

Ph.D. Dissertation Summary

Determinants of Sovereign Bond Spreads in Emerging Markets

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## **Table of Contents**

1. Introduction.....	3
2. Structure of the Dissertation.....	7
3. Results.....	9
4. Summary.....	15
References .....	16
Publications.....	19

## 1. Introduction

Emerging market sovereign debt has become an increasingly important asset class for investors in the last two decades, especially in the 2000s. The continuous expansion of both the local and hard currency emerging sovereign bond market was driven by a number of factors.<sup>1</sup> First, U.S. Treasury secretary Nicholas Brady announced a debt restructuring program in 1989 that was aimed at addressing the less-developed-countries' debt crisis that started in 1982, mostly in Latin America. By re-negotiating the terms of their loans with external lenders, participating countries reduced their debt level and regained access to external financing. Furthermore, they also adopted a number of structural reforms with the goal of improving their long-term creditworthiness. Second, following a series of emerging market crisis episodes such as the Tequila crisis of 1994, the Asian crisis of 1997, the Russian default of 1998, Ecuador defaulting on its Brady bonds in 1999 and the Argentine default of 2001, emerging market governments conducted sounder macroeconomic policies that enhanced growth outlook, led to lower and more stable inflation, as well as improved their external and fiscal position. The growing interest of foreign investors in emerging market debt stemming from their better macroeconomic fundamentals also allowed these countries to extend the maturity profile of their public debt, reduce the issuance of floating-rate debt and increase the issuance of local currency debt.

The increasing reliance of emerging markets on external private financing and the increasing holding of emerging market debt by investors made it essential for both policymakers and investors to understand the main determinants of sovereign bond yields. For policymakers, although increased external financing diversified their funding structure, potential capital flow reversals during crisis periods raised liquidity risk. Furthermore, policymakers need to understand whether prevailing bond yields are in line with their fundamentals and global conditions. First, they may want to increase issuance

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<sup>1</sup> See *Anderson et al.* [2010] and *Arslanalp and Takahiro* [2014].

at favorable yields, i.e. when yields are smaller than the level justified by macroeconomic fundamentals. Second, it is of primary importance to analyze whether the prevalence of favorable funding conditions is the result of sound macroeconomic fundamentals or supportive global environment. In the latter case, low bond yields should not prevent policymakers from focusing on reducing vulnerabilities, as weak fundamentals, which may be “overlooked” by investors during tranquil times, can amplify the negative effects on their economies of an adverse shift in global market sentiment. As *El Erian and Spence* [2012] note, it is important for policymakers to have an appropriate design and use of ex ante and ex post circuit breakers that could “prevent the evolution of structures that amplify feedback loops and break the serial contamination of expectations, the real economy, and market linkages, thereby interrupting the often disruptive dynamic that leads to a sequence of bad equilibriums”.

For investors, the most important issues include the misalignment of yields, i.e. the difference between actual yields and the ones justified by macroeconomic fundamentals and global conditions, the sensitivity of yields to changes in global conditions as well as the co-movement of yields across countries. First, they may want to increase their holdings of emerging market debt when it is perceived to be underpriced, i.e. when yields are higher than the level justified by domestic and external factors. Second, the sensitivity of yields to global conditions indicates the riskiness of a given country. Even if prevailing yields seem attractive, a high sensitivity could lead to a spike in yields in the case of a deterioration of global market sentiment. Third, although investing in a large number of countries could reduce the risk profile of a portfolio consisting of emerging market sovereign bonds given their historical co-movements, in fact cross-country correlations tend to be time-varying. Specifically, during periods of increased correlation, diversification benefits may be eroded, thereby leaving investors exposed to possible adverse shifts in global conditions.

Over the past two decades a vast number of empirical studies examined the relationship between emerging market sovereign debt spreads and both country-specific

and global factors.<sup>2</sup> There is also an extensive literature that analyzes whether the impact of the country-specific and global factors on spreads is in turn a function of global market conditions and the strength of country fundamentals, and whether this relation changes depending on the time horizon.<sup>3</sup> To summarize, the studies find that: (i) global liquidity and risk factors do affect the strength and sometimes the direction of the effect which country-specific fundamentals have on spreads; (ii) stronger country-specific fundamentals reduce the effect of the global factors on spreads; (iii) country fundamentals determine spreads in the long-term, while global factors are important drivers of spreads both in the short- and the long-term.

The analysis of the increasing co-movement of financial markets during crisis periods has also been the subject of a large number of studies. It has often been attributed to spillovers and contagion observed during several emerging market crisis episodes. One of the most popular methods to assess these phenomena has been the analysis of the timely evolution of cross-country correlations. However, an increase in cross-country co-movements may not indicate the presence of contagion, as it can also be the result of other factors. Specifically, *Masson* [1999] attributed exchange rate variation to three components: (i) ‘monsoonal’ or common shocks, (ii) spillovers occurring via trade and other macroeconomic linkages, (iii) residual: contagion (a jump between equilibria triggered by a crisis in another market). Excess co-movement (i.e. the correlation of return residuals) was first used as a measure of contagion by *Pindyck and Rotemberg* [1990] that was followed by several studies.<sup>4</sup> In order to analyze time-varying co-movements, some recent papers resorted to new estimation techniques, mostly the

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<sup>2</sup> For example, see *Edwards* [1985], *Eichengreen and Mody* [1998], *Luengnaruemitchai and Schadler* [2007], *Hartelius et al.* [2008] or *Jaramillo and Tejada* [2011].

<sup>3</sup> For example, see *Ferrucci* [2003], *González-Rozada and Levy-Yeyati* [2005], *Baldacci et al.* [2008], *Alexopoulou et al.* [2009], *Bellas et al.* [2010], *Levy-Yeyati and Williams* [2010], *Baldacci and Kumar* [2010], *Dumicic and Ridzak* [2011], *Jaramillo and Weber* [2012], *Comelli* [2012] or *IMF* [2013].

<sup>4</sup> For example, see *Pindyck and Rotemberg* [1993], *Bekaert et al.* [2005] or *Bunda et al.* [2010].

Dynamic Conditional Correlation multivariate Generalized Autoregressive Conditional Heteroskedasticity (DCC GARCH) model of *Engle* [2002].<sup>5</sup>

The dissertation aims at understanding the relationship between emerging market sovereign bond spreads and their domestic and global determinants, the impact of country fundamentals and market conditions on this relationship as well as the time-varying nature of cross-country co-movements in spreads.

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<sup>5</sup> For example, see *Frank et al.* [2008], *Frank and Hesse* [2009], *Antonakakis* [2012] or *Piljak* [2013].

## 2. Structure of the Dissertation

Chapter 1 lays down the importance of the topic and describes the structure of the remainder of the dissertation.

In Chapter 2, we review the literature on the determinants of emerging market bond spreads as well as analyze the relationship between spreads and country-specific and global factors in a number of emerging markets from three different angles. First, we analyze the changes in emerging market debt spreads with the aim to disentangle the effect of global and country-specific developments. Second, we investigate whether and how the strength of fundamentals is related to the sensitivity of spreads to global factors. In order to do so, we employ two approaches: (i) in the fixed effects panel estimation, we split the sample into countries with weak and strong fundamentals; (ii) in the pooled mean group estimation developed by *Pesaran, Shin and Smith* [1999], we analyze whether country-specific short-term coefficients of global conditions are related to country-specific fundamentals. Third, we also decompose changes in spreads in seven periods over the last decade in order to understand whether they are driven by improving fundamentals and/or global factors, and what role the unexplained part of changes plays. In addition to the breakdown of fitted changes in spreads into the contribution of fundamentals and global factors as common in the literature, we also decompose changes in the residual into correction of initial misalignment and increase/decrease in misalignment in the given period.

In Chapter 3, we review the literature on whether the relationship between emerging market sovereign spreads and country-specific fundamentals/global factors changes over time and/or as a function of global conditions. We apply a two-step procedure with the aim of analyzing the behavior of emerging market sovereign bond spreads in a number of countries across periods associated with a different degree of volatility in financial markets. In the first step, we follow *González-Hermosillo and Hesse* [2009] and *IMF* [2013] and estimate a Markov-switching ARCH model developed by *Hamilton and Susmel* [1994] on the first differences of VIX with the aim of identifying regimes characterized by low, medium and high volatility in financial markets. In the second step, we analyze the behavior of emerging market bond spreads from two different angles.

First, we assess whether the cross-country correlation of spreads increases during high-volatility periods. Second, we regress spreads on the interactions of the regime probabilities with several country-specific and global variables with the aim of understanding whether the relationship between spreads and their determinants is different across regimes. Using the estimation results, we also assess the impact of the strength of country-specific fundamentals on the exposure of spreads to adverse shifts in global market sentiment.

In Chapter 4, we review the literature on the time-varying co-movement of financial markets as well as we analyze the time-varying nature of the co-movement of spreads between Hungary and selected emerging market countries by estimating a Dynamic Conditional Correlation (DCC) GARCH model of *Engle* [2002].

Chapter 5 summarizes the main findings of the dissertation.

### 3. Results

*Thesis 1. While both country-specific and global developments are important determinants of emerging market sovereign bond spreads in the long run, it is mostly the global factors that determine spreads in the short run.*

Our pooled mean group estimation showed that while both country-specific and global developments are important determinants of spreads in the long run, it is mostly the global factors that determine spreads in the short run. This finding is intuitive, consistent with the literature, and sheds lights on recent market developments. First, the asset-pricing theory predicts that all relevant information shall be included in asset prices (or spreads) and hence both global factors and the strength of country-specific fundamentals should be reflected in the long-run, equilibrium, level of bond prices (spreads). Second, since country-specific fundamentals change slowly over time—as macroeconomic policies and structural reforms take time to bear fruit—it is the variation in global factors that should be more important in driving country spreads in the short run. This finding may explain why during the second half of 2012-beginning of 2013 all emerging markets experienced significant narrowing in sovereign bond spreads, seemingly irrespective of country-specific fundamentals. The liquidity boat lifted all boats, both sturdy and shaky ones, in the short-term, but leaves shaky ones vulnerable to eventual correction when spreads revert to their long-term fundamental values.

*Thesis 2. The role of both country-specific fundamentals and global factors differs across low-, medium- and high-volatility regimes. While country-specific fundamentals are important determinants of spreads in each regime, the importance of global factors increases during high-volatility periods.*

Using the interactions of the regime probabilities stemming from the estimation of a Markov-switching ARCH model on VIX index with several country-specific and global variables as the determinants of spreads, our panel estimations also showed that the role of both country-specific fundamentals and global factors differs across regimes associated with a low, medium and high degree of volatility in financial markets. We

found that while country-specific fundamentals are important determinants of spreads in each regime, the importance of global factors increases during high-volatility periods. This implies that the sensitivity of emerging market spreads to exogenous developments increases during periods of distress.

*Thesis 3. Countries with stronger fundamentals tend to have lower sensitivity to changes in global risk aversion. In other words, sound macroeconomic policies and strong fundamentals reduce the exposure of spreads to adverse shifts in global risk aversion.*

This finding was supported by three different estimations. In the fixed effects panel estimation, we compared the sensitivity of spreads to global conditions across two groups of countries associated with weak and strong fundamentals. In the pooled mean group estimation, we analyzed whether country-specific short-term coefficients of global conditions are related to country-specific fundamentals. Both estimation results suggested that countries with stronger fundamentals tend to have a lower sensitivity to changes in global conditions. In the regime-switching estimation, we found that sound macroeconomic policies and strong fundamentals reduce the sensitivity of spreads to adverse shifts in global risk aversion. Specifically, based on the panel estimation results we showed that while a shift from low- to medium- and high-volatility regimes results in the substantial increase of fitted spreads of countries with weak fundamentals, the increase is much less pronounced in countries with stronger fundamentals.

This finding is important from the policy-making perspective as it highlights the premium on good policies, suggesting that solid domestic fundamentals do provide some cushion against sudden shifts in the global market sentiment.

*Thesis 4. The pre-crisis decrease in spreads across emerging markets was driven by both improving fundamentals and global conditions. In contrast with this, the changes in spreads during the global financial crisis followed tightening and widening in line with financial markets switching between risk-on and risk-off periods.*

Based on the fixed effects and the pooled mean group estimation results, we decomposed changes in spreads with the aim of understanding whether general increases/decreases in spreads across emerging markets reflected changing fundamentals, global conditions, a correction of initial misalignment and/or increasing misalignment.

In the pre-crisis period (January 2001–August 2007), the model-based spread decline was driven by both improving domestic and global factors. The excessive spread compression — the part not explained by either fundamentals or global factors — reflected: (i) a correction of a significant undervaluation of emerging market debt that existed at the beginning of 2001, most probably related to events such as the burst of the dotcom bubble and/or emerging market crisis episodes of the end-1990s, and (ii) an overvaluation that emerged during an extended period of favorable global market environment, which lasted until the unfolding of the sub-prime crisis in the middle of 2007.

The changes in spreads during the crisis follow periods of tightening and widening which are well-explained by the model and are intuitive. In addition, the dynamics of the components of the unexplained residual intuitively follow all the major developments of the current crisis that in turn impact market sentiment: the 2007–early Fall 2008 period when the crisis was mostly contained to the mature financial systems; the period after the Lehman bankruptcy when the “mature market crisis” turned into a full-blown “confidence and growth crisis” and spilled over to the emerging markets, especially in Europe; some thawing of market conditions and improvement in fundamentals in 2009–early 2010; followed by the many nerve-wrecking twists and turns of the Eurozone debt crisis from the spring 2010 to mid-2012; and the spectacular improvement in global market sentiment between mid-2012 and early 2013 as monetary policy decision-makers relieved concerns about the tail risk of the Eurozone debt crisis.

In general, we found that in periods of severe market stress and general lack of public understanding of country-specific developments, such as during the intensive phase of the Eurozone debt crisis, global factors tend to drive the changes in spreads and misalignment tends to increase in magnitude and its share in actual spreads increases. We also found that a spectacular performance of emerging market sovereign debt in 2012 was mainly driven by an improvement in global factors, both risk perception and

liquidity. The small unexplained part mostly reflected the correction of the undervaluation of emerging market debt, but some misalignment started to build up by early 2013; however, the latter broadly disappeared due to increasing uncertainty related to Cyprus.

*Thesis 5. Sovereign debt was undervalued before the global financial crisis in most emerging markets with the exception of CEE countries. As a result of the belief that the crisis would be confined to advanced countries, emerging market debt became overpriced during the initial stage of the crisis. However, since the collapse of Lehman was followed by a broad-based crisis, markets tended to require higher spreads than justified by fundamentals and global factors.*

To analyze the misalignment in the valuation of emerging market sovereign debt, we compared actual and fitted spreads for each country, using the coefficients obtained from the fixed effects and the pooled mean group estimation. We defined misalignment as the difference between actual and fitted spreads. For the entire emerging market universe we could establish three main sub-periods:

- a) *Pre-crisis period, before 2007*: our estimates show that most emerging markets had positive residuals with the exception of Bulgaria, Chile, China, Hungary, Poland and Ukraine where markets tended to require lower spreads than justified by domestic and global factors. An example of Hungary is a notable case of misalignment, as the country was running twin deficits well into high single digits for the good part of mid-2000s, while enjoying low spreads on market financing.
- b) *Crisis mostly confined to industrial country financial systems, 2007– fall 2008*: most emerging market countries had negative residuals. This possibly reflects the fact that during the initial part of the crisis, up until the fall of 2008, it was believed that the crisis could be confined to the industrial country financial systems and emerging markets were successfully decoupling. Hence markets put a positive premium on emerging market sovereign debt.

- c) *Broad-based crisis*, since late 2008: the majority of emerging market countries has had positive residuals, suggesting an increasingly cautious pricing behavior of market participants. In the fall of 2008, or roughly after the Lehman collapse, the crisis that was initially confined to industrial country financial systems has broadened dramatically: global growth tumbled and crisis spread to emerging markets, especially Emerging Europe due to its strong trade and financial ties with Developed Europe as well as accumulated domestic imbalances in many countries. Again, there were a few countries such as Indonesia and Turkey that had negative residuals in this period based on the results of both models, consistent with anecdotal evidence that markets were placing positive premiums on perceived top performers or safe heavens within the emerging market universe.

*Thesis 6. Cross-country co-movements of spreads differ across periods associated with low, medium and high volatility in financial markets.*

This finding is supported by two estimations. First, after the identification of low-, medium- and high-volatility regimes using the Markov-switching ARCH model, we analyzed the regime-specific cross-country correlation of spreads. In line with the literature, we found that cross-country correlations of EMBIG spreads increase substantially during medium- and high-volatility periods as compared to the low-volatility regime. This possibly suggests that emerging market bond spreads are mainly driven by external factors during periods of distress, thus they can only partially decouple from their peer countries when global sentiment deteriorates.

Second, using a multivariate GARCH framework, we were also analyzing the timely variation of correlations between the EMBIG spreads of Hungary and selected emerging market countries from three regions. We showed that on average the Hungarian spread exhibits the strongest co-movement with its regional peers, Poland and Bulgaria, while implied correlations are much smaller with countries from Asia and Latin America. This suggests that there is some degree of regional differentiation by investors across countries.

We also showed that correlations between Hungary and other emerging markets increased substantially in the aftermath of the global financial crisis. Our analysis suggests that this was primarily driven by common external factors. In line with the literature, these factors could include the expansive monetary policy in advanced economies, the search-for-yield behavior of investors and the improving macroeconomic performance of emerging markets as compared to advanced countries. In contrast with this, correlations dropped at the peak of the global financial crisis in 2008, possibly due to the fact that Hungary was among the first emerging countries severely hit by the market turmoil following the collapse of Lehman while other emerging markets proved more resilient during this period.

## 4. Summary

Using several estimation methods, we analyzed the determinants of emerging market sovereign bond spreads and their cross-country co-movements in a number of countries from four different perspectives. First, we analyzed emerging market debt spreads with the aim to disentangle the effect of global and country-specific developments as well as showed that the importance of country-specific and global factors is conditional on the time horizon and the degree of volatility in financial markets. Specifically, we showed that (i) while both country-specific and global developments are important determinants of spreads in the long run, it is mostly the global factors that determine spreads in the short run; (ii) while country-specific fundamentals are important determinants of spreads in each regime the importance of global factors increases during high-volatility periods.

Second, we investigated whether and how the strength of fundamentals is related to the sensitivity of spreads to global factors. Using three different methods, we showed that countries with stronger fundamentals tend to have lower sensitivity to changes in global risk aversion.

Third, we decomposed changes in emerging market sovereign spreads in seven periods over the last decade in order to understand whether they are driven by improving fundamentals and/or global factors, and what role the unexplained part of changes plays. In general, we found that in periods of severe market stress and general lack of public understanding of country-specific developments, such as during the intensive phase of the Eurozone debt crisis, global factors tend to drive the changes in spreads and misalignment tends to increase in magnitude and its share in actual spreads increases.

Finally, we also analyzed the cross-country co-movement of spreads using two methods. In short, we showed that co-movements of spreads tend to vary across periods associated with low and high volatility in financial markets.

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