



# Co-movement between equity and bond markets



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## ABSTRACT

This study explores the co-movement between equity and bond markets and decomposes it into the equity-bond, equity, and bond co-movements. Moreover, the estimation method captures the heterogeneity between developed and emerging equity markets. It reveals that both equity-bond and equity co-movements are important for the developed equity markets. Although the idiosyncratic component plays a substantial role in the emerging equity and bond markets, the global financial crisis has impacted on the co-movement of the emerging equity markets, while does not have an effect on that of the emerging bond markets. The co-movements depend upon market uncertainty measured by VIX.

## 1. Introduction

Equity and bond markets are the most important financial markets, and the relationship between these two markets is of particular interest for financial researchers and market participants. There are many factors which impact upon the relationship and affect the integration of the economy and currencies, such as the European Union (EU) and Euro, as well as the development of emerging markets, all of which have been widely examined.

Equity markets have co-movements (see for example, Bekaert, Harvey, Lundblad, and Siegel (2011), Bekaert and Harvey 1995, De Jong & De Roon, 2005, Bekaert, Hodrick, & Zhang, 2009, Pukthuanthong and Roll 2009, Bekaert, Harvey, Lundblad, and Siegel (2011), Christoffersen, Errunza, Jacobs, and Langlois 2012, Donadelli and Paradiso 2014, Eiling and Gerard 2014). Equity markets of developed and emerging countries have different market structure and Bekaert et al. (2009) focus on developed markets, De Jong and De Roon (2005), Donadelli and Paradiso (2014), and Eiling and Gerard (2014) examine emerging markets, and Pukthuanthong and Roll (2009), Bekaert et al. (2011), and Christoffersen et al. (2012) explore both developed and emerging markets.

Bond market co-movement is also investigated and Barr and Priestley (2004) use the Capital Asset Pricing Model (CAPM) and assess five developed markets. Volosovych (2011) employs the Principal Component Analysis (PCA) and explores the long-run relation of developed markets. Abad, Chulia, and Gomez-Puig (2010) adopt the CAPM model to explore EU bond markets. Pozzi and Wolswijk (2012) and Christiansen (2014) have also focused on EU bond markets and investigate the effects of the recent financial crisis.<sup>1</sup>

Moreover, cross asset co-movement, in particular, equity-bond market co-movement is important research area. For instance, Scruggs and Glabadanidis (2003) use the asymmetric dynamic covariance model and find that both equity and bond market shocks

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<sup>1</sup> Baele (2005) adopts the regime switching model and finds the sensitivity to EU equity market shocks for each EU equity market increases over time. Cappiello, Kadareja, and Manganelli (2010) and Bekaert, Harvey, Lundblad, and Siegel (2013) examine that Euro membership and Euro adoption for equity market integration.

impact on equity market variance, although only bond market shocks have an effect on bond market variance.<sup>2</sup> Panchenko and Wu (2009) focus on emerging markets and adopt a semi-parametric approach. They conclude that equity and bond market decoupling is due to increased demand for equities. Baele, Bekaert, and Inghelbrecht (2010) employ the dynamic factor model with state-dependent factor betas and report that macroeconomic fundamentals are not critical determinants for equity and bond correlation. The volatility spillovers of the cross-asset markets are also investigated by Christiansen (2010). She presents that both global and regional bond market shocks are substantial for bond markets in EU countries after the introduction of Euro, while the effects of the global and the regional equity market shocks are marginal for the bond markets. Garcia and Tsafack (2011) investigate a dependence structure by using the regime-switching copula model and provide evidence that the dependence between equity and bond markets is weak. The correlation between equity and bond markets vary over time. Aslanidis and Christiansen (2012) adopt the smooth transition regression (STR) model that captures both positive and negative correlations.

The first contribution of this study is to decompose co-movements across equity and bond market into (i) equity-bond co-movement, (ii) asset specific co-movement, and (iii) developed or emerging market specific co-movement. In contrast to the previous studies, which capture the asset and cross-asset co-movements separately, I estimate both co-movements simultaneously. Moreover the co-movement is linked to each other. To this end, this study employs the dynamic hierarchical factor model (DHFM) proposed by Moench, Ng, and Potter (2013). This model has the benefit of imposing a hierarchical structure on the dataset and allows us to interpret the meaning of factors more easily than the conventional PCA approach. A hierarchical structure model is widely used to capture common and regional components in several contexts (see for instance, Kose, Otrok, and Whiteman 2003; Moench and Ng 2011; Kose, Otrok, and Prasad 2012, and Förster, Jorra, and Tillmann 2014). This approach differs from those of Pukthuanthong and Roll (2009) and Volosovych (2011), since their PCA methods do not assume the structure of data and they do not focus on cross-asset co-movements.

The second contribution of this study is to extend Connolly, Stivers, and Sun (2005, 2007), who show that, when equity market uncertainty is high, the equity (bond) return is low (high). They estimate the equity-bond correlation conditional upon the market uncertainty computed by the Chicago Board Options Exchange Volatility Index (VIX). They consider higher equity market uncertainty is related to hedging demand for bonds. I examine the equity-bond, equity, and bond co-movements are associated with market uncertainty. Connolly et al. (2005, 2007) focus on the correlations, but this study examines the co-movement conditional upon the change in VIX. My approach is not limited by the relation of two variables. For instance, Connolly et al. (2007) explore the equity and bond market correlation in one country and the equity market correlation between two countries. Our approach, however, the co-movement contains information of more than 30 countries.

This study finds that the equity-bond and equity co-movements have a similar impact on developed equity markets. The developed bond markets present strong heterogeneity after the financial crisis in 2008. More importantly, I observe that the idiosyncratic component dominates the emerging bond market fluctuations and the financial crisis has small effects on the emerging bond markets. The previous literature has not investigated these points. Moreover, the equity-bond, equity, and bond co-movements are affected by the market uncertainty. The new approach in this study allows us to conclude that the equity-bond co-movement is mainly driven by the equity co-movement.

The remainder of this paper is structured as follows: Section 2 explains data; Section 3 discusses the methodology; Section 4 reports the empirical results; Section 5 presents the robustness; and Section 6 provides a conclusion.

## 2. Data and summary statistics

This section explains the data used; 18 advanced economies and 13 emerging market equity and bond market indices based on Cappiello, Engle, and Sheppard (2006) and Panchenko and Wu (2009) are obtained from Thomson Reuters Datastream. Morgan Stanley Capital International (MSCI) country index total returns are employed as equity market returns. Datastream-constructed five-year average maturity government bond index total returns are adopted as bond market returns. If these bond indices are not available, J.P. Morgan emerging bond market index total returns are used. All data series are weekly and denominated in local currencies, since weekly data can avoid the nonsynchronous problem as in Bekaert et al. (2009). The sample period extends from January 2001 to December 2014.

The summary statistics are reported in Table 1 and mean returns and standard deviations are annualized. The entire average return of developed equity markets can be seen to be smaller than that of developed bond markets (3.9% and 5.0%). The average standard deviation of developed equity markets is much larger than that of developed bond markets (20.6 and 3.7).

The returns of emerging equity markets vary across countries. For instance, Egypt is the highest (20.5%), while Israel is the lowest (4.0%). The emerging equity markets are more volatile than the developed equity markets. The average standard deviation of the emerging equity markets is 25.8 but that of the developed equity markets is 20.6. The emerging bond markets are heterogeneous and high inflation countries such as Argentina and Turkey show higher returns (28.7% and 21.2%).

## 3. Methodology

This section describes a model to capture market co-movement. This study adopts a four-level DHFM based on Moench et al. (2013). This model has common, block, subblock and idiosyncratic variation. Let  $X_{bsn,t}$  be the  $n$ -th series in subblock  $s$  of block  $b$  in period  $t$ , and the four-level model is denoted as follow:

<sup>2</sup> Cappiello et al. (2006) extend this study and adopt the asymmetric generalized dynamic conditional correlation model.

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