Time-varying Importance of Country and Industry Factors in European Corporate Bonds

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Abstract

In this paper we study the financial integration in Europe by looking at the time-varying relative importance of country versus industry factors in the European corporate bond market. Using a unique dataset that is representative for the universe of actively quoted corporate bonds, we find that although unconditionally the country factor dominates the industry factor, there is substantial time variation and no trend towards full integration. The variation corresponds with several important events in the European financial market integration, such as the introduction of the Euro and the sovereign debt crisis.

JEL-codes: G12, G15, F36

Keywords: market integration, corporate bond markets, factor decomposition, dynamic models

*We thank the particpants of the European Sovereign Debt Crisis conference in Monaco, with a special thanks to the discussant Evren Örs. We also thank the participants of the Erasmus Brownbag Seminar and the APG Quantround Seminar. Corresponding author. Erasmus University Rotterdam, Erasmus School of Economics. PO Box 1738, 3000DR, Rotterdam, the Netherlands. E: qian@ese.eur.nl; T: +31 10 408 1285; F: +31 10 408 9165.

I Introduction

Financial integration has been a critical goal of the European countries for decades. After the start of the European Economic and Monetary Union (EMU) and especially the adoption of Euro as the single currency, a well integrated capital market has been of significant importance for Europe. The integration process in Europe has experienced a number of major events over the past decades. On the one hand, the start of the EMU especially the introduction of Euro is a ground-breaking step towards better financial integration in Europe. On the other hand, the recent global financial crisis and the European sovereign debt crisis interrupt the integration process dramatically. The relative importance of country versus industry factors has been used as a means to determine the success of creating a single financial market in the monetary union. The extent of the integration of capital markets under the single currency can be measured by the degree in which the importance of country effects in asset returns fade (Baele et al., 2004). Therefore, in this paper, we are going to study the financial integration process in Europe by looking at the relative importance of country versus industry factors in the European corporate bond market from January 1991 to January 2013.

There are numerous studies that try to measure integration in the equity markets. Hardouvelis et al. (2006) estimate a conditional asset pricing model with time-varying degrees of integration to measure the importance of EU-wide market and currency risks relative to country-specific risk. Bekaert and Harvey (1995) examine the market integration by modelling time variation in expected returns induced by changes in covariance with a single global factor. Eiling and Gerard (2007) model market integration by the proportion of return variance explained by a single global factor relative to the total variance of a country's returns. Bekaert et al. (2013) measure a country's segmentation by an industry weighted average of the absolute earnings yield differences. Their results show that the adoption of Euro as well as the anticipation of the it has minimal effects on market integration. For the corporate bond market, Baele et al. (2004) develop several measures for European corporate bond integration. They find that the European corporate bond market is relatively well integrated since the EMU. However, their data ends in 2003 which excludes the possibility to assess the influence of the recent financial crisis. In this paper, we aim to look at the evolution of financial integration in the European corporate bond market by analyzing the relative importance of the country versus industry factors in explaining corporate bond returns from January 1991 up to the recent time period of January 2013.

This paper adds to the relatively bare field of financial integration studies for bonds by analyzing the relative importance of the country versus industry factors for European corporate bond returns. Based on the time-series of country and industry betas, we are able to study how the financial integration process evolve among the EMU countries. Relative to the existing literature, our paper makes two important contributions. First, we make both country and industry factor loadings time-varying. Secondly, we use the time variation to examine the effects of several critical events on the relative importance of country versus industry factors which indicate financial integration process in Europe. To our best knowledge, this is the first study that brings the analysis of the importance of country and industry factors in corporate bond returns to the territory of time-varying betas and the global financial crises. By manually collecting a unique and comprehensive dataset of the European corporate bond market, we are able to look into the dynamic properties of country and industry factors in Europe over a period of more than two decades. Through break point analyses we identify which events have left significant marks on the European corporate bond market. The creation of the single currency and the global financial crisis which morphs into a sovereign debt crisis in the Euro zone are two significant cases we expect to be important ex-ante.

The benchmark study for the relative importance of country and industry factors is Heston and Rouwenhorst (1994). They introduce a factor decomposition model with static and unit betas, which they apply to equity markets. They find that country factors play a bigger role in explaining stock returns than industry factors. A great number of studies have followed since using the same decomposition methodology or a variant thereof to analyze the relative importance of the two factors for stocks. The empirical results of these studies show in general that country effects explain a bigger proportion in return variation than industry factors until the turn of the millennium (e.g.: Griffin and Karolyi, 1998; Rouwenhorst, 1999; Cavaglia et al., 2000; Brooks and del Negro, 2004). After 2000, industry factors are documented to play an increasingly larger role in explaining equity returns (e.g.: Baca et al. 2000; Cavaglia et al., 2000; Adjaoute and Danthine, 2003; Flavin, 2004; Phylaktis and Xia, 2006). For Europe, where this result comes through quite strongly, the turning point coincides with the introduction of the Euro.

While the question of financial integration and thus the relative strength of country and industry effects in explaining returns is equally important for bond as for equity markets, the number of bond studies is vastly smaller than for stocks. Varotto (2003) and Pieterse-Bloem and Mahieu (2013) apply the standard decomposition methodology of Heston and Rouwenhorst (1994) to corporate bond returns. Both studies find that country factors dominate over industry factors and other bond-related factors such as credit rating, maturity and liquidity. Pieterse-Bloem and Mahieu (2013) compare the periods before and after the introduction of the Euro for the European corporate bond market from January 1991 to March 2008. They find that post-EMU, country factors are still dominant, mostly because the importance of industry factors diminishes under the single currency. However, the sample period of Pieterse-Bloem and Mahieu (2013) stops in March 2008 and thus only captures the early months of the global financial crises and none of the Euro zone sovereign debt crisis. As far as we know, there are not many studies, not even for stocks, that address the relative importance of country versus industry factors in the crisis or a high volatility period. Brooks and Del Negro (2004) is one of the few examples. They find that after the IT bubble, country factors still play an important role in equity portfolio diversification. This result suggests that at times of crises and thereafter, the importance of industry factors is set back. This is also confirmed by the recent study of I-Chou and Zhou (2013), which finds that country factors play a more important role in the global financial crisis period in the equity market. There are no such studies for bond returns according to our knowledge. Therefore, by including more recent periods of time, we get the opportunity to look into the influence of the recent crisis on the process of financial integration in the corporate bond market.

Concerning the methods of research, both Varotto (2003) and Pieterse-Bloem and Mahieu (2013) apply unit and fixed factor betas rendering their results quite contingent on the sample period selection for calculating the factor loadings. In equity markets, there are several studies for stocks that make factor loadings different and time varying. Marsh and Pfleiderer (1997) relax the assumption in Heston and Rouwenhorst (1994) that each stock has the same exposure to country and industry factors. They apply an iteration approach to allow the sensitivities to country and industry factors to differ across each stock. They find a more important role for industry factors than Heston and Rouwenhorst (1994). However, the betas in March and Pfleiderer (1997) are still time-invariate. Studies like Bekaert and Harvey (1997) and Fratzscher (2002) make betas conditional on certain structural information variables. Baele (2005) models betas conditional on a latent variable. Baele and Inghelbrecht (2009) combine the two approaches and propose a structural regime-switching volatility spillover model, which allows for factor exposures and asset-specific volatilities to vary over structural changes and temporary business and financial fluctuations. They find that the increasing importance of industry effects compared to country effects is just a short-lived, temporary phenomenon. Not accounting for time-varying factor exposure leads to large errors in measuring country and industry risks. These studies show that time-varying factor loadings are methodologically preferred to static and unit factor loadings. This suggests that it is of significant importance to apply time-varying factor loadings in analyzing bond returns too.

The method we use in this paper to make betas time-varying is a multivariate GARCH specification of the standard factor decomposition model of Heston and Rouwenhorst (1994). This method does not impose any pre-defined structures on the factor loadings. The dynamic properties of the factor loadings can be directly observed. This makes it better suited for our research question than the methods used to calculate time-varying betas in some other studies (e.g.: Bekaert and Harvey, 1997; Fratzscher, 2002; Baele, 2005).

Our main results show that in general financial integration of the corporate bond market has had its ups and downs, and far from complete today. It is noticeable that country factors are still dominant after the EMU and become even more important after the crisis despite years of financial market integration in the monetary union. However, the relative importance of country and industry factors changes over time, suggesting that there is significant time variation in the country and industry betas of European corporate bond returns. The break point analysis of the country and the industry factor loadings further confirms that several events including the start of EMU and the recent financial crisis significantly change the country and industry factor loadings at both the absolute and the slope level. Country factors reduce their importance relative to the industry factors, which indicates that EMU fosters financial integration at first when also the industry composition of countries becomes more specialized. However, after the financial crisis in 2007, country factors regain their importance in explaining bond returns over the industry factors, showing that this shock is a major setback to integration and leads to financial fragmentation in the Euro zone. Similar results are obtained after excluding Germany or the financial and funds sector to reduce the dominant positions of one country or industry in our sample. If we take a closer look at the relative importance of country versus industry factors by dividing the countries into four groups, we observe that different countries in different economic and financial stages of development have different trends of integration.

The rest of the paper is organized as follows. Section II develops five main hypotheses. Section III explains how we prepare the data and gives the summary statistics of our final bond sample. In Section IV we outline the main methods that we employ for our study. We discuss our main findings in Section V. In Section VI we conduct two additional tests, excluding the most dominant country (Germany) and most dominant industry (Financial and Funds). The last section concludes the paper.

II Hypothesis Development

HYPOTHESIS 1: Unconditionally, country factors dominate industry factors in explaining the variance of European corporate bond returns.

Pieterse-Bloem and Mahieu (2013) use the standard factor decomposition of

Heston and Rouwenhorst (1994) with unit and time invariant betas. They find over their sample period of January 1991 to March 2008 as a whole that country effects explain more of the variance than industry effects in European corporate bond returns. Extending this analysis to January 2013 incorporates more of the global financial crisis, which then turns into a sovereign debt crisis in the Euro zone. The European sovereign debt crisis results in an increased focus on country specific issues and reassessment of the differences in the creditworthiness of countries. Therefore, ex ante it can be expected that increasing the number of observations in the global financial crisis period has the effect of increasing the importance of country factors relative to that of industry factors. If true, then over the full sample period that our dataset comprises, country effects will continue to dominate industry effects. We test this hypothesis with the standard Heston and Rouwenhorst (1994) decomposition method using the data from January 1991 to January 2013.

HYPOTHESIS 2: There is significant time variation in the country and industry betas of European corporate bond returns.

Country and industry betas of stock returns have proven to contain significant time-varying properties and we expect ex ante that the same holds for corporate bond returns. Specifically, studies like Bekaert and Harvey (1997) illustrate the time variation in country and industry effects for equity. Given that a company's equity is sensitive to time variation in factor loadings, we also expect this to be true for a company's debt.

HYPOTHESIS 3a: After the start of EMU, country factors become less important relative to industry factors.

We argue that after the start of the EMU and the introduction of one single currency in Europe, countries are more integrated within the EMU. Therefore, country factors fade and industry factors gain relative importance after EMU.

HYPOTHESIS 3b:After the start of the global financial crisis, country factors regain importance over industry factors.

Since the effect of the global financial crisis on the relative importance of country and industry factors has thus far not been analyzed, we formulate an ex ante expectation from economic intuition. Given that the global financial crisis morphs into a sovereign debt crisis in the Euro zone, we expect ex ante to see the this impact through rising country factors in European corporate bond returns. However, since the crisis starts in the financial sector and since this is by far the largest sector of the European corporate bond market, we also expect industry factors to increase, though not by as much as county factors do in this period.

HYPOTHESIS 4: There are several shocks to the financial integration process in Europe which impact both the level and the direction of country and industry betas of European corporate bond returns.

There are several major events in our time sample which directly impact the financial integration process in the EMU. For example, the start of EMU and the global financial crisis are documented to be events of large magnitude for the European financial market. We expect ex ante that there are several break points which significant influence the level (direct effect) and trend (anticipation effect) of the relative importance of country versus industry factors. We test this hypothesis by first identifying the potential break points using rolling-window break point analysis. Secondly, based on the most significant dates obtained from this, we regress a set of time dummies and time trends dummies on the estimated time-varying country betas using the break points we identified.

HYPOTHESIS 5: Core, periphery and non-Euro countries show different trends in the country and industry betas from January 1991 to January 2013.

The economic development stages among countries in the EMU are quite diverse. The same goes for the financial market development. Eiling et al., (2012) find that for markets with stronger economic linkages, industry effects dominate both before and after the introduction of the Euro. For countries with weaker linkages, country factor dominants before EMU and industry factors take off after EMU. Pieterse-Bloem and Mahieu (2013) observe in the case of European corporate bonds that the country effects of Southern or peripheral countries swell in the latter months of their sample. Based on this latter, but quite preliminary observation, we expect ex ante that in the Euro sovereign debt crisis the country effects of peripheral euro zone countries, rather than those of the core countries, drives the country betas higher. The UK and Sweden are part of EU but not among the euro countries. By looking at these two countries, we can see whether the integration process is widespread and is not restricted to countries belonging to the Euro zone.

III Data

Country and industry return indexes are required for the empirical analysis of the importance of those factors in return variation. For equities, those types of indexes are readily available, but this is not the case for Eurobonds. This may play a role in the fact that contributions on equity returns outnumber contributions on bond returns in the country versus industry debate.

In absence of the required Eurobond indexes, we utilize the bond database used by Pieterse-Bloem and Mahieu (2013) and extend the daily prices of the bonds to January 2013 from Bloomberg. This set of bonds is representative for the actively quoted Eurobond market[1]. The price series are all collected in

[1] Whenever a Eurobond is issued, Bloomberg registers the bond with its own ISIN and when they are quoted a price by one of the banks that is a price source provider. Bloomberg has practically all the banks that are active in the primary and secondary market as a price source provider. Therefore, Bloomberg captures the universe of actively quoted Eurobonds. We have made an indiscriminate selection from that universe. We omit Eurobonds that do

their local currency. Since our research is based on one common currency, we also collect end-of-month exchange rates of the local currencies against the US dollar (USD) from Datastream.

We follow Pieterse-Bloem and Mahieu (2013) in the creation of USD country and industry return indexes from the individual corporate bond price series. Holding-period (monthly) returns for individual Eurobonds are calculated for each month from the end-of-month dirty prices, using clean prices and accrued interests. We assume that coupon re-investments take place at the beginning of the following month. These local currency returns are then converted to USD returns using the relevant spot USD exchange rates.

The final data sample includes 8,446 corporate bonds covering the period from January 1991 to January 2013. The data set constitutes a closed set, since each Eurobond belongs to one country and one industry. In total, we have eight country indexes and seven industry indexes. The countries that are represented in the analysis are Belgium/Luxembourg (BL), France (FR), Germany (GE), the Netherlands (NE), Italy (IT), Spain (SP), Sweden (SW) and the United Kingdom (UK). The industries that are represented are financial and funds (FF), government institutions (GI), consumer goods (CO), communications and technology (CT), basic materials and energy (BE), industries (IN) and utilities (UT).

< Insert Table 1 here >

Table 1 shows how the bonds distribute over different countries and industries. Panel A of Table 1 describes that Germany constitutes 37.8% in our sample, which is the largest proportion of Eurobonds among the eight countries. France and the United Kingdom follow with 15.4% and 15.1% of total Eurobonds each. For the industries, Panel B shows that the financial and funds

not provide a price quote for at least two consecutive months from our dataset.

sector dominates with 67.0% of corporate bonds in the whole sample. On a value-weighted basis, the dominance of Germany and the financial industry is largely reduced. Panel D indicates that the value-weighted share of Germany now consists of only 19.5% among the whole sample. On a value-weighted basis, the United Kingdom and Italy are among the largest issuing countries besides Germany. Among the industries the dominance of the financial industry is likewise reduced. On a value-weighted basis the financial sector still accounts for 43.4% of the sample.

Table 1 indicates that each country has at least one bond in each industry. This indicates that there are good diversification opportunities in our sample and that all countries are industrially diversified. Nevertheless, certain patterns of industry concentration in the European countries are visible from Panels C and D. For example, France is more concentrated in the consumer and industrial sectors. Germany, the Netherlands and Sweden have some concentrations in the government sector. The United Kingdom is relatively concentrated in consumers and utilities. All countries have relatively heavy weights in the financial industry.

< Insert Table 2 here >

Table 2 lists the summary of the monthly percentage mean and standard deviation of European corporate bond returns classified by country (Panel A) and by industry (Panel B). The table shows that although country and industry sector returns are very similar, the variation in average returns and return volatility is larger among the country indexes than the industry indexes. Judging from the value-weighted mean country index returns, above-average performing countries are the United Kingdom and Spain, while the Germany and France are below the average. For the value-weighted industry index mean returns, the best performing sector is utilities and the industries sector is the worst. On a value-weighted basis, the difference between the highest and lowest mean index return among all countries is 0.21%, while the difference is only 0.09% among all industries. The range in the standard deviation of the returns is 0.49% for all countries and 0.18% for all industries. The correlation matrixes in the table indicate that different countries are less correlated with each other than different industries are, both on an equal and a value-weighted basis. The difference between the equally-weighted and value-weighted indexes is not large and does not change these observations.

IV Methods

The main focus of this paper is to make country and industry factor loadings time-varying. There are several methods available in the literature, mainly applied to equity markets. Mergner and Bulla (2008) apply a state space model using the Kalman filter algorithm to model and estimate the time-varying structures of betas. However the state space model needs to impose certain structures on the betas and is computationally more demanding. The Markov switching framework by Hamilton (1989, 1990) can also be used to introduce time variation in betas. The implicit assumption that models switching between different regimes is usually that the data result from a process that undergoes abrupt changes, induced, for example, by political or environmental events. Given that the main goal of our paper is to analyze the time-series pattern of the factor loadings, we prefer not to impose any regime structures to the factor loadings as in Markov switching model. Moreover, the Markov switching model is rarely used to model time-varying betas because it is relatively difficult to estimate.

Given our research question, we opt for the multivariate GARCH specification as our basic tools to estimate time-varying betas. Since we mainly focus on two episodes of especially high volatility namely the start of the EMU and the global financial crisis, it is natural to have betas conditional on market volatility. The generalized autoregressive conditional heteroskedasticity (GARCH) model was first introduced by Bollerslev(1986). More specifically, we employ the bivariate BEKK(1,1,1) by Engle and Kroner (1995) which has the advantage that the conditional covariance matrix is guaranteed to be positive-definite by construction. Compared with other methods, the GARCH based beta estimator has the advantage of taking into account the potential conditional heteroscedasticity of the returns[2].

A Constructing Country and Industry Factors

We apply a two-step approach. In the first step, we employ the Heston and Rouwenhorst (1994) method to construct the country and industry factors using cross-sectional regressions. For each month from January 1991 to January 2013, the asset returns for the individual bonds that exist in that month can be decomposed into a country, industry, and an idiosyncratic component, using the following regression equation.

$$r_{n,t} = \alpha + \sum_{j=1}^{j} f_{j,t} I_{nj,t} + \sum_{k=1}^{k} f_{k,t} I_{nk,t} + \varepsilon_{n,t} \tag{1}$$

where $r_{n,t}$ represents the vector of individual bond returns of company n existing in month t. $I_{nj,t}$ is an industry dummy variable which equals one if asset n belongs to industry j at time t and zero otherwise. Likewise, the country dummy $I_{nk,t}$ equals one if asset n belongs to country k in period t and zero otherwise. The coefficients $f_{j,t}$ and $f_{k,t}$ capture the returns that can be assigned to a specific industry and country respectively.

Equation (1) cannot be estimated in its present form because it is uniden-

[2] For robustness, we also run all our analyses using rolling window regressions to account for the time variation in the betas. The results are qualitatively similar; results available upon request.

tified due to perfect collinearity. Intuitively, this is because every bond belongs to both an industry and a country, so that industry and country effects can be measured only relative to a benchmark. To resolve the indeterminacy, we follow Heston and Rouwenhorst (1994) and impose the restriction that the weighted sum of industry and country effects equal zero at every point in time:

$$\sum_{j=1}^{j} w_{j,t} f_{j,t} = 0 \tag{2}$$

and

$$\sum_{k=1}^{k} v_{k,t} f_{k,t} = 0 \tag{3}$$

where $w_{j,t}$ and $v_{k,t}$ represent the weight of industry j and country k in the total universe of Eurobonds at time t. In this paper, we focus on market value weights[3]. The value weights are constructed from the USD equivalent of the amounts issued. Imposing such restriction is equivalent to measuring the size of each industry and country relative to the average size. The country and industry weights sum to unity:

$$\sum_{j=1}^{j} w_{j,t} = 1 \tag{4}$$

and

$$\sum_{k=1}^{k} v_{k,t} = 1 \tag{5}$$

The estimation process decomposes the bond returns into country and industry return indexes. First, $R_{K,t}$ represents the value-weighted index return of country K and can be decomposed as follows:

[3] Equal weights give qualitatively similar results. Results are available on request.

$$R_{K,t} = \hat{\alpha} + \sum_{j=1}^{j} \hat{f}_{j,t} \sum_{n=1}^{N} w_{nk,t} I_{nj,t} + \hat{f}_{k,t} \tag{6}$$

where $w_{nk,t}$ represents the weight a particular Eurobond n has in country k at time t.

In words, the value-weighted index return of country k can be decomposed into three parts: a component which is similar to all countries $\hat{\alpha}$, the average industry effects of the Eurobonds that make up its index and a country-specific component $\hat{f}_{k,t}$. Similarly, the value-weighted index return of industry J can be decomposed as follows:

$$R_{J,t} = \hat{\alpha} + \sum_{k=1}^{k} \hat{f}_{k,t} \sum_{n=1}^{N} w_{nj,t} I_{nk,t} + \hat{f}_{j,t} \tag{7}$$

where $w_{nj,t}$ represents the weight a particular Eurobond n has in industry j at time t.

B Creating Time Varying Betas

In the second step, we employ the time-series context. More specifically, the time series of the pure factor returns obtained from the cross-sectional regressions in the first step are used to estimate the time-varying factor loadings (unconstrained betas) for each bond. To allow country and industry factor loadings to vary and thus obtain a time-series of betas, we utilize the multivariate GARCH-BEKK model. Two different MGARCH structures are often used in the literature: BEKK and DCC. The bivariate BEKK(1,1,1) by Engle and Kroner (1995) has the advantage that the positive-definite constraint of the conditional covariance matrix is guaranteed by construction. In this paper, we choose the GARCH-BEKK as our basic model to obtain covariance between and variance of the individual bond and factor returns.[4]

First, we perform the MGARCH analysis on individual bond returns and the country factor that are obtained in the first step. With the conditional covariance and variance of bond returns and country factor, we can estimate the conditional country beta for each bond using the following equation:

$$\beta_{n,t}^{k} = \frac{Cov(r_{n,t}, f_{k,t})}{var(f_{k,t})} \tag{8}$$

Similarly, we obtain the conditional covariance between and variance of individual bond and industry factors by estimating the MGARCH model on bond returns and the industry factor. The conditional industry beta can then be calculated as:

$$\beta_{n,t}^{j} = \frac{Cov(r_{n,t}, f_{j,t})}{var(f_{j,t})} \tag{9}$$

V Results

A Unconditional Results

The European corporate bond returns in our sample are decomposed into pure country effects and a weighted average sum of seven industries according to the Heston and Rouwenhorst (1994) method in the first step of our analysis. Likewise, we decompose the returns into pure industry effects and a weighted average sum of eight countries.

< Insert Table 3 here >

[4] We apply the bivariate-GARCH model instead of the trivariate-GARCH model because the country factor and the industry factor are orthogonal to each other by construction in our analysis. In addition, bivariate-GARCH has fewer estimated variables than trivariate-GARCH.

The first column of Table 3 shows the decomposition results of the returns for the full sample period from January 1991 to January 2013. The variance of the pure country effects outweighs that of pure industry effects by 2.67 times. Compared to the variance of pure country effects in the country indexes (Panel A), the variance of pure industry effects in the industry indexes (Panel B) is more homogeneous. In addition, the weighted sum of eight country effects explains more of the variance in the industry index returns than the sum of the seven industry effects do in the country indexes returns (0.46 versus 0.13). The results in Table 3 indicate that country effects play a bigger role than industry effects during the whole period from January 1991 to January 2013. This confirms the results of Pieterse-Bloem and Mahieu (2013) for the extended period and supports our Hypothesis 1.

The second and third column of Table 3 shows the standard decomposition model for the period before and after the start of global financial crises in July 2007. It can be directly compared with the first column in Table 3. The results show that on average, the ratio of the variance of the pure country and industry effects increases from 2.56 in the pre-crisis period to 3.04 in the post-crisis period. The variance of the pure country effects for France, Netherlands and Spain decreases in the post crisis period while those of Belgium, Germany, Italy and Sweden increase. The variance of pure country effects of the United Kingdom are relatively similar in the two periods. As for the industry indexes, the variance of the pure industry effects all decrease slightly in the post-crisis period except for the government institution sector. The largest drop in pure industry effects occurs with respect to the financial sector. This is quite a remarkable result given that the financial sector is the source of the crises and yet the variance of returns of precisely this sector halves.

B Time-varying betas

The decomposition results from Table 3 give us a general picture of the relative importance of the country versus industry factors before and after the financial crisis using static and unit betas. In order to get the relative importance across time, we need to generate the time pattern of the two factors throughout the whole sample period. To this end we apply the MGARCH model in the second step of our analysis for the estimation of the time-varying betas. The exact movement of the country and industry betas over the sample period can be observed by plotting the factor loadings over time, as per Figure 1.

< Insert Figure 1 here >

Figure 1 shows the median value of the time-series country and industry loadings obtained from the MGARCH model for the period from January 1991 to January 2013 for all bonds. We use value-weighted country and industry indexes in the first step of the estimation process. The country betas from the MGARCH model (in the left graph) decrease around 1999 when the Euro becomes a real currency and a single monetary policy is introduced under the authority of the ECB. However the country betas increase significantly around 2007 when the financial crisis starts. Figure 1 gives support to Hypothesis 2 that country and industry betas are time varying.

< Insert Figure 2 here >

Figure 2 shows the relative importance of country versus industry factors over the whole sample period from January 1991 to January 2013. It does so by taking the difference between the absolute value of the country factor loadings and the absolute value of the industry factor loadings and dividing this difference by the absolute value of the industry factor loadings from January 1991 to January 2013. The country and industry betas are obtained from the MGARCH model. The graph shows that the country factors become less important relative to the industry factors around 1996 and level off afterwards. After 2008, country factors regain their relative importance over industry factors. There are several big swings after 2010. We argue that although the recent crisis starts from the financial industry which composes nearly half of our total bond sample on a value-weighted basis, it morphs into a sovereign debt crisis in the Eurozone which results in an increased focus on country specific issues. Therefore, industry effects are set back relative to country effects during the crisis. To sum up, the results of the relative importance of country versus industry factors in Figure 2 support both Hypothesis 3a and Hypothesis 3b.

After getting the time-varying country and industry betas, we would like to establish where the significant break points are in the sample. In order to identify the break points, we conduct the following rolling-window regressions.

$$\beta_t^{'} = \alpha_1 D_1 + \alpha_2 D_2 + \gamma_1 D_1 T_t + \gamma_2 D_2 T_t + \varepsilon_t \tag{10}$$

where $\beta_t^{'}$ are the time-series country factor loadings or the relative importance of the country versus industry factors $(|\beta_c| - |\beta_i|)/\,|\beta_i|)$ from the GARCH-BEKK model

We take a rolling sample of 50 observations and check whether the middle point within the 50 months is a breakpoint by comparing the coefficient between the two periods using the F-test. For example, for the first regression, we take period 1 to 50. D_1 equals one if it falls into period from time 1 to 25 and zero otherwise. D_2 is the opposite of D_1. It equals one if it falls into period 26 to 50 and zero otherwise. T_t is the time. The estimated coefficients α_1 and α_2 allow us to draw inferences on different levels of beta exposures, whereas the estimated coefficients γ_1 and γ_2 measure the difference in time trends in the two periods. We then compare if α_1 and α_2 (γ_1 and γ_2) are significantly different from each other with F tests.

< Insert Figure 3 here >

< Insert Figure 4 here >

Figure 3 and Figure 4 shows the rolling F-statistics for the country betas and the relative importance of country versus industry factors respectively. The blue line represents the F statistics of comparing the coefficients α_1 and α_2 and the green line stands for the F statistics of comparing the coefficients γ_1 and γ_2 . We add the critical line of 7.18 representing the 99% confidence interval. The most significant dates are marked in the text boxes.

The results in Figure 3 show that there are six most significant break points in our sample which impact the country betas and Figure 4 indicates there are five for the relative importance of country versus industry factors. Both results support Hypothesis 4 that there are several shocks to the financial integration process in Europe which impact both the level and the direction of country and industry betas of European corporate bond returns.

Table 4 presents the exact months of the identified breakpoints for the relative importance of country versus industry factors. Interestingly, all breakpoints we find in the data are clearly related to major economic events in our sample period including the start of EMU and the global financial crisis. February 1994 could be matched with the signing of the Maastricht Treaty. In 1992, the Maastricht Treaty was signed which states the completion of the EMU as a formal objective. It came info force on November 1, 1993. In December 1995, the name of the single currency in EMU was decided and the transition periods are set. The anticipation of Euro adoption could be matched with our second break point of June 1996. In January 1999, the euro became a real currency and a single monetary policy was announced. Therefore, the third break point of July 1999 could be the result of the introduction of Euro. November 2007 and

December 2009 could be linked to the global financial crisis and the sovereign debt crisis respectively.

After obtaining the dates with the most significant F statistics, we analyze the directions of coefficients before and after these points. For this purpose, we apply the break point analysis to the relative importance of country versus industry factors using the five dates in Figure 4. Our main regression equation for the second step break point analysis can be described as follows:

$$
\begin{aligned}
\beta_t^{'} \quad = \quad & \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \\
& \gamma_1 D_1 T_t + \gamma_2 D_2 T_t + \gamma_3 D_3 T_t + \gamma_4 D_4 T_t + \gamma_5 D_5 T_t + \gamma_6 D_6 T_t + \gamma_7 D_7 T_t + \varepsilon_t
\end{aligned}
\tag{11}
$$

where D represent the dummy variables among which D_1 equals 1 if it is from 1991.1 to 1994.2 and zero otherwise, D_2 equals 1 if it is 1994.3 to 1996.6 and zero otherwise, D_3 equals 1 if it is from 1996.7 to 1999.7 and zero otherwise, D_4 equals 1 if it is from 1999.8 to 2007.11 and zero otherwise, D_5 equals 1 if it is from 2007.12 to 2009.12 and zero otherwise, D_6 equals 1 if it is from 2010.01 to 2013.1 and zero otherwise.

< Insert Table 5 here >

Table 5 reports the break point analysis of the relative importance of country versus industry factors using the five break points identified in Figure 4. We see that the five events in our sample significantly changed the relative importance on the absolute level at 95% confidence level. On the slope level, except February 1994, all break points significantly impact the relative importance at 95% confidence level. The directions of the coefficients are as expected.

C Cross-sectional results

Figure 1 and 2 shows the average country and industry betas for the bonds from all countries in our sample. However, there are large economic and financial differences among the countries in the EMU. Therefore, we divide the countries into four groups. The first group consists of Germany and Netherlands. The second group is France and Belgium (Luxemburg). These two groups are considered core countries in the EMU. The third group includes Spain and Italy as the periphery countries, and the fourth group is Sweden and UK which are the non-Euro countries in our sample. We expect to see that the core countries and peripheral countries have different time series patterns of country and industry betas and particularly that the country factors of the peripheral countries rise during the financial crisis as they are most effected by the Euro sovereign debt crisis. By looking at the countries like UK and Sweden, we could see whether the integration process is widespread and is not restricted to Euro countries.

< Insert Figure 5 here >

Figure 5 shows the average country betas for the four groups. The dark blue line stands for Germany and The Netherlands, the green line for France and Belgium, the red line for Spain and Italy and the light blue for Sweden and UK. The results show that Germany and the Netherlands have similar patterns for country betas as France and Belgium. The country betas of these two groups decrease around 1998 and increase significantly after the crisis. However, Germany and the Netherlands show bigger jumps upwards during the crisis. Country betas of the peripheral countries increase in 2000 and remain stable afterwards. They become quite volatile after the crisis. For Sweden and UK, countries betas are quite stable before 2005. They increase after 2005 but decrease significantly after the crisis.

< Insert Figure 6 here >

Figure 6 shows the relative importance of country versus industry factors for the four groups using. The dark blue line stands for Germany and The Netherlands, the green line for France and Belgium, the red line for Spain and Italy and the light blue for Sweden and UK. The relative importance of country versus industry betas for core countries and peripheral countries show similar patterns across time. They decrease after 1997 and increases after 2000. Before 2005, country betas decrease its power against industry betas by a small extent. After the financial crisis, country betas start to regain its power over the industry betas quite dramatically. Around 2009, the relative importance of country versus industry factor decreases significantly with some dramatic ups and downs afterwards. For Sweden and UK, the relative importance of country versus industry factors decrease significantly after 1995 and remains stable after 1997. After the crisis, the trend shows some small-scale ups and downs.

To sum up, both the classified country betas in Figure 5 and the relative importance of country versus industry in Figure 6 show that patterns for different country groups vary which partially support Hypothesis 5. The results show similar trends for core and peripheral countries across time. However Germany and the Netherlands show larger impacts from the crisis which is unexpected. The fact that the country betas of core countries rise more significantly that those of peripheral countries does not fully support our Hypothesis 5 which expect the country effects of peripheral euro zone countries, rather than those of the core countries, drives the country betas higher during the recent crisis. We suspect that it is due to the break-up risks of EMU igniting a flight to safety to the core countries during the crisis. Sweden and UK, the non-Euro countries in our sample, show different trends than the Euro countries suggesting that the integration process is not that widespread and is restricted to the Euro countries.

VI Additional Analyses

In this section, we conduct two additional analyses. We exclude Germany and financial and funds industry respectively in our sample to reduce the dominant effects of one country (Germany) and one industry (Financial and Funds) in our sample. We exclude the months from January 1991 to December 1992 due to limited data availability after these exclusions.

A Germany

Germany has the largest proportion $(37,84\%)$ of the number of bonds in our sample. Omitting Germany from other countries could reduce the dominant effects of Germany in our analysis. After excluding Germany from our sample, the financial industry still dominates the sample[5].

<Insert Figure 6 here>

The left graph in Figure 6 shows the average value of the country betas from January 1993 to January 2013 after excluding Germany from our sample in a blue solid line and the average country betas for all bonds in a dotted red line as a reference to our earlier results. The right graph in Figure 6 shows the average value of industry betas for all bonds in a dotted red line and for those excluding Germany in a solid blue line for the same period of time. The results excluding Germany are generally similar to those of the whole sample. Country betas decrease after 1998 and increase significantly after the crisis. Industry betas increase around 2000 and decrease significantly after 2006. After the crisis, industry betas increase for a short while but decline dramatically very

[5] The results are not reported but available upon request.

soon thereafter. We argue that the dominant position of Germany in our sample does not affect the results much.

B Non-financial versus financial sample

Financial companies dominate in our sample with 43.3 percent on a value-weighted basis and they are also the most heavily impacted by the global financial crisis. Therefore excluding financial and funds from our sample allows to see whether financial industry significantly influences the relative importance of country versus industry in our analysis. After excluding the Financial and Funds industry, Germany no longer dominates our data sample. France consists of the biggest proportion and is followed by the United kingdom.

< Insert Figure 7 here>

The left graph in Figure 7 shows in a blue solid line the median value of the country betas after excluding Financial and Funds and in a dotted red line the average country betas for all bonds as a reference from January 1993 to January 2013. The right graph in Figure 7 shows the industry betas excluding (in a blue solid line) and including (in a dotted red line) Financial and Funds for the same period of time. Country betas for bonds excluding Financial and Funds in our sample decrease around 1996 and increase significantly after the crisis. Industry betas are stable with some small but steady increase across the time. If we compare the results for all bonds in our sample, the pattern for countries betas are similar with and without Financial and Funds industry. However, excluding Financial and Funds industry significantly affects the industry betas across time. Industry betas show little variance across time after excluding Financial and Funds. We argue that financial industry is the most affected industry during the crisis and absorbs most of the impact.

VII Conclusion

In this paper, we analyze how the financial integration process evolves from January 1991 to January 2013 by looking at the relative importance of country versus industry betas in the European corporate bond market. To our knowledge, our paper is the first to apply time-varying factor loadings to the relative importance of country versus industry factors in the European corporate bond market over a relative long and recent period of time. It is of significant importance to measure the success of the EMU and the introduction of the Euro in creating one single integrated capital market in Europe by studying the relative importance of country versus industry factors across time. In addition, the trends of the time-series country and industry betas are able to demonstrate how the integration process in Europe is influenced by different events within the sample period. Although not the focus of this paper, to study whether country or industry factors play a more important role is also important for understanding the optimal international asset portfolio diversification. Therefore, to know the relative importance of country versus industry effects in returns across time can be very beneficial for market practitioners and policy makers alike.

We manually collect daily prices of European corporate bonds yielding a unique dataset representative of the entire actively quoted corporate bond universe. Different from previous studies on bond returns which address the country versus industry debate using static factor loadings, we apply a multivariate GARCH model to obtain time-varying country and industry loadings. We are thus able to analyze how the relative role of country versus industry factors in explaining bond returns change with time in the European corporate bond market. These methods suit our research design, as we can directly observe the time pattern of the relative importance of country versus industry factor throughout the sample period.

The main results of the paper show that although country factors dominate unconditional, there are large time variations in the relative importance of country versus industry betas. The break point analyses indicate that there are several significant break points in our time sample which affect the relative importance of country versus industry factors so the trends are highly conditional on market circumstances. The start of EMU and the recent financial crisis are two important events subsequently for the integration and disintegration of the European corporate bond market. The relative importance of country versus industry factors across time shows that country betas decrease in importance after the start of the EMU indicating ongoing financial integration in Europe. However, after the financial crisis in 2007, country factors increase significantly relative to industry factors in explaining bond returns. This could signal that the recent crisis stops the integration process in the EMU and the capital market becomes more fragmented. The fragmentation persists right to the last observation, which is more then five years after the start of the crisis. The results generally hold if we exclude Germany or financial and funds from our sample. The core, periphery and non-Euro countries in our sample behave differently during the integration process. Germany and the Netherlands show larger impacts from the crisis than France, Belgium, Spain and Italy which is unexpected. Sweden and UK have totally different trends of county and industry betas than the Euro countries.

References

[1] Adjaoute, K., & Danthine, J. P., 2001. EMU and portfolio diversification opportunities (No. 2962). Centre for Economic Policy Research.

[2] Adjaoute, K., & Danthine, J. P., 2003. European financial integration and equity returns: a theory based assessment. European Central Bank, Frankfurt, 185-246.

[3] Alexander, C., 1998. Volatility and correlation: measurement, models and applications. Risk Measurement and Analysis, 1, 125-171.

[4] Bekaert, G., & Harvey, C. R., 1995. Time-varying world market integration. Journal of Finance, 50(2), 403-444.

[5] Bekaert, G., & Harvey, C. R., 1997. Emerging equity market volatility. Journal of Financial economics, 43(1), 29-77.

[6] Baele, L., 2005. Volatility spillover effects in European equity markets. Journal of Financial and Quantitative Analysis, 40(2), 373-401.

[7] Baele, L., Ferrando, A., Hördahl, P., Krylova, E., & Monnet, C., 2004. Measuring European financial integration. Oxford Review of Economic Policy, 20(4), 509-530.

[8] Baele, L., Inghelbrecht, K., 2009. Time-varying integration and international diversification strategies. Journal of Empirical Finance 16(3), 368-387.

[9] Baele, L., Inghelbrecht, K., 2010. Time-varying integration, interdependence and contagion. Journal of International Money and Finance 29(5), 791-818.

[10] Baca, S. P., Garbe, B. L., & Weiss, R. A., 2000. The rise of sector effects in major equity markets. Financial Analysts Journal 56(5), 34-40.

[11] Bekaert, G., & Harvey, C. R., 1997. Emerging equity market volatility. Journal of Financial Economics, 43(1), 29-77.

[12] Bekaert, G., Hodrick, R.J., Zhang, X., 2009. International Stock return co-movements. Journal of Finance 64 (6), 2591 – 2626.

[13] Bekaert, G., Harvey, C. R., Lundblad, C. T., & Siegel, S., 2013. The European union, the euro, and equity market integration. Journal of Financial Economics, 109(3), 583-603.

[14] Bollerslev, T., 1986. Generalized autoregressive conditional heteroskedasticity. Journal of Econometrics, 31(3), 307-327.

[15] Brooks, R., Del Negro, M., 2004. The rise in comovement across national stock markets: market integration or IT bubble? Journal of Empirical Finance 11(5), 659-680.

[16] Cavaglia, S., Brightman, C., & Aked, M., 2000. The increasing importance of industry factors. Financial Analysts Journal 56(5), 41-54.

[17] Eiling, E., & Gerard, B., 2007. Dispersion, equity returns correlations and market integration. Unpublished Working Paper, University of Toronto.

[18] Eiling, E., Gerard, B., Hillion, P., & de Roon, F. A., 2012. International portfolio diversification: currency, industry and country effects revisited. Journal of International Money and Finance, 31(5), 1249-1278.

[19] Engle, R. F., & Kroner, K. F., 1995. Multivariate simultaneous generalized ARCH. Econometric Theory, 11(1), 122-150.

[20] Fama, E. F., & MacBeth, J. D., 1973. Risk, return, and equilibrium: Empirical tests. The Journal of Political Economy 81(3), 607-636.

[21] Fratzscher, M., 2002. Financial market integration in Europe: on the effects of EMU on stock markets. International Journal of Finance & Economics, 7(3), 165-193.

[22] Flavin, T. J., 2004. The effect of the Euro on country versus industry portfolio diversification. Journal of International Money and Finance, 23(7), 1137-1158.

[23] Griffin, J. M., & Karolyi, A.G., 1998. Another look at the role of the industrial structure of markets for international diversification strategies. Journal of financial economics, 50(3), 351-373.

[24] Hardouvelis, G.A, Malliaropoulos, D , and Priestley, R., 2006. EMU and European Stock Market Integration. Journal of Business, 79, 365-392.

[25] Hamilton, J. D., 1989. A new approach to the economic analysis of nonstationary time series and the business cycle. Econometrica: Journal of the Econometric Society 57(2), 357-384.

[26] Hamilton, J. D., 1990. Analysis of time series subject to changes in regime. Journal of Econometrics, 45(1), 39-70.

[27] Heston, S.L., Rouwenhorst, G.K., 1994. Does industrial structure explain the benefits of international diversification? Journal of Financial Economics 36(1), 3-27.

[28] I-Chou,H and Zhao.J, 2013. Factor reversal in the Euro Zone Stock Returns: Evidence from the Crisis Period.

[29] Mergner, S., & Bulla, J., 2008. Time-varying beta risk of Pan-European industry portfolios: A comparison of alternative modeling techniques. The European Journal of Finance, 14(8), 771-802.

[30] Marsh, T., Pfleiderer, P., & Tien, D., 1997. The role of country and industry effects in explaining global stock returns. Unpublished working paper, UC Berkeley and Stanford University.

[31] Phylaktis, K., & Xia, L., 2006. The changing roles of industry and country effects in the global equity markets. The European Journal of Finance, 12(8), 627-648.

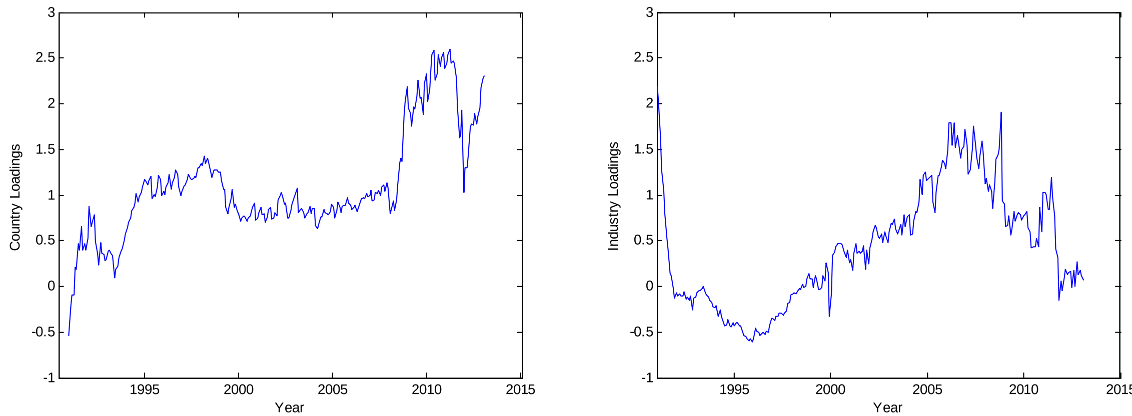
[32] Pieterse-Bloem, M., & Mahieu, R. J., 2013. Factor decomposition and diversification in European corporate bond markets. Journal of International Money and Finance, 32, 194-213.

[33] Rouwenhorst, K. G., 1999. Local return factors and turnover in emerging stock markets. The Journal of Finance, 54(4), 1439-1464.

[34] Steliaros, M., & Thomas, D. C., 2006. The cross-sectional variability of stock-price returns: Country and sector effects revisited. Journal of Asset Management, 7(3), 273-290.

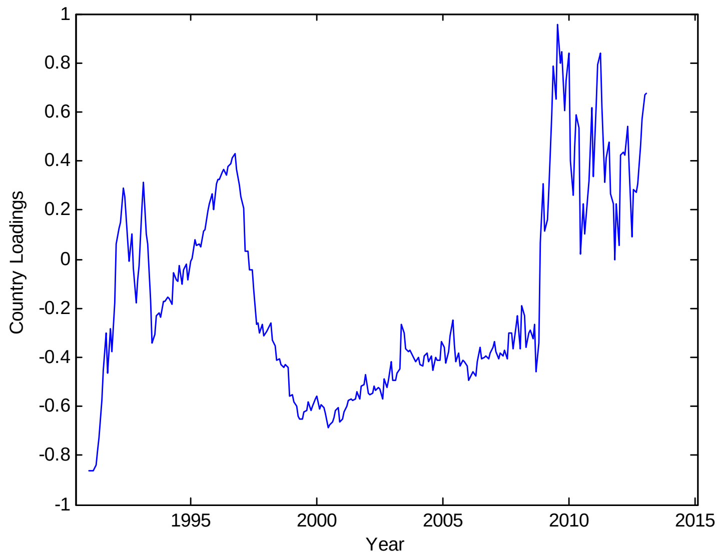
[35] Varotto, S., 2003. Credit risk diversification: evidence from the Eurobond market. Bank of England Working Papers 199.

Figure 1: Average Time-series Country and Industry Betas



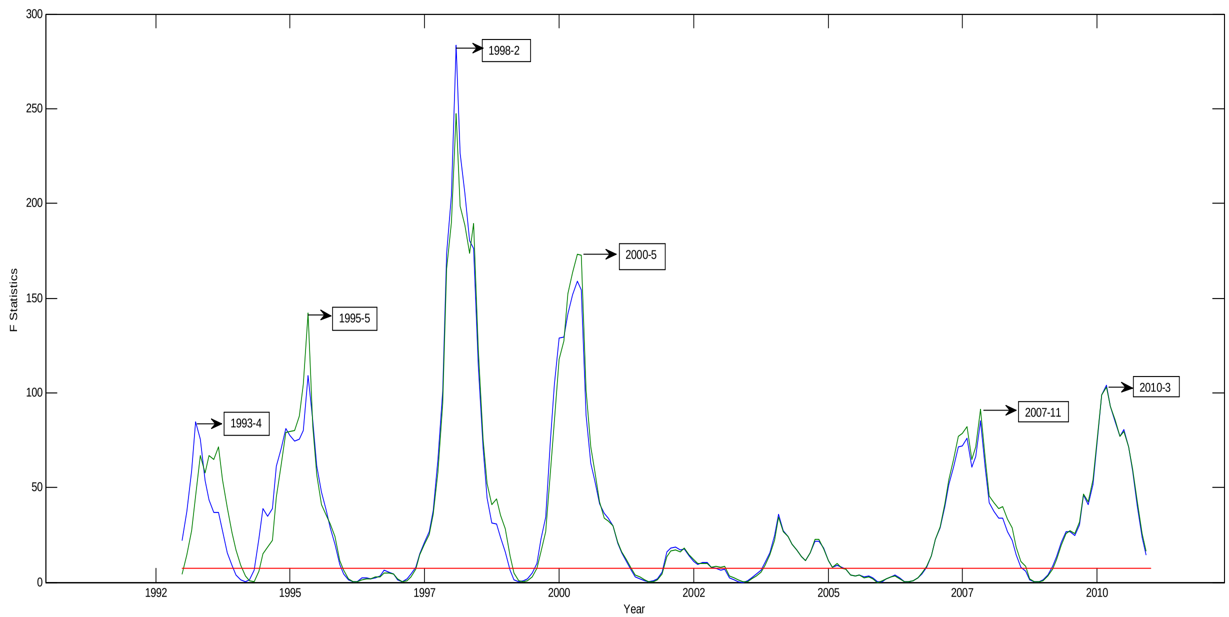
Notes: The left graph shows the median value of the country betas for all bonds over the total sample period (January 1991-January 2013). The right graph shows the median value of the industry betas for all bonds over the same period. In both graphs, the x-axis represents the time from 1991 to 2013 and the y-axis represents the median value of country (industry) betas for all bonds. We use value-weighted country and industry indexes in the first step to decompose stock returns into country and industry factors and the GARCH-BEKK model in the second step to obtain the time-varying country and industry betas.

Figure 2: The Relative Importance of Country versus Industry Betas



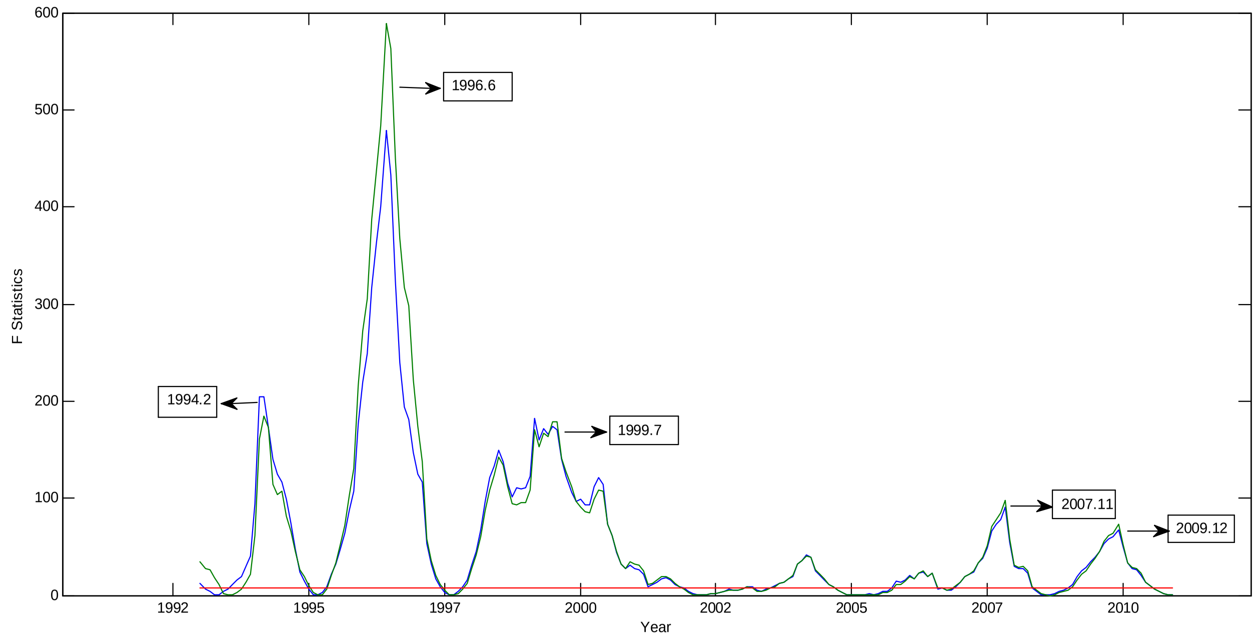
Notes: The figure shows the relative importance of the country versus industry factors over the total sample period (January 1991-January 2013). In the graph, the x-axis represents the difference between the absolute value of the country betas and the absolute value of the industry betas divided by the absolute value of the industry betas $((|\beta_c| - |\beta_i|)/|\beta_i|)$. We use value-weighted country and industry indexes in the first step and GARCH-BEKK model in the second step to obtain the time-series country and industry betas.

Figure 3: Time-series F-statistics for Country Betas



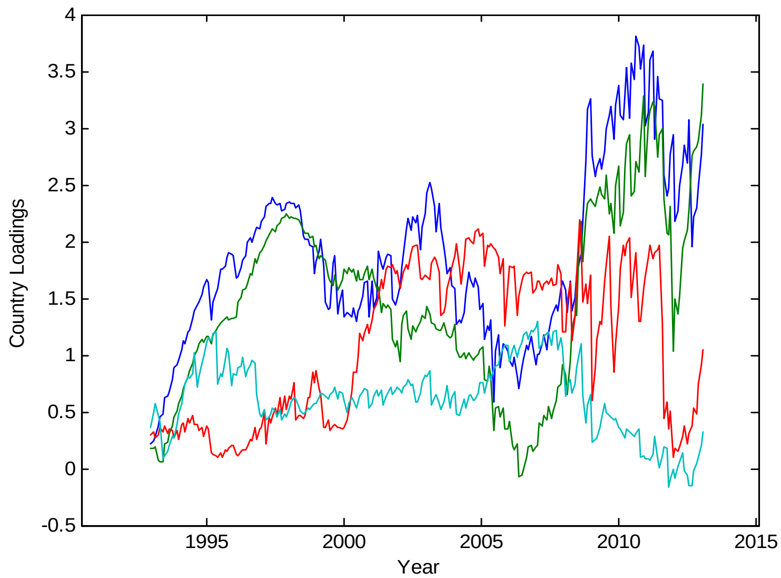
Notes: The figure shows the F statistics of comparing the coefficients in Equation 12 for country betas using rolling window regression with window period of 50 over the total sample period (January 1991-January 2013). The blue line shows the F statistics of comparing the coefficients α_1 and α_2 and the green line shows the F statistics of comparing the coefficients γ_1 and γ_2 . The x-axis represents the year and the y-axis the F statistics. The red line shows the critical value of 7.18 with 99% confidence interval. We use value-weighted country and industry indexes in the first step and GARCH-BEKK in the second step to obtain the time-series country betas.

Figure 4: Time-series F-statistics for the Relative Importance of Country versus Industry Factors



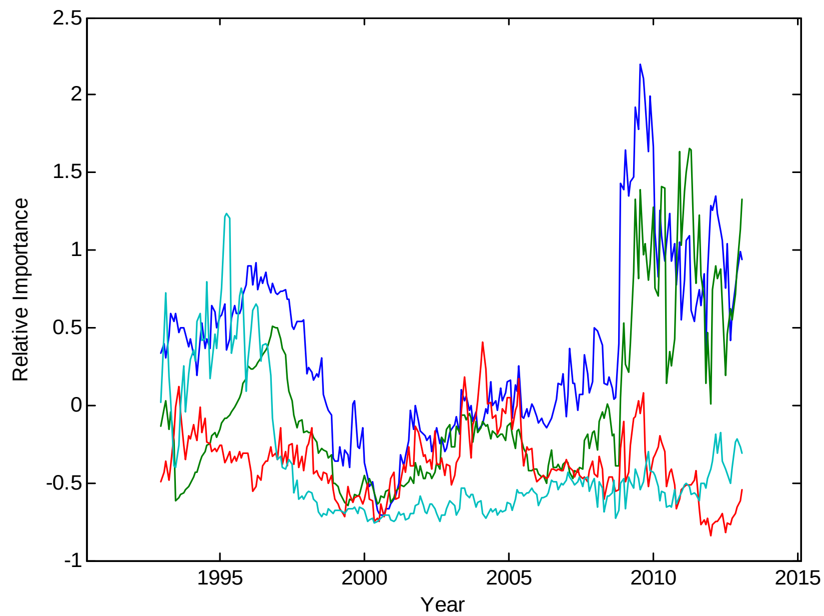
Notes: The figure shows the F statistics of comparing the coefficients in Equation 12 for the relative importance of country versus industry factors $((|\beta_c| - |\beta_i|)/|\beta_i|)$ using rolling window regression with window period of 50 over the total sample period (January 1991-January 2013). The blue line shows the F statistics of comparing the coefficients α_1 and α_2 and the green line shows the F statistics of comparing the coefficients γ_1 and γ_2. The x-axis represents the year and the y-axis the F statistics. The red line shows the critical value of 7.18 with 99% confidence interval. We use value-weighted country and industry indexes in the first step and GARCH-BEKK in the second step to obtain the time-series country betas.

Figure 5: Average Time-series Country Betas for the Four Groups of Countries



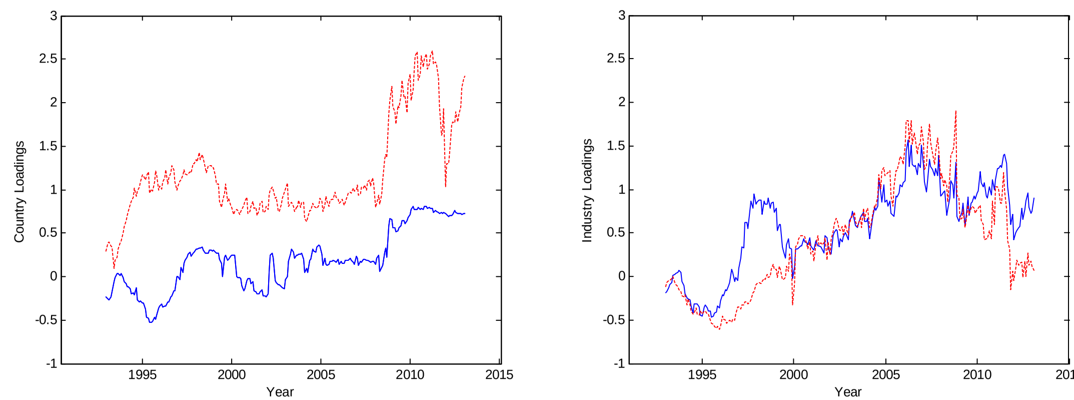
Notes: The figure shows the median value of the country betas for the four goups of countries over the period from January 1993 to January 2013. The dark blue line stands for Germany and the Netherlands, the green line for France and Belgium, red line for Italy and Spain, and light blue for Sweden and UK. We use value-weighted country and industry indexes in the first step and GARCH-BEKK model in the second step to obtain the time-series country and industry betas.

Figure 6: Relative Importance of Country versus Industry Factors for the Four Groups of Countries



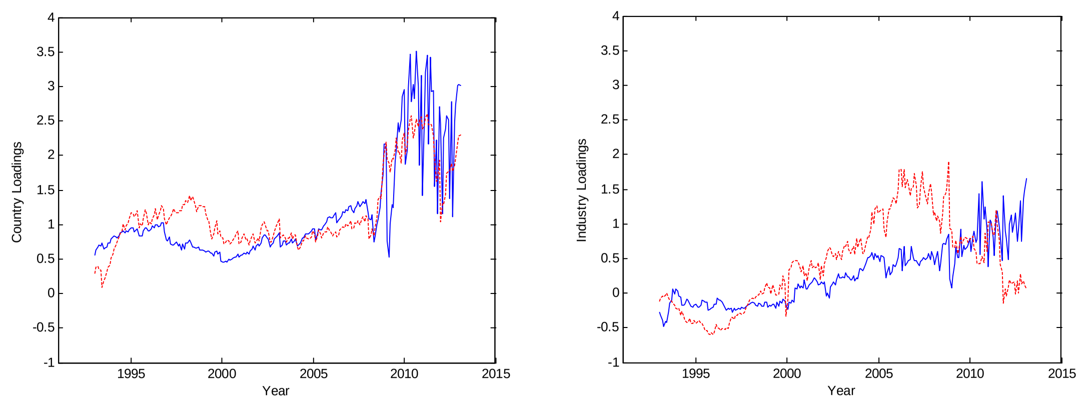
Notes: The figure shows the relative importance of the country versus industry factors over the period from January 1993 to January 2013 for the four groups of countries. The dark blue line stands for Germany and the Netherlands, the green line for France and Belgium, red line for Italy and Spain, and light blue for Sweden and UK. In the graph, the x-axis represents the difference between the absolute value of the country betas and the absolute value of the industry betas divided by the absolute value of the industry betas $((|\beta_c| - |\beta_i|)/\,|\beta_i|)$. We use value-weighted country and industry indexes in the first step and GARCH-BEKK model in the second step to obtain the time-series country and industry betas.

Figure 7: Average Time-series Country and Industry Betas Excluding Germany



Notes: The left figure shows the median value of the country factor loadings from January 1993 to January 2013. The solid blue line stands for bonds from all countries excluding those of Germany. The red dotted line represents all bonds in our sample as a reference. The right figure shows the median value of the industry factors loadings from January 1993 to January 2013. The solid blue line stands for bonds from all countries excluding those of Germany. The red dotted line represents all bonds as a reference. In both graphs, the x-axis represents the time from 1993 to 2013 and the y-axis represents the median value of country (industry) betas. We use value-weighted country and industry indexes in the first step to decompose stock returns into country and industry factors and GARCH BEKK model in the second step to obtain the time-varying country and industry betas.

Figure 8: Average Time-series Country and Industry Betas Excluding Financial and Funds



Notes: The left figure shows the median value of the country factor loadings from January 1993 to January 2013. The solid blue line stands for bonds from all industries excluding those of financial and funds. The red dotted line represents all bonds in our sample as a reference. The right figure shows the median value of the industry factors loadings from January 1993 to January 2013. The solid blue line stands for bonds excluding financial and funds. The red dotted line represents all bonds as a reference. In both graphs, the x-axis represents the time from 1993 to 2013 and the y-axis represents the median value of country (industry) betas. We use value-weighted country and industry indexes in the first step to decompose stock returns into country and industry factors and GARCH BEKK model in the second step to obtain the time-varying country and industry betas.

Table 1: Country and Industry Composition

A. By country (number and percent of total)			
Belgium/Luxembourg	BL	260	3.08%
France	FR	1305	15.45%
Germany	GE	3196	37.84%
Italy	IT	611	7.23%
Netherlands	NE	997	11.80%
Spain	SP	136	1.61%
Sweden	SW	668	7.91%
United Kingdom	UK	1273	15.07%
Total		8446	100%

B. By industry (number and percent of total)			
Financials&Funds	FF	5662	67.04%
Government Institute	GI	784	9.28%
Consumer Goods	CO	691	8.18%
Comm.Technology	CT	313	3.71%
Basic material&Energy	BE	246	2.91%
Industrials	IN	292	3.46%
Utilities	UT	458	5.42%
Total		8446	100%

C. Number of Eurobonds by country and industry

	FF	GI	CO	CT	BE	IN	UT	Total
Belgium/Luxembourg	163	13	16	9	24	16	19	260
France	624	95	203	79	90	111	103	1305
Germany	2652	241	137	40	35	58	33	3196
Italy	454	47	22	28	14	6	40	611
Netherlands	641	206	28	42	24	22	34	997
Spain	78	16	5	12	4	7	14	136
Sweden	336	146	70	38	17	37	24	668
United Kingdom	714	20	210	65	38	35	191	1273
Total	5662	784	691	313	246	292	458	8446

D. Average weights of country/industry in the value-weighted European market:

in percentage	FF	GI	CO	CT	BE	IN	UT	Total
Belgium/Luxembourg	0.48	0.33	0.03	0.15	0.19	0.09	0.21	1.48
France	6.14	2.18	2.31	1.92	1.03	1.66	2.28	17.52
Germany	12.08	2.8	1.56	0.72	0.44	1.02	0.74	19.36
Italy	2.32	13.76	0.31	0.73	0.29	0.13	0.6	18.05
Netherlands	6.27	3.63	0.26	0.6	0.3	0.3	0.39	11.75
Spain	0.57	1.95	0.03	0.18	0.11	0.12	0.28	3.24
Sweden	6.43	2.04	0.1	0.2	0.03	0.06	0.32	9.18
United Kingdom	9.87	0.61	3.07	1.76	0.54	0.67	2.87	19.39
Total	44.16	27.21	7.67	6.26	2.93	4.05	7.69	100

Notes: Panel A and B give for each country and industry the number of bonds included in the total sample and as a percentage of the total number of bonds. Panel C gives for each country by industry the number of bonds included in the total sample. Panel D gives the average weight of the (live) bonds in the country by industry cross-sector in the total value-weighted market over the whoel sample. Percentages do not add up to precisely 100 due to rounding.

Table 2: Summary Performance Statistics

A. By country

Country	EW Return		VW Return		Currency return		Correlation matrix								
	Mean	St.dev	Mean	St.dev	Mean		BL	FR	GE	IT	NE	SP	SW	UK	Total
BL	0.6931	3.3048	0.6765	3.3573	0.0387	3.1389	1	0.9567	0.9621	0.8936	0.9672	0.8536	0.9084	0.8512	0.9517
FR	0.6751	3.1109	0.6685	3.2056	0.033	3.1169	0.965	1	0.9763	0.9049	0.9837	0.8765	0.9211	0.8497	0.9669
GE	0.7101	3.2308	0.6369	3.1361	0.039	3.1395	0.9609	0.9698	1	0.9029	0.9793	0.8579	0.9243	0.8781	0.9757
IT	0.7735	3.2133	0.7871	3.3067	0.145	3.2064	0.9296	0.9428	0.9338	1	0.8914	0.8322	0.867	0.8415	0.9582
NE	0.6508	3.2188	0.6402	3.2268	0.0387	3.1372	0.9685	0.9827	0.9572	0.9156	1	0.872	0.9314	0.8459	0.9654
SP	0.8089	3.4862	0.8499	3.6248	0.1569	3.2277	0.8652	0.8947	0.8719	0.8564	0.8803	1	0.8254	0.7608	0.8718
SW	0.7343	3.2665	0.7142	3.3226	0.1141	3.5417	0.9457	0.9439	0.9493	0.9101	0.9444	0.8473	1	0.8264	0.9429
UK	0.904	3.2909	0.8379	3.2075	0.1189	2.7742	0.7961	0.8065	0.7983	0.7801	0.7868	0.7557	0.7922	1	0.9113
Total	0.7578	3.1274	0.7584	3.1057			0.9641	0.9749	0.9736	0.9383	0.9627	0.8892	0.9505	0.8969	1

B. By industry sector

Industry	EW Return		VW Return		Correlation matrix							
	Mean	St.dev	Mean	St.dev	FF	GI	CO	CT	BE	IN	UT	Total
FF	0.7632	3.2282	0.7331	3.2093	1	0.9665	0.9568	0.9541	0.9686	0.9657	0.9562	0.9861
GI	0.7318	3.2481	0.7402	3.2274	0.9521	1	0.9222	0.9182	0.9173	0.9397	0.92	0.9873
CO	0.7509	3.051	0.7315	3.1366	0.9417	0.9391	1	0.9453	0.9656	0.9529	0.9575	0.9574
CT	0.7664	3.1285	0.7359	3.2123	0.937	0.9433	0.9631	1	0.9546	0.9686	0.9388	0.9548
BE	0.75	3.1429	0.7478	3.1906	0.9571	0.9411	0.9669	0.9616	1	0.9649	0.9574	0.9586
IN	0.7335	3.1247	0.6978	3.1635	0.9571	0.9626	0.9651	0.9723	0.9732	1	0.9476	0.9712
UT	0.7961	3.1893	0.7919	3.3134	0.9161	0.9212	0.9582	0.9555	0.939	0.9422	1	0.9542
Total	0.7578	3.1274	0.7584	3.1057	0.99	0.98	0.97	0.97	0.98	0.98	0.95	1

Notes: Panel A (B) summarizes the mean and the standard deviation of the equal-weights (EW) and the value-weighted (VW) monthly returns by country (industry) sector. All returns are in US dollars and expressed in percent per month. The currency return is the proportional change in the exchange rate of the respective country vis-a-vis the US dollar, where a positive number indicates an appreciation. In the correlation matrices, the coefficients above the diagonal refer to the value-weighted returns and below the diagonal are between the equal-weighted returns.

Table 3: Decomposition of Excess Bond Index Returns (Full Period and Sub-periods)

Full Period					January 1991-July 2007				August 2007-January 2013			
A:Country indexes												
	Pure country effect		Sum of industry effects		Pure country effect		Sum of industry effects		Pure country effect		Sum of industry effects	
Country	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio
BL	0.8444	0.8475	0.1148	0.1153	0.5190	1.0608	0.1029	0.2103	1.8283	0.7208	0.1527	0.0602
FR	0.4359	0.5945	0.1331	0.1816	0.5364	0.5978	0.1400	0.1560	0.1320	0.5571	0.1140	0.4809
GE	0.5250	0.6165	0.0970	0.1139	0.5243	0.5792	0.0946	0.1045	0.5350	0.7619	0.1053	0.1499
IT	0.7434	1.2814	0.1011	0.1743	0.6218	1.2227	0.0825	0.1623	1.1004	1.3933	0.1586	0.2008
NE	0.8315	0.7194	0.2197	0.1901	1.0421	0.7535	0.2563	0.1854	0.2019	0.4260	0.1102	0.2326
SP	2.6464	1.0666	0.0891	0.0359	2.9647	1.0693	0.0826	0.0298	1.7051	1.0503	0.1100	0.0678
SW	0.9030	1.0976	0.0937	0.1139	0.7739	1.2585	0.0699	0.1137	1.3027	0.8908	0.1668	0.1141
UK	2.7489	1.0644	0.1952	0.0756	2.7756	1.1509	0.2109	0.0874	2.6982	0.8652	0.1496	0.0480
Average	1.2098	0.9110	0.1305	0.1251	1.2197	0.9616	0.1300	0.1312	1.1880	0.8332	0.1334	0.1693
B: Industry indexes												
	Pure industry effect		Sum of country effects		Pure industry effect		Sum of country effects		Pure industry effect		Sum of country effects	
Industry	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio	Variance	Ratio
FF	0.3076	0.4631	0.2579	0.3883	0.3632	0.4351	0.3371	0.4038	0.1415	0.9144	0.0220	0.1419
GI	0.2803	0.9961	0.2115	0.7518	0.1658	1.7094	0.2405	2.4797	0.6294	0.7452	0.1252	0.1483
CO	0.4801	0.7691	0.6104	0.9778	0.5358	0.7221	0.7882	1.0624	0.3187	1.1499	0.0805	0.2903
CT	0.3743	0.5786	0.2754	0.4256	0.4164	0.5675	0.3515	0.4791	0.2526	0.6487	0.0447	0.1148
BE	0.6256	0.9966	0.8281	1.3193	0.6322	1.1010	1.0745	1.8712	0.6106	0.7638	0.0905	0.1132
IN	0.2703	0.8377	0.1689	0.5182	0.2794	0.9009	0.2077	0.6695	0.2555	0.6803	0.0539	0.1436
UT	0.8345	0.9113	0.8854	0.9670	0.9393	0.9508	1.1577	1.1719	0.5229	0.7395	0.0734	0.1039
Average	0.4536	0.7932	0.4625	0.7640	0.476	0.9124	0.5939	1.1625	0.3902	0.8060	0.0700	0.1509

Notes: The table gives the variance of the components of the value-weighted (VW) excess country index returns in panel A and excess industry index returns in panel B over the total market for the full period of January 1991-January 2013 in the first column, pre-crisis period of January 1991-July 2007 in the second column and Post-crisis period of August 2007-January 2013 in the third column. The ratio is the variance ratio to the index in excess of the market.

Table 4: Break Point Analysis for The Relative Importance of Country versus Industry Factors

Panel B: The Relative Importance:	
Date	Event
February 1994	Signing of the Maastricht Treaty
June 1996	The Anticipation of Euro Adoption
July 1999	Introduction of Euro
November 2007	Global Financial Crisis
December 2009	Sovereign Debt Crisis

Notes: The table gives the results for the break point analysis of the relative importance of country versus industry factors. Specifically, the significant breakpoitns detected in the sample period are presented in combination with the event.

Table 5: Break Point Analysis for the Relative Importance of Country versus Industry Factors

Panel A: Country betas				Panel B: Period Comparison		
	Coef.	t	P>t		F	Prob>F
D1	-0.55	-5.68	0.00	D1 vs D2	14.66	0.00
D2	-0.97	-19.09	0.00	D2 vs D3	572.97	0.00
D3	2.40	18.26	0.00	D3 vs D4	617.81	0.00
D4	-0.93	-34.84	0.00	D4 vs D5	106.60	0.00
D5	-12.86	-11.13	0.00	D5 vs D6	90.30	0.00
D6	0.09	0.13	0.90			
D1*T	0.02	4.16	0.02	D1*T vs D2*T	0.47	0.50
D2*T	0.02	21.94	0.00	D2*T vs D3*T	876.17	0.00
D3*T	-0.03	-21.13	0.00	D3*T vs D4*T	531.27	0.00
D4*T	-0.0	17.49	0.00	D4*T vs D5*T	116.30	0.00
D5*T	0.06	11.36	0.00	D5*T vs D6*T	95.21	0.00
D6*T	0.00	0.41	0.68			

Notes: The table gives the results for the break point analysis for the relative importance of country verus industry factors. D1 equals 1 if it is from 1991.1 to 1994.2 and zero otherwise, D2 equals 1 if it is 1994.3 to 1996.6 and zero otherwise, D3 equals 1 if it is from 1996.7 to 1999.7 and zero otherwise, D4 equals 1 if it is from 1999.8 to 2007.11 and zero otherwise, D5 equals 1 if it is from 2007.12 to 2009.12 and zero otherwise, D6 equals 1 if it is from 2010.01 to 2013.1, T represents time. Panel A shows the estimated coefficients and their t-statistics and p-values of the regression. Panel B indicates the comparisons between the coefficients for the time dummies. The regression uses robust standard errors clustered by time.