Not all emerging markets are the same: A classification approach with correlation based networks☆,☆☆

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ARTICLE INFO

ABSTRACT

Using dynamic conditional correlations and network theory, this study brings a novel interdisciplinary framework to define the integration and segmentation of emerging countries. The individual EMBI+ spreads of 13 emerging countries from January 2003 to December 2013 are used to compare their interaction structure before (phase 1) and after (phase 2) the global financial crisis. Accordingly, the unweighted average of dynamic conditional correlations between cross country bond returns significantly increases in phase 2. At first glance, the increased co-movement degree suggests an integration of the sample countries after the crisis. However, using correlation based stable networks, we show that this is not enough to make such a strong conclusion. In particular, we reveal that the increased average correlation is more likely to be caused by clusters of countries that exhibit high within-cluster co-movement but not between-cluster co-movement. Potential reasons for the post-crisis segmentation and important implications for international investors and policymakers are discussed.

1. Introduction

The integration of financial markets lies at the heart of the asset and risk management, especially for the investors who are looking to diversify their portfolios internationally and policymakers trying to maintain financial stability. Unfortunately, analysis of market integration is a challenging process; though they are structurally different, contagion at a global scale can be confused with financial globalization as both have a tendency to raise correlations among assets. On top of this, the ongoing structural changes in the world economy and financial architecture, including technological improvements and innovative financial products, raise this complexity even further. Although it is a complex process, the effects of integration on investment choices and policy actions are crucial, thus necessary attention should be devoted while performing analysis and making decisions.

One of the problem faced in many academic studies is that the terms integration and contagion cannot be strictly differentiated in technical terms. At a fundamental basis, an accepted view in the literature belongs to Forbes and Rigobon (2002) where authors define contagion as a significant increase in correlation during the periods of turmoil. Accordingly, if the correlation does not increase significantly in turbulent times, then any continued high level market co-movement suggests strong real linkages that can be called

interdependence. In this study, we also have a similar approach, i.e. while we call markets are *interdependent* when they have long-term high correlations, *contagion* is defined as high however, short lived correlations.[1]

During the last two decades, increased financial and economic integration amplified the correlations between developed markets which diminished the benefit of diversification and led investors to seek alternative investment opportunities. With the help technological innovations, in a more globalized financial system, emerging markets (EMs) have attracted the attention of investors who would like to diversify their portfolios. Consecutively, EMs sovereign debt securities, one of the main instruments of funding, have become an important instrument as an asset class for investors. Before 2000s, attributable to high volatility in shallow markets, international investors were reluctant to invest in EM bonds. Indeed, once Erb et al. (2000) described EM bonds as assets with small relative market capitalization and limited liquidity, and that are highly volatile and negatively skewed. However, the credit quality of EMs has enhanced as many emerging countries have made improvements to their fiscal positions and banking systems since then. The investment grade percentage in J.P. Morgan's Emerging Markets Bond Index (EMBI) was only about 40% in 2007 and became roughly 73% at the end of 2013. After the recent global financial crisis, there has been abundance in liquidity in markets and nominal short-term rates were close to zero in developed markets, with real rates stuck in negative territory while longer dated instruments were offering very little return. As a result more and more investors were looking for fixed income alternatives like EM sovereign bonds. While emerging market yields have also fallen in this period, yields offered were still well above the developed markets and risk appetite of investors has increased parallel to liquidity provided by quantitative easing operations.

In line with the shift in investors' perception of emerging markets as a viable investment opportunity, small, albeit increasing, number of papers examined the integration of bond markets, sovereign bond markets in particular. For example, Cifarelli and Paladino (2006) analyzed the dynamic relationship between sovereign bond spreads of 10 EM countries located in Asia and Latin America from October 1999 to April 2002 and found out that conditional co-variations increase in periods of turbulence and subsequently subside and describe this as a kind of temporary contagion. Bunda et al. (2009) analyzed roles of external factors on co-movements in EMs and tried to find evidence of contagion and common external shocks by using the data of 18 countries bond spreads over the period of March 1997 to end of October 2008. They showed that before the global financial crisis, average correlations were low and decreasing, though some pairwise correlations were high. Based on this results, they suggested that bond markets were not unimodal but there were subgroups characterized by high within-group movements. They also analyzed the period after September 2008 and observed increase in correlations which they interpreted as diminish of investors' discrimination across EMs. Jaramillo and Weber (2013) investigated the global spillovers into EM bond markets for 26 emerging economies between years 2007 and 2013. According to their results, domestic bond yields were influenced mainly by global risk appetite and liquidity conditions, and vulnerability of EMs to these two factors is not uniform but rather depends on country specific factors.

In contrast to the number of studies analyzing integration of EM bond markets; there are quite many studies that investigate the

determinants of EM bond pricing. As a pioneer study, Eichengreen and Mody (1998) found that the same explanatory variables had quite different effects on different types of borrowers. They suggested that shifts in market sentiment (rather than shifts in macroeconomic fundamentals) truly explains the changes in spreads over time. McGuire and Schrijvers (2003) concluded that common forces account for the one third of the total variation in spreads and a single common factor explains approximately 80% of the common variation. Uribe and Yue (2006), Juttner et al. (2006), Ozatay et al. (2009), Kennedy and Palerm (2014) analyzed the influences of external/global versus domestic variables on EMBI spreads and suggested that much of the movements were explained by external conditions, whereas differences in spreads were related to the dissimilarity in country specific fundamentals. Baldacci et al. (2008) found that political risk factors and fiscal position of emerging countries played a significant role in EM bond pricing. Hilscher and Nosbusch (2010) added volatility of fundamentals into consideration and found that variation in country fundamentals explain a large share of variation in EM sovereign debt prices. Hartelius et al. (2008) showed that the Fed can play a role in reducing the risk in EMs and asserted that a clear communication strategy by Fed may guide investor expectations. Bellas et al. (2010) and Csonto and Ivaschenko (2013) disentangled spreads into short and long term effects and found that in the long-run fundamentals were more significant while global factors were the main determinants of spreads in the short-run. Comelli (2012) emphasized that the contribution of the explanatory variables might change across time and regions by giving the reasoning of over-time and across different emerging economies, investors did not always assign the same weight to domestic and external factors when selecting bonds to hold in their portfolio.

The above literature shows that there is a vast amount of studies on determinants of EM bond pricing, however, the studies on EM bond market integration stay relatively limited. This paper tries to fulfill this gap by investigating the integration and segmentation[2] of EM bond markets using individual EMBI+ spreads of 13 emerging countries from January 2003 to December 2013. Our study contributes to the literature in at least three ways. Firstly, the data used in this study cover the period between 2003 and 2013, letting financial crisis in 2008 stays at the middle. So that equal weight has been given to the pre- and post-crisis periods in comparison. Secondly, the literature that analyzed the determinants of bond spreads or financial contagion used a range of different methodologies such as principle component analysis, panel data analysis, co-integration and vector error correction models, however the correlation based network analysis employed in the paper is relatively new, and to the best of our knowledge, only a simpler version has been used in the work of Sensoy et al. (2015) before. Third the co-movements in EMs mostly examined by using stock markets or exchange rates, however sovereign bond markets constitutes a topic of little empirical investigation. With this paper, we would like to broaden the topics analyzed under EM bond market integration. Besides, while EM stock markets may differ by their market capitalization, liquidity and investor base. Moreover, their currencies may be heavily manipulated due to their exchange rate regimes. EMBI+ spread data is more robust since the sovereign debt instruments used in this data fulfill very strict requirements

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[1] However, the technical approach to differentiate integration and contagion is completely different than that of Forbes and Rigobon (2002) and will be introduced in Section 2 later.

[2] In finance literature, *market integration* occurs when prices among different markets follow similar patterns over a long period of time. Group of prices often move proportionally to each other and when this relation is very clear among different markets it is said that the markets are integrated. *Market segmentation* refers to the aggregating of markets into sub-groups (segments) that have common properties and will respond similarly to positive/negative external shocks.