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# Factor decomposition and diversification in European corporate bond markets

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## ABSTRACT

In this paper we present an analysis of diversification strategies on portfolios of European corporate bonds. From the perspective of a US-based investor we study whether mean–variance diversification strategies change as a result of the introduction of the European Economic and Monetary Union (EMU). Using a comprehensive and unique data set of European corporate bonds we show that country factors are more important than industry factors to describe the cross-section of European corporate bonds. In particular we find that in the Post-EMU period country factors remain important.

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## 1. Introduction

The central question of this study is whether a country or an industry diversification strategy performs better in European corporate bond markets. The answer to this question is of more than an academic interest, with potentially strong implications for the practice of bond fund management in Europe. A related issue that we address is whether diversification strategies change around the start of the European Economic and Monetary Union (EMU) and the introduction of the Euro in 1999. Galati and Tsatsaronis (2001) document a surge of corporate bond issuance in Europe in the immediate aftermath of EMU. If indeed, an industry sector allocation strategy in the European corporate bond markets is to be preferred, then this must be based on changing diversification benefits in portfolios of various allocations Pre- and Post-EMU, as can be discerned ex-post from realized returns. There is anecdotal evidence that fund managers of European bonds were intent on a shift from a ‘country’ to

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a ‘sector’ allocation just prior to EMU. Pieterse-Bloem and Lamedica (1998) report from a survey that 85% of European funds who anticipate changes in their EMU non-sovereign holdings, 70% expect an increase of the share of European corporate and bank bonds by an average of 21%.

To our knowledge ours is the first study that analyzes diversification strategies for European corporate bonds over a long period. Unlike for equities, where the study of return volatility, correlations and comovements, their time-varying properties, factor determination and benefits for international diversification enjoys a long-standing history in financial economics, similar studies for bonds are missing. This is probably in some part due to the more esoteric nature of bond markets compared to equity markets and the fact that data for corporate bonds are not as readily available to academic researchers. Eurobonds are mostly traded over-the-counter as opposed to stocks, which are exchange-traded and for which prices are officially recorded, time-stamped and publicly available. We overcome these impediments and hand-collected a database of 4587 of European corporate Eurobond returns over the period from January 1991 to March 2008, covering nearly a decade before and a decade after the inception of EMU in 1999.

Our contribution to the research field is not to provide a new methodology to study the presumed allocation shift for bonds, but rather to draw on earlier research conducted for equity markets.[1] The benchmark study in this field is Heston and Rouwenhorst (1994), who propose a method for decomposing a set of equity returns into country and industry factors. These authors analyze whether the benefits of European equity portfolio diversification stems predominantly from a pure country or industry selections of stocks. The maintained hypothesis is that the relative impact of country factors should decline in favour of industry factors after the introduction of EMU. Heston and Rouwenhorst (1994) and many other studies typically conclude that country effects generally explain a larger portion of the cross-sectional variation in stock returns.[2] Several studies do detect a rise in the relative importance of industry factors during the late 1990s, e.g. Galati and Tsatsaronis (2001), Flavin (2004), Ferreira and Ferreira (2006) and Phylaktis and Xia (2006). The rise in importance of industry effects versus country effects has to date not been confirmed as a long-term trend though.

From a methodological perspective it is important to note that many of the studies in the earlier literature impose the assumption that country and industry factor loadings are fixed and constant over time. More recent studies overcome these limitations by relaxing either or both assumptions of unit and constant factor loadings. For example, Brooks and Del Negro (2004) use a latent factor model that varies exposures of stocks to country, industry and global shocks by virtue of which they demonstrate that the nested model of Heston and Rouwenhorst (1994) is less well supported. The assumption that firm returns have very little to no dynamic loadings to country and industry factors contrasts with evidence from Bekaert et al. (2009) who propose a dynamic arbitrage pricing theory model. Also Baele and Inghelbrecht (2009, 2010) relax the assumption of constant factor loadings by proposing a generalized autoregressive conditional heteroskedasticity (GARCH) framework that allows both factor exposures and asset-specific volatilities to vary over time. While it is entirely plausible that models that overcome the restrictive assumptions of unit and constant factor loadings provide a better fit, they continue to rely on linear factor specifications. Consequently, results from these studies have by and large left the overall conclusion of the dominance of country factors over industry factors in stock return variation intact. Baele et al. (2010) focus on the time-varying features of correlation and covariance structures in country factors. Other studies from this branch, e.g. Hardouvelis et al. (2006), show that distance, information, common institutions and macroeconomic factors play a role in the explanation of equity return comovements between countries.

Cross-fertilization from the existing equity-based literature on return decompositions and time-varying return distributions to the sphere of bonds has to date been rare. Baele et al. (2004) borrow from the literature of equity return decomposition models to devise a measure for the integration of corporate bond markets. Following Heston and Rouwenhorst (1994), they focus on the identification of country components in individual corporate bond yield spreads over government bonds. However,

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[1] We refer to Catao and Timmermann (2010) for a survey of the various strands of literatures that have built on early work of equity return modelling from the early 1980s.

[2] See for example, Griffin and Karolyi (1998), Rouwenhorst (1999), Cavaglia et al. (2000) and Baca et al. (2000).

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