East Asia had no spare tires" (The Economist, 2005). The existence of a local bond market, remarked Mr. Greenspan, could have mitigated the East Asian crisis and turned it less severe. In short, developing deep and liquid corporate bond markets, in particular, could decrease emerging economies' vulnerability to financial crises.

Second, from a broader and more inclusive perspective, it has been demonstrated that financial development is a driver of long-run economic growth, meaning a sustained increase in the growth rate of per capita GDP and total factor productivity in the long-run (Levine 2005; Levine and Zervos 1998). Through the mitigation of financial market failures such as asymmetric information, indivisibilities, transaction costs or the lack of enforcement of

financial contracts, more liquid and deeper financial markets, including bond markets, can spur long-run economic growth and increase domestic welfare in less developed and emerging economies. Although the link between financial development and growth is compelling, the reverse causality is no less true if one thinks that more inclusive and equitable growth may bring about increasing opportunities for individuals and firms to access financial markets hence improving the overall economic standards and performance.

Third, there is a long dating discussion around the link between debt and growth on the one side (Panizza and Presbistero, 2013), and debt and financial stability on the other. This issue has been in the spotlight for decades due to the recurrence of financial crises in emerging and less developed countries, namely currency and banking crises and or debt defaults (Mexico, 1982; Argentina, 2001; Turkey, 2000 and 2001). These crises prevented many countries to borrow long-term in their own currency at convenient interest rate spreads and therefore produced growth rates lower than the average peer country. Basically, increasing debt can be either good or bad for the economy, government and firms. The cost-benefit analysis of increasing government debt rests on the many trade-offs between fiscal deficits, potential crowd-out effects on private investment, foreign currency variability, and debt sustainability, that is the ability to pay off the debt service in the future given a real interest rate, a growth rate and the primary fiscal surplus (Panizza and Presbistero, 2013). For instance, a more developed and enlarging sovereign debt market may foster the development and supply of corporate bond securities in local currency thereby underpinning firms to finance long-term investments. In addition, local currency bond issues bring about benefits for corporate issuers as they don't need to hedge foreign currency risk and avoid foreign transfer risk (Grandes and Peter, 2013).

Fourth, more developed bond markets in emerging and less developed economies are also beneficial in terms of risk diversification. This is because bond returns are usually negatively correlated or non-correlated with stocks and other asset portfolios hence diminishing aggregate portfolio variances, i.e. portfolio risk, and also because investors are able to transfer intertemporal risk and to reduce liquidity risk. One possible gain of the diversification process is a potential increase in investment in technology-intensive

enterprises, namely riskier investment projects otherwise not funded by bank loans and perhaps to some extent through stock market finance or venture capital.

Fifth, more developed bond markets are typically associated with stronger macroeconomic fundamentals, more stable financial systems, sounder and stronger institutional frameworks, more open economies, and the long-lasting presence of institutional investors enhancing the demand for bond securities, especially those holding long maturities (Eichengreen et al., 2004). In particular, corporate and sovereign bonds are financial instruments high on demand by institutional investors provided their credit rating is at or above BBB- according to Standard and Poor's. Therefore, from the demand side, once a country enjoys the investment grade status⁴, given the non-linear inverse relationship between ratings and bond spreads, it is common that they attract a larger pool of investors to its bond supply, at a lower interest rate spread and hence decreased cost of capital.

A large body of literature has examined the determinants of bond market development of emerging economies (Eichengreen and Luengnaruemitchai, 2014; Eichengreen et al., 2008; Burger and Warnock, 2006; Adelegan and Radzewicz-Bak, 2009; Mu et al., 2013). The empirical execution, however, led to mixed results. For instance, while Eichengreen and Luengnaruemitchai (2014) document a negative effect of exchange rate volatility and fiscal balance on sovereign bond markets, Adelegan and Radzewicz-Bak (2009) found a positive and significant impact of those variables on government bond markets of Sub-Saharan countries. Moreover, while Eichengreen and Luengnaruemitchai (2014) report a positive and significant impact of the quality of institutions on corporate bond markets, Mu et al. (2013) found that lower risks perceived and better institutions might reduce the size of corporate bond markets.

Our paper extends this strand of literature by investigating the economic, financial, structural, institutional and developmental determinants of bond market development using a sample of 22 emerging countries and a sample of 20 developed countries over the period 1990-2013. We contribute to the existing literature on bond market development in many ways. First, our paper focuses on the most dynamic bond markets cutting across different 22 emerging and developing economies from all continents unlike the majority of previous studies which

⁴ Such as South Africa or Morocco in Africa or Colombia and Mexico in Latin America.

focused on a particular region: Asian and Developed countries in Eichengreen and Luengnaruemitchai (2004); Latin American countries in Eichengreen et al. (2008); China in Bae (2012), and African countries in Andrianaivo and Yartey (2010), Adelegan and Radzewicz-Bak (2009), and Mu et al. (2013).

Second, we check for the robustness of our results by including a sample of 20 developed economies' bond markets and confirm that the degree of development of the latter should basically be driven by macroeconomic fundamentals and economic size, and should not be statistically and economically affected by other developmental, institutional, financial and structural variables. One would expect that macroeconomic changes and significant structural events such as the recent debt crises in the European Union and the banking crises in the United States might affect the level of their bond market depth and liquidity. However, there is no question as to whether institutions, governance or banking sector development should influence the bond market, or do it marginally.

Third, unlike previous studies that focused on domestic bond issuances, we also include, in a robustness test, multinational and international organization bond securities (World Bank, European Bank for Reconstruction and Development, parastatal companies or international firms) issued on the domestic market.

Fourth, we tackle the problems of endogeneity between the bond market development variable and some of our explanatory variables; we deal with heteroscedasticity and cross-contemporaneous and serial correlation in residuals using the Prais-Winsten and System GMM procedures. Mu et al. (2013) is the only study to tackle the endogeneity of explanatory variables using the GMM procedure. However, given the small size of their sample countries and their focus on Africa, their GMM estimation suffers from structural downward bias of standard errors. In this paper, we refine Mu et al's GMM estimator by using the small-sample correction for the two-step standard errors developed by Windmeijer (2005). Further, given the small size of our sample, we use the forward orthogonal deviations transformation proposed by Arellano and Bover (1995) whereby, in the first-difference transformation, the average of all future observations of a variable is subtracted from the current observation, which minimizes data loss.

Finally, we provide insightful information for the business community and policy makers in terms of to what extent the different economic, structural, institutional, financial or macroeconomic constraints associated to our explanatory variable affect the emergence of a new source of financing for private businesses, i.e. long-term bond financing.

The rest of the paper is structured as follows: Section 2 presents an overview of bond markets in emerging countries. Section 3 reviews the relevant literature. Section 4 describes our data and variables, while Section 5 explains our model and methodology. Section 6 discusses the empirical results, while section 7 presents the results of our robustness checks. We conclude in Section 8.

2. Emerging Bond Markets

African and other emerging financial markets are underdeveloped by international standards, with a few exceptions such as Chile, Mexico, South Africa and Egypt (Adelegan and Radzewicz-Bak, 2009; Andrianaivo and Yartey, 2010; Grandes and Peter, 2013). Table 1 shows the development of African stock markets by 2013. It becomes clear that all African countries, but Egypt, South Africa and to a less extent Nigeria, lag behind the average level of development in Asian or Latin American emerging markets. This is because of their relatively low level of liquidity, capitalization and the low number of listed companies. Shallow and illiquid stock markets are the rule in Africa across the board, and this prevents companies to raise funding to expand physical investment and human capital, among other objectives.

<Insert Table 1 about here>

When it comes to bond markets the picture looks no better, either by emerging market or high-income country standards. First, the corporate bond market capitalization lies between one third and one fifth or less that of developed countries or Latin American and East Asian countries. Second, both sovereign and corporate bond market capitalization in Africa has stagnated or marginally increased in the case of sovereign bond markets since the early 1990s. This is in spite of the recent (2003 to date) surge in Eurodollar bond issuances by countries which had not issued any Eurobond in the past, including Ghana, Senegal, or

Cameroon. Table 2 shows that, as of 2010, African sovereign and corporate domestic bond markets were much less developed than in Latin American and Asia⁵, let alone in high income countries such as Australia, the United States or Japan. Indeed, with the very exception of South Africa, bond markets across the continent barely reach 15 to 18% of GDP with the public sector accounting for by 80 to 90 % of this market capitalization rate. By contrast, Asian bond market capitalization rates range between 50 and 110% with a less predominant share of sovereign bonds in the total stock of debt securities.

<Insert Table 2 about here>

3. Literature Review

In their seminal paper, Eichengreen and Luengnaruemitchai (2004) examined the determinants of bond market development of a sample of 41 developing and developed countries over the period 1990-2001, with a focus on Asia. They found that economic size, trade openness, English origin, distance from equator, investment profile, and capital account openness have a positive and significant effect on the development of sovereign bond markets. In contrast, concentration of banking sector, bureaucratic quality, interest rate spread, exchange rate volatility, and the fiscal balance have a negative impact on sovereign bond market development. For corporate bonds, their results showed that economic size, trade openness, distance from equator, corruption, accounting standards, domestic credit, and bureaucratic quality come out positive and significant, while English legal origin, the interest rate spread, and exchange rate volatility come out negative and significant. Eichengreen et al. (2008) extended the analysis of Eichengreen and Luengnaruemitchai (2004) by employing a panel data set on a sample of developing and developed countries, with a focus on Latin America. Their empirical results confirmed earlier findings obtained by Eichengreen and Luengnaruemitchai (2004).

In the same vein, Burger and Warnock (2006) studied the determinants of sovereign and corporate bond markets' development using a sample of 49 developed and developing

⁵ Indeed, except for South Africa, Nigeria and Egypt to a less extent, all other countries reported by Mu et al. (2013) hardly have any local company issuer on the domestic market. Most or all outstanding bond issues owe to multilateral organizations (World Bank, European Bank for Reconstruction and Development), parastatal companies or international firms.

countries. However, they run a cross-section regression using a small sample, which may question the robustness and representativeness of their results due to the evolution of bond markets in emerging economies since the mid nineties. They found that policies and legal regimes matter. Furthermore, better historical inflation performance, which reflects stable economies, boosts both corporate and sovereign bond markets. One of the main results they found is the complementarity between the banking system and bond markets. Burger and Warnock (2006) concluded that conditions needed for bond markets to develop are similar to those that would foster banking system development.

On their part, Claessens et al. (2007) studied the determinants of domestic government bond markets' development and their currency composition using a panel of emerging and developed countries. They found that one of the main factors of bond market development is the size of the economy. The degree of flexibility of the exchange rate regime is negatively associated with the size of foreign currency issuance. Furthermore, inflation performance, fiscal burden, and capital account openness matter positively for public bond market development. They also report a strong relationship between banking system development and bond markets' development, similar to Burger and Warnock (2006) and similar to Eichengreen and Luengnaruemitchai (2004).

Similar to Claessens et al. (2007), Bae (2012) tested the determinants of bond market development using a sample of 43 developing and developed countries over the period 1990–2009, with a focus on China. The author found that the level of economic development, measured by GDP per capita, is the most important determinant. Moreover, a stronger fiscal balance coupled with higher deficits foster government bond market development, while a well-developed government bond market, low interest rates, and large banking sector are important to corporate bond market development. However, the quality of the country's institutions does not come out significant.

Adelegan and Radzewicz-Bak (2009) investigated the determinants of local domestic public government and corporate debt market capitalization development for 23 Sub-Saharan African (SSA) countries from 1990 to 2008. They found that, for sovereign debt, exchange rate variability, investment profile, absence of capital controls, and the fiscal balance are all positive and significant, while bureaucratic quality and interest rate spread are negative and

significant. For the corporate debt, their results showed that domestic Bank credit, exchange rate variability, absence of capital controls, and the fiscal balance load positive and significant, while interest rate variability and GDP per capita come out negative and significant. Similarly, Mu et al. (2013) analyzed bond markets determinants of a sample of 36 SSA countries over the period 1980-2010. Using a GMM estimation to tackle endogeneity issues, they found that interest rate spread, English legal origin, and fiscal balance have a positive impact on government securities markets, while capital account liberalization and exchange rate volatility are negative and significant. Regarding corporate bonds, Mu et al. (2013) found that richer and more developed economies tend to have larger corporate bond markets. Counterintuitively, they found that lower risks perceived and better institutions might reduce the size of corporate bond markets.

A related literature deals with the determinants of the optimal capital structure in different samples of emerging and mature markets. These studies look into the question of why firms tend to finance increasingly their capital through debt than equity at the microeconomic and firm level (Fan et al., 2012; Cho et al., 2014; Belkhir et al., 2016) or how debt issuances affect the firm value (Davydov et al., 2014). Among the the determinants of the capital structure come out the institutional quality and financial sector regulation.

This paper contributes to the existing literature on bond market development in terms of the sample and country focus (emerging and developed countries), the inclusion of both local and international bond issuers into the analysis, and the econometric technique, which allows us to remedy for the endogeneity problems of the explanatory variables as well as the heteroscedasticity and cross-contemporaneous and serial correlation in the residuals.

4. Sample and Variables

4.1 The Sample

In this paper, we analyze empirically the macroeconomic, developmental, structural, legal and financial determinants of bond market development. We build an unbalanced panel comprising 22 emerging countries from different regions based on data availability. Countries included are: Argentina, Brazil, Chile, China, Colombia, Croatia, Hong Kong, Hungary, India, Indonesia, Malaysia, Mexico, Nigeria, Peru, Philippines, Poland, Russia,

Singapore, Slovenia, South Africa, Thailand and Turkey. The data covers the period from 1990 to 2013 using annual observations.

Our dataset builds on the World Bank's Global Financial Development and Financial Development and Structure databases⁶, the IMF Financial statistics⁷, the ICRG Report, data from La Porta et al. (1999) and Fernández et al. (2015).

4.2 Description of Variables

4.2.1. Bond Market Development

We measure the dependent variable, bond market development, by the total amount of domestic sovereign and corporate debt securities as a share of GDP. This measure covers Treasury bills, short-term notes, long-term bonds and notes, and commercial paper issued by local governments and corporations.

4.2.2 Determinants of Bond Market Development

Theoretically, the determinants of either government or corporate bond markets, as stated by Eichengreen et al (2004) and later papers, can be thought of as a number of variables that are directly related to how financial markets develop and spur economic growth in the long-term (Levine and Zervos, 1998; Levine, 2005). This is because an improvement in those variables help financial markets reduce the costs of acquiring information (fixed costs, technologies), enforce contracts while mitigating information asymmetries and diminish transaction costs. For instance, a sounder regulatory framework and better institutions reduce information and transaction costs in bond markets. Or, a larger economy offers economies of scale to bond issuers thereby expanding the bond market.

Economic Size

Among structural variables, the one that reflects the most the importance of a country's features is its size of the economy. Indeed, a larger economy might need financing besides the banking system and bonds might meet this extra financing demand. Small economies do not have conditions for firms to issue bonds because of high fixed costs of issuances. The positive association could be explained as a consequence of economies of scale, i.e., larger

⁶ <http://data.worldbank.org/data-catalog/global-financial-development>

⁷ <http://elibrary-data.imf.org/finddatareports.aspx?d=33061&e=169393>

economies would decrease the average lending cost and risks associated with it and hence promote a broader access of firms and governments to bond financing. Therefore, as investors would be, all else equal, hardly attracted to smaller and therefore riskier economies, these economies might not be included in global portfolio indexes and, then, constraint the information available to global investors (Eichengreen and Luengnaruemitchai, 2004). We measure size of the economy using GDP expressed in purchasing-power-parity (PPP) at billions of 2011 international dollars.

Trade Openness

The impact of openness on bond market development is not as straightforward as is the size of the economy. A higher degree of openness may foster firms to expand their production in order to compete in foreign markets. Thus, they may need financing to enlarge their production capacity or their consumption of inputs or capital goods. However, a more open economy often implies a more open capital and financial accounts and this might produce a crowding out phenomena between ways foreign and domestic financing, which could be especially important when studying the currency composition of bonds. That is, as the economy becomes more open, international capital inflows in hard currencies in the form of bond financing could crowd out domestic bond financing. We measure Openness using the ratio of exports to GDP.

English Legal Origin

La Porta et al. (1998) argue that English common law legal system offers higher protection for private investor rights than the French civil law legal system, which should foster the development of bond markets. Hence, a positive relationship is expected between English legal origin and bond market development.

Distance from Equator

It is argued that countries with unfavorable geographical or disease endowments tend to have less developed financial markets (Beck et al., 2003). The reason is that these environmental factors are presumably shaping the long-standing market institutions necessary for financial development. We use the distance from Equator to capture geographical endowment.

GDP per Capita

The level of economic development, proxied by per capita GDP, is a determinant of bond markets development as more developed economies require larger financing for larger fixed capital, education, technology and inter-generational investments. Furthermore, less developed countries are often characterized by poor transparency, weak creditor rights, inadequate corporate governance, and risky investment environments (Eichengreen et al., 2004).

Quality of Institutions

The empirical literature has now reached a consensus that well-developed institutions matter for financial and economic development as they facilitate investment in physical and human capital, shape the structure of economic incentives in the society, and contribute to the efficient allocation of resources in the economy (Knack and Keefer, 1995; Mauro, 1995; Hall and Jones, 1999; Acemoglu et al., 2001; Easterly and Levine, 2003). We posit that developed institutions of governance should spur the development of bond markets. We measure the quality of institutions with four indexes taken from the International Country Risk Guide (ICRG), namely:

- *Investment Profile (IP)*: is an assessment of factors influencing the risk to investment. It is estimated by a risk rating using the sum of three subcomponents: contract viability/expropriation, profits repatriation, and payment delays.
- *Law and Order (LO)*: is an assessment of the popular observance of the law and the strength and the impartiality of the legal system.
- *Control of Corruption (CC)*: is an assessment of corruption within the political system.
- *Bureaucratic Quality (BQ)*: is an assessment of institutional strength and bureaucracy. Higher scores are given to countries where the bureaucracy tends to be autonomous from political pressures and has the power and expertise to govern without brutal changes in policy or interruptions in governmental services.

A higher score in investment profile and law and order would imply lower investment risk, which will spur bond market capitalization. A lower score in corruption would mean a distorted economic and financial development with reduced efficiency of both government and corporate sector. On the other hand, bureaucratic quality would be positively related to bond markets given that it reflects how elastic a country's political and business environment is to changes in government. Thus, long-term decisions would be possible if there are no deep changes just by the arrival of a new government and this would foster bond markets.

Size of banking system

The impact of a country's banking system on the development of bond markets is ambiguous. On one hand, banks and bonds are competing sources of external finance. Thus, a more sophisticated banking system may succeed in depriving bonds from market share. This is the so-called "crowding out" effect. On the other hand, the presence of well-developed banking system is required for the development of a liquid and deep bond market, since banks serve as dealers and market makers therein. Hence, bond and bank financing could be complements rather than substitutes. To measure the size of the banking system, we use the credit to private sector by commercial banks as a share of GDP.

Banking concentration

Previous literature stated that when banking sector is concentrated, these powerful banks may set lending interest rates at the levels they prefer in order to dissuade firms or any other organization from issuing debt securities (Bentson, 1994; Schinasi and Smith, 1998; Smith, 1998; and Rajan and Zingales, 2003). Following the World Bank, we measure banking concentration with the ratio of the assets of the three largest banks to the total assets held by commercial banks. Thus, a higher percentage would imply a more concentrated banking system and, thus, a smaller debt securities market.

Capital controls

The absence of capital controls may foster bond market development since openness to foreign portfolio investments would ease the access to domestic debt to foreign investors and promote the quality of governance of local firms (Adelegan and Radzewick-Bak, 2009). We measure capital controls with an index constructed by Fernandez et al. (2015). The information on capital controls is disaggregated both by controls over inflows or outflows,

and by nine different categories of assets⁸. The overall index is the average between inflow and outflow controls. Zero means “No control” and one means “Total control”.

Interest rates volatility

Volatile interest rates would discourage investors from investing in long-term bonds since there is a risk that the purchasing power of long-term debt securities would be eroded in the presence of volatile interest rates (Bhattacharyay, 2013). We therefore expect a negative relationship between the variability of interest rates and bond market development. We measure interest rate volatility with the logarithm of the standard deviation of interest rates, following Mu et al (2013). Higher values would be reflecting more volatile interest rates, while low values would be reflecting stable interest rates over time.

Interest rates spread

When interest rates are high, governments and corporations would be less willing to borrow through bond issuance, which will have a depressing effect on the development of bond markets. We measure the level of interest rates by the interest rate spread (lending rates minus borrowing rates).

Exchange rate volatility

Stable exchange rates may encourage the development of bond markets since pegged or relatively fixed exchange rates pose low risk to foreign investors. However, Goldestein (1998) argue that stable exchange rates may lead foreign investors to underestimate the risk of lending to corporations and banks and, hence, the resulting foreign competition may hinder the development of domestic intermediation. We measure exchange rate volatility by the standard deviation of the difference in the logarithm of the nominal foreign exchange rate.

Fiscal balance

Fiscal balance is the difference between fiscal revenues and expenditures. Larger fiscal deficits are associated with larger government bond markets, because as public expenditures exceed public revenues, there is a need to finance this gap: Sovereign Bonds are, usually, the

⁸These include portfolio equity flows, portfolio bonds flows, money markets, collective investments, derivatives restrictions, financial credits, commercial credits, direct investments, and real estate.

way in non-inflationary and low-inflation economies. Thus, countries with worse fiscal performance tend to have larger Sovereign Bond markets. We measure fiscal balance with the cyclically-adjusted structural balance. These cyclical adjustments wipe out the effect of temporary financial sector and asset price movements as well as one-off, or temporary revenues or expenditures items.

Table 3 summarizes our variables, their measures, their expected signs, and their sources.

<Insert Table 3 about here>

5. Model and Methodology

In this section, we describe our model and the estimation method we use to investigate the determinants of bond market development in a panel setting. Our panel model of bond market development can be written as follows:

$$\begin{aligned}
 Y_{i,t} = & \beta_0 + \beta_1 GDP_{i,t} + \beta_2 O_{i,t} + \beta_3 UK + \beta_4 ASIA + \beta_5 EQUATOR_i + \beta_6 I_{P_{i,t}} + \\
 & \beta_7 L\&O_{i,t} + \beta_8 GDP_{PC_{i,t}} + \beta_9 C_{i,t} + \beta_{10} BQ_{i,t} + \beta_{11} BD_{GDP_{i,t}} + \beta_{12} BC_{i,t} + \\
 & \beta_{13} SP_{i,t} + \beta_{14} INTVOL_{i,t} + \beta_{15} FXVOL_{i,t} + \beta_{16} CCI_{i,t} + \beta_{17} FB_{i,t} + \mu_i + \varepsilon_{i,t}
 \end{aligned}
 \tag{1}$$

Where i is the country ($i=1, \dots, N$); t stands for the time period ($t=1, \dots, T$); $Y_{i,t}$: outstanding domestic total (corporate and sovereign) debt securities to GDP; $GDP_{i,t}$: GDP-PPP adjusted; $O_{i,t}$: Openness (exports as a proportion of GDP); UK : is a dummy variable indicating whether the country's legal system is that of the UK; $ASIA$: is a dummy variable for those Asian markets in the sample; $EQUATOR_i$: distance from country i to Equator; $I_{P_{i,t}}$: investment profile; $L\&O_{i,t}$: Law and order index; $GDP_{PC_{i,t}}$: GDP per capita based on purchasing power parity; BQ_i : Bureaucratic quality; $C_{i,t}$: Corruption index; $BD_{GDP_{i,t}}$: Bank credit to GDP; $B_{C_{i,t}}$: Bank concentration; $SP_{i,t}$: Interest rate spread; $INTVOL_{i,t}$: Deposit interest rate volatility; $FXVOL_{i,t}$: exchange rate volatility; $CCI_{i,t}$: Capital control index (between 0 and 1); $FB_{i,t}$: Fiscal balance; μ_i : an unobserved country-specific effect and $\varepsilon_{i,t}$: an error term.

We tested for the presence of serial correlation in the series of residuals, $\varepsilon_{i,t}$, using the Wooldridge (2002) test. The null hypothesis posits that the residuals are not temporally correlated (i.e. the model does not suffer from serial correlation⁹). In our case, evidence shows that there are serial correlation problems in the model, so we reject the null hypothesis. Furthermore, to test for the presence of heteroscedasticity in the residuals, we applied the modified Wald's test¹⁰. Estimation results indicate that fixed effects estimation errors do not present constant variances across countries. Finally, in order to test for the presence of contemporaneous correlation, we applied the Friedman's test of cross sectional independence. The results confirm the presence of contemporaneous correlation across panels in the error series. To tackle the above-mentioned econometric problems, we estimate our model (1) using the Prais-Winston estimation procedure, which produces panel corrected standard error (PCSE) estimates for linear panel data models. When computing the standard errors and the variance-covariance estimates, the disturbances are assumed to be heteroskedastic and contemporaneously correlated across panels.

6. Empirical Results

Tables 4 and 5 display the descriptive statistics and the correlations among all our explanatory variables.

<Insert Tables 4 and 5 about here>

In Table 4, we can observe there is a high dispersion in all variables, which is expected given the nature and composition of our sample. Table 5 displays the pairwise correlation among all explanatory variables. It supports the case for estimating the model using a multivariate regression analysis *a la* in Eichengreen and Luengnaruemitchai (2004), i.e. a group-wise regression model where each group is composed of a set of variables related to an explanatory

⁹ Wooldridge's (2002) method consists on estimating the first differences version of the model to check if residuals are serially correlated. So, if μ_i are not serially correlated, then $\text{Corr}(\Delta\mu_{i,t}, \Delta\mu_{i,t-1}) = -0.5$ and we can conclude that the errors of the model are uncorrelated (Drukker, 2003).

¹⁰ Besides the modified Wald test, there exist alternative tests that could be used to test for the presence of heteroscedasticity in panel data estimations (such as the Breusch-Pagan test). However, most of them -except the modified Wald test- are sensitive to the error normal distribution assumption (Green, 2000). All tests' results, i.e. Wald, Wooldridge and Friedman's tests, are available to the reader upon request.

feature, e.g. macroeconomic or developmental, as set out in Equation (1). This is intended to deal with the sample problem of relatively high collinearity which can alter the variables' individual and global significance artificially. For instance, the macroeconomic variable GDP PPP is highly and significantly correlated with most other variables as is GDP per capita or the measures of financial sector (Banking credit to GDP and Banking concentration) with nearly 80 to 90% of all explanatory variables. In any case, we also report the full regression results.

Table 6 shows the results of the regression equations estimated using the Prais-Winston procedure for our sample of 22 emerging countries over the period 1990-2013.

Column 1 of Table 6 focuses on the structural determinants of bond market development. We note that economic size has a positive and significant effect on total bond market development at a significance level of 1%, suggesting that a larger economy is generally associated with larger bond markets. This is in line with the findings of most studies on the determinants of bond markets (Levine, 1997; Eichengreen and Luengnaruemitchai, 2004; Mu et al., 2013). Openness is also positively and significantly related to total bond market development suggesting that bond markets develop faster in more open economies (Eichengreen et al., 2008). The other structural variables in the panel regression, that is English legal origin, the Asia dummy, and distance from equator are not statistically significant.

Column 2 of Table 6 presents the results of the impact of the developmental stage of the economy on total bond market capitalization. This is proxied by the investment profile as a measure of the safety of the investment environment, law and order as a measure of the country's rule of law, and by GDP per capita as a summary measure of development. The investment profile came out significant and positively associated with total bond market development at the 5% level of significance, suggesting that more sophisticated and diversified investors tend to invest in more liquid and stable bond markets, hence more developed markets. Law and order was negatively but statistically insignificantly correlated with total bond markets. In what refers to the developmental stage of the economy –measured by GDP per capita variable-, we obtained a positive and statistically significant effect at the 1% level. This finding is consistent with Eichengreen and Luengnaruemitchai (2004) and

implies that more developed economies tend to be associated with more developed bond securities markets.

Column 3 of Table 6 displays the results of the effects of regulation and governance of the financial sector on the development of total bond markets. We notice that corruption (the index of corruption ranges from 0 to 6, where a higher score means a lower degree of corruption.) presented a negative but insignificant impact on total bond market development. On the other hand, the coefficient of bureaucratic quality is positive and significant at the 1% level, indicating that stronger and enhanced public civil service and institutions drive more developed bond markets. There is also a positive and significant relationship between the size of banking system, measured by Bank credit to GDP, and total bond market development. In other words, the presence of well-developed banking system is required for the development of a liquid and deep bond market, since banks serve as dealers and market makers therein (Eichengreen and Luengnaruemitchai, 2004). Hence, bond and bank financing seem to be complements rather than substitutes. Surprisingly and contrary to expectations, we found a positive and significant impact of banking concentration on total bond market development. It may be that banks with market power are able to spur bond market development through the promotion of liquidity, lower transaction costs and scale economies at the issuance time especially where bond markets are less developed domestically.

Column 4 of Table 6 considers macroeconomic factors. The results show that the interest rate spread borne the wrong positive sign, but not significant at conventional levels. We would have expected that changes in interest rate spreads were interpreted as changing macroeconomic conditions, thus they should act as a depressing factor for financial development. However, the interest rate volatility coefficient was negative and very significant at the 1% level, indicating that a heightened interest rate volatility discourages investors to buy into domestic bonds, possibly because of a thin market and lack of available hedges to insure against interest rate risk. For its part, the foreign exchange rate volatility is positively and significantly related to total bond market development. This finding is consistent with the argument of Goldstein (1998) that stable exchange rates may lead foreign investors to underestimate the risk of lending to corporations and banks and, hence, the

resulting foreign competition may hinder the development of domestic intermediation. The index of capital controls was not significant in explaining the development of the total bond market development. Lastly, fiscal balance was negatively and mildly significantly correlated to bond market development.

Finally, column 5 considers the entire range of hypotheses. These results must be interpreted with caution due to the high and significant collinearity among nearly all variables, as shown in Table 5 and explained in our econometric methodology. As expected, economic size, openness, investment profile, and exchange rate volatility remain positively and significantly related to total bond market development. However, bureaucratic quality, size of banking system, and interest rate volatility are no longer significant at conventional levels, most probably due to high collinearity among these and the developmental and governance variables. The coefficient of English legal origin is now positive and significant at the 1% level as expected. The Asian dummy is unexpectedly negatively and significantly related to bond markets. Surprisingly, GDP per Capita loads negative and significant at the 1% level. The latter two results may be driven by the high linear correlation between GDP per capita and the Asian countries bond market development on the one hand, and between GDP per capita and the other developmental, governance and macroeconomic variables. It comes as no surprise because the Asian countries sampled hold the most developed domestic bond markets and their GDP per capita ranks among the highest. Furthermore, the index of capital controls is now positively and statistically significant in explaining the development of the total bond market development, at the 1% significance level. The obtained sign suggests that, in our sample, capital controls do not necessarily discourage foreign participation in domestic bond markets given the shallowness of the latter. Finally, fiscal balance is now negatively and statistically significant at the 1% level suggesting that stronger fiscal balances are negatively associated with bond markets development. Usually, larger fiscal deficits help domestic bond markets develop because governments issue Treasury bills and notes to finance those deficits hence expanding liquidity and completing the yield curve of the country's bond market on the short end.

<Insert Table 6 about here>

7. Robustness checks

To check that our results are robust, we conducted a battery of robustness tests that allow us to tackle issues related to outliers, alternative measures of bond market development, inclusion of developed countries and international bond issuers, potential structural break, and endogeneity of explanatory variables.

7.1. Outliers

The presence of outliers could affect our results on the determinants of bond market development. To tackle this issue, we eliminate observations that are beyond three standard deviations. The unreported results are quantitatively and qualitatively similar to those presented in Table 6 and are available to the reader upon request.

7.2. Alternative measures of bond market development

In order to test the robustness of our results, we constructed two additional measures of bond market development: (1) Sovereign bond market development (sovereign) is measured as the value of government bonds domestically issued as a share of GDP; and (2) Corporate bond market development (corporate) is measured by the value of corporate bonds outstanding as a share of GDP.

Table 7 presents the results of the determinants of sovereign bond market development. Consistent with earlier findings, openness, GDP per Capita, bureaucratic quality, size of banking system, banking concentration, and exchange rate volatility are positive and significant, while interest rate volatility and fiscal balance are negatively and significantly associated with sovereign bond market development. We notice, however, that economic size and investment profile are no longer significantly related to the development of government bond markets in the multivariate analysis yet both are positively associated to the dependent variable at the 1% significance level, a result in line with the regression output of the total domestic bond market regression. However, it must be read with caution due to the high collinearity among the variables included in the full specification (Column 5).

<Insert Table 7 about here>

Table 8 shows the results when corporate bond market development is used as a dependent variable. As expected, economic size, openness, GDP per Capita, bureaucratic quality, size of banking system, and exchange rate volatility are all positive and significant, while interest rate volatility is negatively and significantly related to corporate market development. Nonetheless, fiscal balance is now negative but no longer statistically significant at the 5% level. In other words, while governments running fiscal deficits have expectedly more sovereign bond issuance, fiscal deficits do not appear to spur corporate bond issuance. It is worth noting that whereas countries' institutional characteristics, such as investment profile and bureaucratic quality, matter for total bond market development, they obviously matter much less for corporate bond market development. We also notice, upon disaggregating between sovereign and corporate bond market development, that the positive and significant relationship between exchange rate volatility and bond market development disappears in the multivariate analysis. However, this result doesn't hold when we run the full regression as the former variable turns out significant at the 1% level and bears a positive sign. Once again, this result may be accounted for by the high collinearity so we keep our conclusion that foreign exchange rate volatility doesn't affect domestic corporate bond markets. Intuitively, this should be true because corporate bond markets, with the exception of Asia, are barely developed and therefore corporate bonds' exposures are if any affected by foreign exchange volatility or because bond securities are issued in foreign currency.

<Insert Table 8 about here>

7.3. Domestic and International bond issuers

Thus far, we dropped multinational and international organization bond securities (World Bank, European Bank for Reconstruction and Development, parastatal companies or international firms) issued on the domestic market and focused on local bond issuers. However, it could be argued that having such international issuers on the domestic bond markets may be a signal of market development¹¹. Therefore, to test for the robustness of our results, we include both local and international bond issuers into our analysis. The results that

¹¹ We are thankful to an anonymous referee for suggesting this effect.

appear in Table 9 are generally consistent with our original findings. We note that there is a positive and significant relationship between English legal origin and bond market development, as expected. This finding is consistent with La Porta et al. (1998) that argue that English common law legal system offers higher protection for private investor rights than the French civil law legal system, which should foster the development of bond markets.

<Insert Table 9 about here>

7.4. Bond market development: a comparison between developed and emerging countries

In the aftermath of the recent global financial crisis of 2008, concerns have emerged that donors' funds may turn out to be scarcer. Moreover, since banks are highly leveraged institutions, economies that depend heavily on bank financing are considered much more vulnerable to a financial crisis. Therefore, having a sufficiently liquid and deep bond market is becoming increasingly important not only for emerging countries but also for developed countries.

In this sub-section, we test for the determinants of bond market development using a sample of 42 emerging and developed countries¹² over the period 1990-2013. The results are displayed in Table 10. We notice that, consistent with our earlier findings, economic size, GDP per Capita, bureaucratic quality, and banking sector size are all positively and significantly correlated with bond market development. In contrast, interest rate volatility and fiscal balance are negatively and significantly related to bond market development, as expected. However, openness and investment profile are no longer significantly related to the development of bond markets. Additionally, the coefficient of exchange rate volatility is negative and significant at the 1% level, indicating that more stable exchange rates may encourage the development of bond markets since they pose low risk to foreign investors. We also notice that the coefficient of capital controls is expectedly negative and significant at the 1% level, suggesting that the absence of capital controls may spur bond market

¹² The new sample comprises our original sample of 22 emerging countries plus a sample of 20 developed countries. The developed countries included are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

development since openness to foreign portfolio investments would ease the access to domestic debt to foreign investors and ameliorate the quality of governance of domestic firms (Adelegan and Radzewick-Bak, 2009).

<Insert Table 10 about here>

We also test for the determinants of bond market development for the sample of 20 developed countries over the same period. We dropped the Asian dummy and distance from equator as these variables are not pertinent to developed countries. The results are displayed in Table 11. We notice that none of the developmental and institutional variables is significantly related to bond market development (Specifications (2) and (3)). Moreover, the coefficient of openness is negative but insignificant at conventional levels. These findings could be explained by the fact that developed countries are characterized by a high level of openness to international trade, sounder and stronger institutional frameworks, and the long-lasting presence of institutional investors. Hence, these variables should not affect bond market development of advanced economies.

As expected, economic size is positive and significant at the 1% level, suggesting that bond markets develop faster in larger economies. Finally, interest rate volatility and fiscal balance are negative and significant at the 1% level, as expected.

<Insert Table 10 about here>

All in all, it seems that a combination of structural, development, institutional, and macroeconomic factors seem to exert a significant effect on bond markets for the sample of emerging and developed countries. However, when considering the sample of developed countries, what matters for the development of bond markets are macroeconomic fundamentals and the size of the economy.

7.5. Endogeneity

Most of relevant empirical literature assumed that our explanatory variables in Equation (1) are strictly exogenous to bond market development. However, this assumption may not be valid, which complicates the task of identifying the determinants of bond market

development. For instance, the size of the economy may spur the development of bond markets. However, the growth of bond markets may increase the size of the economy. Moreover, fiscal balance might be endogenous to bond markets since the interest on bonds may drive the fiscal balance, especially if the amount of bonds is significant (Mu et al., 2013). Similarly, developed domestic bond markets can drive down interest rate spreads and thereby the cost of capital and increase long-run economic growth (Grandes and Pinaud, 2005; Levine, 2005). Hence, we expect that interest rate volatility and spreads to be endogenous to bond market development. Similar reverse causality problems apply to openness, GDP per Capita, and Bank credit to GDP. Therefore, we control in turn for the endogeneity of: economic size and openness in specification (1), GDP per Capita in specification (2), Bank credit to GDP in model (3), and interest rate volatility, spreads and fiscal balance in specification (4).

Mu et al. (2013) is only study to tackle the endogeneity of explanatory variables. However, their GMM estimation suffers from structural downward bias of standard errors. In this paper, we refine Mu et al's GMM estimator by using the small-sample correction for the two-step standard errors developed by Windmeijer (2005). In a Monte Carlo study, Windmeijer (2005) shows that the corrected variance closely approximates the finite sample variance of the two-step GMM estimator, leading to lower bias and smaller standard errors, hence more accurate statistical inference. Furthermore, given the small size of our sample, we use the forward orthogonal deviations transformation proposed by Arellano and Bover (1995) whereby, in the first-difference transformation, the average of all future observations of a variable is subtracted from the current observation, which minimizes data loss.

Note that the validity of system GMM estimator rests on the test of Hansen (1982) for the overall validity of the instruments used and on the test of Arellano and Bond (1991) for the presence of second order autocorrelation in the differenced residuals. Table 9 shows that, for all specifications, the test of Hansen (1982) cannot reject, at the 1% level, the null hypothesis of the validity of our instruments. Moreover, the Arellano and Bond's (1991) test cannot reject, at the 1% level, the null hypothesis of absence of second order autocorrelation in the differenced residuals.

The results that appear in Table 12 show that, consistent with earlier evidence, size of economy, openness, investment profile and GDP per capita are positively and significantly

related to bond market development. Furthermore, interest rate volatility is negatively and significantly related to bond market development at the 5% significance level. In addition, exchange rate volatility is no longer significantly associated with bond market capitalization. Surprisingly, interest rate spread is positive and significant at 5%, suggesting that higher interest rates spreads are associated with larger bond markets. Finally, after controlling for the endogeneity of the explanatory variables, fiscal balance is no longer a major determinant of bond market development. In a nutshell, our results remain robust to these tests.

<Insert Table 12 about here>

7.6. Structural Break

In order to test whether the importance of the determinants of bond market development has changed over time, the sample period has been divided into 2 sub periods: 1990-2001 and 2002-2013. Table 13 shows the results for the sub period 1990-2001, while Table 14 displays the results for the sub period 2002-2013. We notice that overall the results are qualitatively and quantitatively similar to those obtained with the full sample period. We safely conclude that there is no structural break in the sample period.

<Insert Table 13 and 14 about here>

8. Conclusion

The aim of this paper was to identify and analyze the main empirical determinants of bond market development in 22 emerging economies. We built an unbalanced panel database including the dependent variables and a well-established set of covariates in the relevant literature as well as a set of alternative control variables for 22 developing countries from Latin America, Africa, Eastern Europe, and Asia over the period 1990-2013 period.

Using the Prais-Winstone estimation technique, which adjusts for panel heteroscedasticity, serial and contemporaneous correlation, the evidence shows that a combination of structural, financial, institutional, and macroeconomic factors seem to exert a significant effect on bond markets. Indeed, larger economic size, more open economies, better investment profile, higher bureaucratic quality, larger and more concentrated banking sector, and higher foreign exchange volatility are associated with larger bond markets. Furthermore, higher interest rate

volatility and better fiscal balance are negatively associated with bond market development. Overall, these results were robust to regressing the measures of sovereign and corporate bond market development against the same set of determinants. After controlling for the endogeneity of explanatory variables, interest rate volatility is still negatively and significantly related to bond market development, while exchange rate volatility and fiscal balance are no longer significantly associated with bond market capitalization. For the sample of developed countries, the evidence shows that the degree of development of bond markets is driven mainly by macroeconomic fundamentals and economic size, and not statistically and economically affected by other developmental, institutional, financial and structural variables.

Our findings suggest a set of important policy implications for countries seeking to promote the development of their bond markets. They should strive to develop their economies and follow stable macroeconomic policies in order to reduce interest rate and exchange rate volatilities, and, hence, attract investors to hold debt securities. Moreover, they should promote the quality of their institutions of governance by reducing the risk of investment and ameliorating the quality of bureaucracy. Finally, they should develop their banking system since this is required for the development of a liquid and deep bond market.

Going forward, we think an agenda for future research should take into account at least the following two issues:

- 1) The tradeoff between developing domestic bond markets against expanding international bond market issues by sovereign and corporate entities as countries grow, and need increasing finance for development, which can be cheaper overseas provided there are more complete markets and hedges available. This process of internationalization was typical of countries moving up the credit risk ladder in the late 1990s or 2000s either in Latin America or Asia as they were awarded the investment grade and subsequently were able to borrow at lower interest rates, longer terms, in foreign currency.
- 2) As most corporate domestic bond markets in emerging and less developed economies remain incipient if at all, bond market development will still be driven by the public sector unless there are financial reforms and regulatory changes that favor the

emergence of a liquid and investible corporate bond market. This fact also poses the problem of “crowding-out” whenever the supply of loanable funds on the bond markets are scarce for the less developed and riskier countries.

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Table 1**Africa: Indicators of Stock Market Development 2013¹³**

AFRICA : INDICATORS OF STOCK MARKET DEVELOPMENT 2013					
COUNTRIES	NUMBER OF LISTED COMPANIES	STOCK MARKET CAP/GDP	VALUE TRADED/GDP	TURNOVER/VOLUME OF SHARES	
BOTSWANA	35	34%	2%		710.500.000
BRVM*	37	15%	0,4%		60.754.359
EGYPT	237	23%	5%		4.748.900
GHANA	38	55%	0,4%		313.024.312
KENYA	61	40%	3,3%		7.665.919.336
MORROCCO	75	53%	3%		125.700
MAURTIUS	88	75%	4%		2.110.898.169
NAMBIA	34	1023%	4%		112.666.861
NIGERIA	190	15%	1%		106.539.868.178
SOUTH AFRICA	376	314%	118%		38.964.070
TANZANIA	22	11%	0,5%		243.537.149
TUNISIA	71	18%	2%		238.674.931
UGANDA	16	38%	0,5%		2.353.987.917
ZAMBIA	23	39%	0,1%		275.901.714
ARGENTINA	104	9%	1%		936.400
BRAZIL	365	45%	36%		191.596.800
CHILE	306	96%	16%		2.137.400
MEXICO	143	42%	14%		34.059.600
MALAYSIA	913	160%	47%		27.951.300
THAILAND	581	92%	0,1%		78.765.300

*Regional Stock Exchange serving the following countries: Benin, Burkina Faso, Guinea Bissau, Cote D'Ivoire, Mail, Niger, Senegal and Togo

¹³ Sources: World Bank; <http://www.african-exchanges.org>; <http://world-exchanges.org>; <http://arab-exchanges.org>.

Table 2**Bond Market Development: International Comparison (2010)**

Region	Country	Market Capitalization (percent of GDP)		Contribution to Total Domestic Debt (percent)	
		Government	Corporate	Government	Corporate
Developing Countries and Emerging Markets					
Africa	All	14.8	1.8	89.2	10.8
	South Africa (SA)	31.2	20.0	60.9	39.1
	All excluding (SA)	14.2	1.3	91.8	8.2
	CEMAC	10.5	0.7	93.8	6.3
	WAEMU	14.1	2.3	86.0	14.0
	Oil exporters	7.7	1.1	87.5	12.5
	Fragile countries	18.4	1.2	93.9	6.1
	Low income	15.3	1.1	93.3	6.7
	Middle income	15.1	3.5	81.2	18.8
Asia	China	27.3	22.8	54.5	45.5
	Hong Kong	35.9	13.8	72.2	27.8
	Malaysia	57.3	57.0	50.2	49.8
	South Korea	43.8	59.5	42.4	57.6
	Thailand	50.5	12.8	79.7	20.3
Latin America	Argentina	13.3	2.6	83.7	16.3
	Brazil	39.4	22.7	63.4	36.6
	Chile	13.1	17.0	43.5	56.5
	Mexico	22.6	17.1	56.9	43.1
Central Europe	Czech Republic	23.3	11.2	67.5	32.5
	Hungary	57.3	7.0	89.1	10.9
	Poland	42.6	1.8	95.9	4.1
Developed Countries					
Global	Australia	27.4	51.0	35.0	65.0
	Canada	63.2	26.5	70.5	29.5
	Japan	205.4	37.8	84.5	15.5
	United States	75.7	98.6	43.4	56.6
	Europe	55.8	46.4	54.6	45.4

Source: Mu et al. (2013)

Table 3: Definition of variables

Variables	Measure	Exp. Sign	Source
Bond Market Development	Total amount of domestic private and public debt securities issued in domestic markets as a share of GDP	na	<i>Global Financial Development Database (GFDD), The World Bank</i>
1- Structural			
Size of the economy	GDP PPP-adjusted	+	<i>WDI</i>
Openness	Exports to GDP	+/-	<i>WDI</i>
Asia dummy	Asia, Dummy Asia=1, 0 otherwise	+	<i>Authors' calculations</i>
Legal origin	Dummy, UK=1, 0 otherwise	+	<i>La Porta et al. (1999)</i>
Distance from Equator	Distance from Equator	+	<i>La Porta et al. (1999)</i>
2- Developmental			
Investment Profile	Investment Profile index (ICRG)	+	<i>ICRG</i>
Law and Order	Law and Order Index (ICRG)	+	<i>ICRG</i>
GDP per capita	GDP per Capita PPP-adjusted	+	<i>WDI</i>
3- Governance and Regulation of Financial Sector			
Corruption	Corruption perception index (ICRG)	+	<i>ICRG</i>
Bureaucracy Quality	Bureaucracy quality index (ICRG)	+	<i>ICRG</i>
Bank credit to GDP (in %)	Credit to private sector by commercial banks to GDP	+/-	<i>WDI</i>
Banking concentration	Herfindhal Concentration index	-	<i>GFDD</i>
4- Macroeconomic			
Interest rate spreads	Spread between lending and deposit rate	-	<i>WDI</i>
Interest Rate Volatility	Standard deviation of interest rates	-	<i>WDI</i>
Foreign exchange volatility	Standard deviation of the log of exchange rates	+/-	<i>WDI</i>
Capital controls	Index that summarizes controls over inflows or outflows, and by nine different categories of assets	-	<i>Fernandez et al. (2015)</i>
Fiscal balance	General government structural balance as a percentage of GDP	-	<i>IMF</i>

Table 4: Descriptive Statistics

This table reports the descriptive statistics of our main variables for the sample of 22 emerging countries between 1990 and 2013.

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP, PPP	515	1.081.945	182.571	.002346	160.24
Openness	517	4.737.776	480.242	6.6	230.27
Asia	528	.4545455	.4984018	0	1
English Legal Origin	528	.3181818	.4662122	0	1
Distance from Equator	528	.2790909	.1925814	.01	.67
Investment Profile	510	7.977.451	2.164.634	2	12
Law and Order	510	3.608.824	1.246.772	1	6
GDP per Capita, PPP	515	1.501.069	1.236.741	151.621	7.772.089
Corruption	510	2.872.549	1.022.551	1	5
Bureaucratic Quality	510	2.502.941	.7950554	0	4
Bank credit to GDP	513	5.112.538	470.492	6.46	322.63
Bank Concentration	343	6.465.026	2.456.857	7.25	100
Interest rate spread	447	1.992.577	1.291.342	-6.91	2334.96
Interest rate volatility	504	8.908.714	2.172.451	.72	972.37
Exchange rate volatility	528	.2190909	.2114501	0	.98
Capital Control Index	399	.532406	.3170542	0	1
Fiscal Balance	333	-1.545.429	4.167.728	-12.788	16.331

Table 5: Correlation matrix

This table shows the correlation coefficients for the explanatory variables used in our main regression models. The definitions of our variables appear in Table 3.

Variable	GDP, PPP	Openness	Asia	English Legal Origin	Dist. Equator	Invest Profile	Law and Order	GDP per Capita	Corruption	Bureaucratic Quality	Bank credit to GDP	Bank Conc.	Interest rate spread	Interest rate volatility	FX volatility	Capital Control	Fiscal Balance
GDP, PPP	1																
Openness	-0.21*	1															
Asia	0.30*	0.39*	1														
English Legal Origin	-0.09*	0.53*	0.35*	1													
Distance Equator	0.10*	-0.24*	-0.19*	-0.42*	1												
Investment Profile	-0.09*	0.41*	-0.04	0.06	0.09*	1											
Law and Order	-0.01	0.42*	0.24*	0.09*	0.34*	0.26*	1										
GDP per Capita	-0.20*	0.85*	0.14*	0.25*	0.00	0.52*	0.46*	1									
Corruption	-0.254	0.37*	-0.07	0.09*	0.05	0.14*	0.47*	0.44*	1								
Bureaucratic Quality	-0.18*	0.41*	-0.01	0.15*	0.03	0.35*	0.43*	0.48*	0.51*	1							
Bank credit/GDP	-0.09*	0.79*	0.42*	0.55*	-0.19*	0.39*	0.34*	0.60*	0.28*	0.32*	1						
Bank Concentration	-0.44*	0.47*	0.00	0.30*	-0.19*	0.34*	0.09	0.40*	0.34	0.29*	0.43*	1					
Interest rate spread	-0.02	-0.06	-0.09	-0.08	0.01	-0.10*	-0.12*	-0.06	0.02	-0.12*	-0.07	-0.17*	1				
Interest rate volatility	-0.15*	-0.16*	-0.31*	-0.28*	0.05	-0.00	-0.03	-0.09*	-0.04	-0.17*	-0.18*	-0.04	0.26*	1			
FX volatility	0.03	-0.37*	-0.35*	-0.36*	0.05	-0.22*	-0.24*	-0.17*	-0.18*	-0.25*	-0.30*	-0.24*	0.12*	0.25*	1		
Capital Control	0.41*	-0.40*	0.23*	-0.07	0.07	-0.26*	-0.17*	-0.47*	-0.25*	-0.03	-0.25*	-0.28*	0.02	-0.36*	-0.07	1	
Fiscal Balance	-0.10	0.50*	0.19*	0.21*	-0.27*	0.04	0.14*	0.49*	0.23*	0.03	0.13*	0.14*	-0.12*	-0.03	-0.13*	-0.33*	1

Table 6: Total Bond Market Development

This table shows the results of the regressions estimated with the Prais-Winston procedure for our sample of 22 emerging countries for the period 1990-2013. The dependent variable is total bond market development. The definitions of our variables appear in Table 3. The Prais-Winston technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.199*** (0.000)				0.286*** (0.000)
Openness	0.106*** (0.003)				0.168** (0.016)
Asia	-5.795 (0.133)				-7.732** (0.013)
English Legal Origin	4.551 (0.402)				20.11*** (0.000)
Distance from Equator	1.040 (0.899)				-0.143 (0.980)
Investment Profile		0.532** (0.036)			0.821* (0.058)
Law and Order		-0.615 (0.292)			-2.846*** (0.003)
GDP per Capita, PPP (thousands of \$)		0.398*** (0.000)			-0.359** (0.029)
Corruption			-0.297 (0.644)		0.067 (0.114)
Bureaucratic Quality			3.735*** (0.005)		0.056 (0.189)
Bank credit to GDP			0.226*** (0.000)		-0.057 (0.940)
Bank Concentration			0.121*** (0.000)		11.10*** (0.000)
Interest rate spread				0.151 (0.566)	-0.231 (0.330)
Interest rate volatility				-0.028*** (0.024)	-0.001 (0.113)
Exchange rate volatility				20.13** (0.026)	56.96*** (0.000)
Capital Control Index				1.138 (0.770)	14.40*** (0.001)
Fiscal Balance				-0.346* (0.068)	-0.611*** (0.007)
Constant	9.934*** (0.000)	7.688*** (0.000)	1.081 (0.703)	26.48*** (0.000)	-27.18*** (0.001)
Number of Observations	466	463	326	258	234
Number of Countries	22	22	21	19	18

Table 7: Sovereign Bond Market Development

This table shows the results of the regressions estimated with the Prais-Winston procedure for our sample of 22 countries for the period 1990-2013. The dependent variable is Sovereign Bond market development. The definitions of our variables appear in Table 3. The Prais-Winston technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.145 (0.754)				0.070*** (0.000)
Openness	0.058** (0.045)				0.035 (0.499)
Asia	0.916 (0.759)				-6.728** (0.013)
English Legal Origin	1.554 (0.688)				2.356 (0.350)
Distance from Equator	6.966 (0.352)				-4.494 (0.277)
Investment Profile		0.289 (0.157)			1.021*** (0.004)
Law and Order		-0.516 (0.246)			-1.865*** (0.005)
GDP per Capita, PPP (thousands of \$)		0.321*** (0.000)			0.048 (0.671)
Corruption			0.050 (0.917)		0.016 (0.976)
Bureaucratic Quality			4.406*** (0.000)		6.518*** (0.000)
Bank credit to GDP			0.071*** (0.013)		0.059 (0.120)
Bank Concentration			0.129*** (0.000)		0.097*** (0.000)
Interest rate spread				0.155 (0.366)	-0.031 (0.861)
Interest rate volatility				-0.023*** (0.000)	-0.014*** (0.000)
Exchange rate volatility				21.58*** (0.000)	27.25*** (0.000)
Capital Control Index				3.768 (0.206)	9.674*** (0.000)
Fiscal Balance				-0.286* (0.071)	-0.360** (0.040)
Constant	11.28*** (0.002)	11.47*** (0.000)	-1.975 (0.480)	13.66*** (0.000)	-16.88*** (0.001)
Number of Observations	465	462	326	258	234
Number of Countries	22	22	21	19	18

Table 8: Corporate Bond Market Development

This table shows the results of the regressions estimated with the Prais-Winsten procedure for our sample of 22 countries for the period 1990-2013. The dependent variable is Corporate Bond market development. The definitions of our variables appear in Table 3. The Prais-Winsten technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.167*** (0.000)				0.225*** (0.000)
Openness	0.059*** (0.000)				0.061* (0.088)
Asia	-5.743*** (0.000)				-0.336 (0.869)
English Legal Origin	2.873 (0.157)				16.37*** (0.000)
Distance from Equator	-9.612*** (0.004)				9.422** (0.019)
Investment Profile		0.289 (0.157)			-0.121 (0.563)
Law and Order		-0.147 (0.640)			-0.748 (0.227)
GDP per Capita, PPP (thousands of \$)		0.134*** (0.001)			-0.248*** (0.006)
Corruption			0.098 (0.785)		0.013 (0.974)
Bureaucratic Quality			1.311* (0.054)		6.913*** (0.000)
Bank credit to GDP			0.092*** (0.000)		0.0241 (0.0105)
Bank Concentration			-0.011 (0.640)		-0.012 (0.661)
Interest rate spread				0.116 (0.326)	-0.137 (0.222)
Interest rate volatility				-0.006** (0.024)	0.015*** (0.000)
Exchange rate volatility				-3.067 (0.490)	24.59*** (0.000)
Capital Control Index				1.868 (0.458)	6.034** (0.015)
Fiscal Balance				-0.046 (0.584)	-0.193* (0.078)
Constant	9.934*** (0.000)	7.688*** (0.000)	1.751 (0.231)	11.77*** (0.000)	-21.67*** (0.000)
Number of Observations	415	415	302	250	302
Number of Countries	22	22	21	19	21

Table 9: Domestic and International Bond Issuers

This table shows the results of the regressions estimated with the Prais-Winston procedure for our sample of 22 countries for the period 1990-2013. The dependent variable is the sum of domestic and international bond issues as a share of GDP. The definitions of our variables appear in Table 3. The Prais-Winston technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.132** (0.044)				0.211*** (0.000)
Openness	0.264*** (0.000)				0.255** (0.027)
Asia	-15.88*** (0.000)				-3.904 (0.420)
English Legal Origin	14.625*** (0.000)				24.14*** (0.000)
Distance from Equator	9.701 (0.461)				29.591** (0.013)
Investment Profile		-0.234 (0.584)			-0.646 (0.325)
Law and Order		-3.23*** (0.001)			-5.633*** (0.000)
GDP per Capita, PPP (thousands of \$)		0.792*** (0.000)			-0.687** (0.013)
Corruption			-0.394 (0.629)		-0.620 (0.511)
Bureaucratic Quality			12.805*** (0.000)		28.394*** (0.000)
Bank credit to GDP			0.207*** (0.000)		0.101* (0.064)
Bank Concentration			0.098*** (0.009)		0.029 (0.534)
Interest rate spread				0.562 (0.137)	-0.424 (0.232)
Interest rate volatility				-0.041*** (0.000)	-0.004 (0.383)
Exchange rate volatility				3.974 (0.753)	84.17*** (0.000)
Capital Control Index				-2.696 (0.672)	10.738 (0.106)
Fiscal Balance				0.132 (0.632)	-0.210 (0.498)
Constant	29.223*** (0.000)	52.773*** (0.000)	-2.791 (0.331)	50.446*** (0.000)	-42.46*** (0.000)
Number of Observations	308	308	262	226	207
Number of Countries	21	21	20	19	18

Table 10: Bond Market Development for Emerging and Developed Countries

This table shows the results of the regressions estimated with the Prais-Winsten procedure for our sample of 42 emerging and developed countries for the period 1990-2013. The dependent variable is total bond market development. The definitions of our variables appear in Table 3. The Prais-Winsten technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.449*** (0.000)				0.271*** (0.000)
Openness	-0.087 (0.443)				-0.147*** (0.005)
Asia	-9.422 (0.304)				5.479 (0.449)
English Legal Origin	-2.273 (0.580)				-7.213 (0.206)
Equator	25.004 (0.439)				-4.998 (0.670)
Investment Profile		0.687 (0.518)			0.348 (0.598)
Law and Order		1.639 (0.343)			-2.518** (0.025)
GDP per Capita, PPP (thousands of \$)		1.043*** (0.005)			0.183 (0.584)
Corruption			0.0347 (0.981)		-0.349 (0.761)
Bureaucratic Quality			11.949*** (0.003)		20.661*** (0.000)
Bank credit to GDP			0.196** (0.020)		0.111 (0.219)
Bank Concentration			-0.039 (0.610)		0.116* (0.065)
Interest rate spread				0.390 (0.309)	-0.203 (0.402)
Interest rate volatility				-0.067*** (0.000)	-0.029*** (0.000)
Exchange rate volatility				-38.85*** (0.006)	42.970*** (0.000)
Capital Control Index				-42.48*** (0.000)	-14.671*** (0.009)
Fiscal Balance				-1.610*** (0.000)	-0.940*** (0.001)
Constant	45.426*** (0.000)	10.661 (0.134)	2.308 (0.637)	70.931*** (0.000)	-17.844** (0.043)
Number of Observations	944	841	603	463	359
Number of Countries	42	42	41	37	35

Table 11: Bond Market Development for Developed Countries

This table shows the results of the regressions estimated with the Prais-Winsten procedure for our sample of 20 developed countries for the period 1990-2013. The dependent variable is total bond market development. The definitions of our variables appear in Table 3. The Prais-Winsten technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.457*** (0.004)				1.589** (0.025)
Openness	-0.420* (0.096)				-0.755** (0.022)
English Legal Origin	-15.080* (0.093)				-27.239*** (0.020)
Investment Profile		1.483 (0.499)			2.215* (0.052)
Law and Order		0.385 (0.957)			4.183 (0.279)
GDP per Capita, PPP (thousands of \$)		-0.773 (0.424)			0.041 (0.947)
Corruption			-6.147 (0.165)		1.646 (0.723)
Bureaucratic Quality			-1.869 (0.762)		11.924 (0.288)
Bank credit to GDP			-0.001 (0.992)		-0.212 (0.111)
Bank Concentration			-0.132 (0.261)		0.086 (0.547)
Interest rate spread				2.448 (0.121)	5.331* (0.080)
Interest rate volatility				-18.12*** (0.001)	-38.548*** (0.001)
Exchange rate volatility				-86.32 (0.490)	693.22*** (0.009)
Capital Control Index				-4.066 (0.774)	11.685 (0.610)
Fiscal Balance				-3.403*** (0.000)	-4.651*** (0.000)
Constant	86.225*** (0.000)	90.168** (0.020)	115.84*** (0.000)	82.866*** (0.000)	-4.651*** (0.000)
Number of Observations	480	380	279	205	125
Number of Countries	20	20	20	18	17

Table 12: Control for Endogeneity

This table shows the results of the regressions estimated with the GMM in system procedure of Blundell and Bond (1998) for our sample of 22 countries for the period 1990-2013. The Hansen (1982) test tests the validity of our instruments, while AR2 is the Arellano and Bond (1991) test of the absence of second order autocorrelation in the differenced residuals. ***, **, * refer to the 1, 5 and 10% levels of significance respectively. The two-step system GMM estimator is used. Windmeijer (2005) finite-sample correction to the two-step covariance matrix and the forward orthogonal deviation transformation proposed by Arellano and Bover (1995) are performed. Robust standard errors consistent in the presence of heteroscedasticity and autocorrelation within the panel are reported.

Explanatory Variables	(1)	(2)	(3)	(4)
GDP, PPP (billions of \$)	0.223*** (0.001)			
Openness	0.370** (0.033)			
Asia	-8.121 (0.303)			
English Legal Origin	-5.063 (0.753)			
Distance from Equator	-6.807 (0.753)			
Investment Profile		1.303*** (0.008)		
Law and Order		-3.551** (0.047)		
GDP per Capita, PPP (thousands of \$)		0.507*** (0.001)		
Corruption			-29.495 (0.640)	
Bureaucratic Quality			-41.006 (0.572)	
Bank credit to GDP			0.303** (0.023)	
Bank Concentration			0.736 (0.420)	
Interest rate spread				1.159** (0.019)
Interest rate volatility				-0.034** (0.040)
Exchange rate volatility				-19.283 (0.580)
Capital Control Index				1.624 (0.905)
Fiscal Balance				1.876 (0.229)
Constant	12.711 (0.281)	19.82** (0.034)	142.363 (0.165)	31.24*** (0.000)
Hansen Test	0.136	0.332	0.820	0.247
AR2 Test	0.160	0.433	0.369	0.831
N	466	463	310	258
No. Instruments	12	9	10	15
<u>Endogenous Variables</u>	<u>GDP,PPP</u>	<u>GDP Per</u>	<u>Bank</u>	<u>Intvol, Spread,</u>
	Openness	Capita	credit/GDP	Fiscal Balance

Table 13: Bond Market Development: Sub-Period 1 (1990-2001)

This table shows the results of the regressions estimated with the Prais-Winston procedure for our sample of 22 emerging countries for the period 1990-2001. The dependent variable is total bond market development. The definitions of our variables appear in Table 3. The Prais-Winston technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	- 0.033 (0.763)				0.616*** (0.000)
Openness	0.095*** (0.005)				0.995*** (0.000)
Asia	-5.743* (0.057)				-41.474*** (0.001)
English Legal Origin	3.081 (0.580)				15.225* (0.062)
Distance from Equator	-12.995 (0.192)				22.651** (0.025)
Investment Profile		0.565** (0.013)			-0.315 (0.645)
Law and Order		-1.029 (0.173)			-3.679** (0.017)
GDP per Capita, PPP (thousands of \$)		0.350*** (0.000)			-2.882*** (0.000)
Corruption			0.700 (0.410)		0.478 (0.692)
Bureaucratic Quality			4.949*** (0.000)		11.269** (0.045)
Bank credit to GDP			0.127*** (0.992)		-0.032 (0.496)
Bank Concentration			0.068* (0.063)		-0.085 (0.405)
Interest rate spread				0.279 (0.517)	-0.392 (0.475)
Interest rate volatility				-0.021*** (0.000)	-0.010 (0.229)
Exchange rate volatility				2.528 (0.873)	58.047*** (0.003)
Capital Control Index				0.445 (0.937)	0.614 (0.923)
Fiscal Balance				-0.047 (0.883)	1.088 (0.202)
Constant	20.234*** (0.000)	15.884*** (0.000)	-3.394 (0.126)	24.816*** (0.000)	7.782 (0.543)
Number of Observations	213	210	78	55	40
Number of Countries	21	21	21	15	15

Table 14: Bond Market Development: Sub-Period 2 (2002-2013)

This table shows the results of the regressions estimated with the Prais-Winstone procedure for our sample of 22 emerging countries for the period 2002-2013. The dependent variable is total bond market development. The definitions of our variables appear in Table 3. The Prais-Winstone technique produces panel corrected standard error (PCSE) estimates for linear panel data models. The p-values appear in parentheses below the estimated coefficients. ***, **, * refer to the 1, 5 and 10% levels of significance respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDP, PPP (billions of \$)	0.138*** (0.000)				0.200*** (0.000)
Openness	0.102*** (0.002)				0.342*** (0.001)
Asia	-4.170 (0.165)				-4.479 (0.265)
English Legal Origin	6.085 (0.245)				23.87*** (0.000)
Distance from Equator	-13.70*** (0.007)				8.199 (0.347)
Investment Profile		0.327 (0.591)			-1.037 (0.274)
Law and Order		-1.036 (0.341)			-1.563 (0.402)
GDP per Capita, PPP (thousands of \$)		0.359*** (0.002)			-0.178 (0.371)
Corruption			0.530 (0.622)		1.300 (0.410)
Bureaucratic Quality			4.263*** (0.006)		10.463*** (0.000)
Bank credit to GDP			0.141*** (0.000)		-0.083** (0.042)
Bank Concentration			0.138*** (0.001)		0.116* (0.095)
Interest rate spread				0.757* (0.059)	0.181 (0.587)
Interest rate volatility				-0.034*** (0.000)	0.010* (0.083)
Exchange rate volatility				4.260 (0.736)	59.636*** (0.000)
Capital Control Index				4.800 (0.216)	42.704*** (0.000)
Fiscal Balance				-0.505* (0.056)	-2.812*** (0.000)
Constant	30.808*** (0.000)	28.87*** (0.000)	4.408 (0.301)	26.944*** (0.000)	-46.034*** (0.000)
Number of Observations	253	253	248	203	194
Number of Countries	22	22	21	19	18