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Exchange rate exposure, interest rate risk, stock returns

Abstract

This study investigates the sensitivity of stock returns at the industry level to market, exchange rate and interest rate shocks in the four major European economies: France, Germany, Italy and the UK. In addition to exposure to the market, significant levels of exposure to both exchange rate risk, in the four countries, and interest rate risk, in France and Germany, are identified. Further, responses to sources of risk are decomposed into components attributable to news about future dividends, real interest rates and excess returns. All three sources of risk contain significant information about future cash flows and excess returns.

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Stuart Hyde*

Abstract

This study investigates the sensitivity of stock returns at the industry level to market, exchange rate and interest rate shocks in the four major European economies: France, Germany, Italy and the UK. In addition to exposure to the market, significant levels of exposure to both exchange rate risk, in the four countries, and interest rate risk, in France and Germany, are identified. Further, responses to sources of risk are decomposed into components attributable to news about future dividends, real interest rates and excess returns. All three sources of risk contain significant information about future cash flows and excess returns.

Keywords: Exchange rate exposure, interest rate risk, stock returns
JEL Classification: F31, G12, G15

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1 Introduction

According to financial theory changes in exchange rates and interest rates should affect the value of the firm. Hence there has been much interest in evaluating the level of exchange rate exposure or interest rate exposure a firm or industry faces. Exchange (interest) rate exposure refers to the extent to which the value of the firm is affected by changes in exchange (interest) rates.

The issue of exposure to both exchange rate and interest rate risk is of importance to individual investors and firms. For example, changes in exchange rates and interest rates can affect an investor holding a portfolio consisting of securities from different countries. Changes in exchange rates should naturally impact the cash flows of a multinational firm with operations in different foreign locations, importers and exporters and even solely domestic firms. Similarly changes in interest rates will alter the firms' financing costs, affecting the amount of loan interest and principal payments and impacting cash flows of the firm.

To evaluate the extent of exposure to market, exchange rate and interest rate risk we estimate the betas, or sensitivities of asset returns to these underlying sources of risk. This study seeks to uncover the extent to which industries are affected by shocks to market returns, exchange rates and interest rates. Further the response to shocks can be apportioned to revisions in expectations about future cash flows, interest rates or expected returns.

A large number of studies have investigated the relationship between exchange rate movements and changes in the values of firms. However, there is far from being a consensus over the impact of exchange rate changes on stock returns. Studies based on U.S. data often uncover mixed findings, suggesting the level of exposure is limited.

Jorion (1990) examines the extent of exchange rate exposure in U.S. multinationals using a two factor model incorporating both market returns and changes in exchange rates finding that there are significant differences across industries. Jorion (1991) shows that industries such as Chemicals, Mining and Retail have significant exchange rate exposure. Chemicals and Mining industries react positively to a change in the exchange rate while Retail adjusts negatively, i.e. heavy industry (exporters) benefit from a depreciation in the exchange rate while importers (Retail) suffer.

Bodnar and Gentry (1993) measure the level of exchange rate exposure in Canada, Japan and the U.S. They find only limited evidence of exposure faced by industries in the three economies, reporting that only 11 out 39 U.S. industries face significant exposure with only 4 out 19 industries in Canada although there are 7 out of 20 in Japan. Additionally, Choi and

Prasad (1995) find only limited evidence of exposure with only 15% of U.S. firms having a significant coefficient. Khoo (1994) investigates the level of exposure to exchange rates of mining firms in Australia. He finds that the sensitivity of stock returns to movements in exchange rates is small. He and Ng (1998) find that approximately one quarter of the 171 Japanese multinational firms in their sample face significant exchange rate exposure.

Conversely, Kiymaz (2003) and Nydahl (1999) present evidence for Turkey and Sweden respectively, suggesting that industries in small open economies face significant exchange rate exposure. Kiymaz (2003) finds that Turkish firms are highly exposed to exchange rate risk particularly firms in the textile, chemical, machinery and financial sectors. He reports that 47% of all firms face significant exchange rate risks although, for example, this rises to 82% of textile firms and 65% of financial firms. The evidence for Sweden is slightly weaker, Nydahl (1999) reports that 40% of the firms face significant exposure.[1]

El-Masry (2004) investigates the extent of exchange rate exposure of UK nonfinancial companies over the period January 1981 to December 2001. The firms analysed cover the industrial sectors also investigated in this study. He finds evidence of significant exposure to both contemporaneous and lagged exchange rate changes. Exchange rate exposure is most prevalent in the periods before and after Sterling entered the European Exchange Rate Mechanism in the early 1990s.

Choi et al (1992) and Choi and Elyasiani (1997) investigate the sensitivity of U.S. bank stock returns to market, interest and exchange rate risks. The market risk beta is significantly positive for all banks, the interest rate risk beta is significant for 23 out of 59 banks and the exchange rate risk beta significant for nearly all the banks (49 out of 59). Moreover they find that all the significant interest rate betas are negative while the exchange rate response is mixed.

Joseph (2002) examines the impact of both exchange rate and interest rate changes on UK stock returns, focusing on the Chemical, Electrical, Engineering and Pharmaceutical industries. He finds that interest rate changes (significant for 34% of firms) have a greater impact than exchange rate changes (significant for 28% of firms).

Typically studies of exchange rate and interest rate exposure are based on estimation of models which are extensions of the basic market model to two and three factor models. Similarly, here, a linear factor model (Burmeister and McElroy, 1988) is used to justify the use of market returns, interest rates and exchange rates as factors in the estimation of a model of state variables that impact all industry sectors.

[1]Based on a 10% significance level. Only 26% of firms are significant at a 5% level.

However, this paper takes a different approach to assess the sensitivity of industry portfolio stock returns to market, interest and exchange rate risks adopting the methodology of Campbell and Mei (1993). This focuses on the estimation of betas for market, exchange rate and interest rate risk. These betas can then be decomposed into future cash flows, real interest rates and excess returns components. Campbell and Shiller (1988b) and Campbell (1991) describe how unexpected returns can be written as an approximate linear function of changing expectations in future cash flows, real interest rates and excess returns. Betas simply measure the covariance of returns with a given factor. The implication of the Campbell-Shiller decomposition is therefore that the betas depend upon the covariances of news about cash flows, real interest rates and future excess returns with the factors, market, exchange rate and interest rate risk.

The remainder of the paper is set out as follows: section 2 introduces the linearised rational valuation formula (RVF) and the theoretical framework, section three covers the beta decomposition and the estimation of the VAR of state variables. Section four discusses the data and empirical results and section five provides some concluding comments.

2 Theoretical Framework

The log-linear representation of the present value model or RVF formulated by Campbell and Shiller (1988b) approximates the one-period log holding return as:[2]

$$h_{i,t+1} \approx k + \rho_i p_{i,t+1} + (1-\rho) d_{i,t+1} - p_{i,t} \tag{1}$$

where $h_{i,t}$ is the expected log real return on portfolio i in period t, $p_{i,t}$ is the log real price of portfolio i at the end of period t and $d_{i,t}$ is the log real dividend paid on portfolio i during period t. ρ_i is $1/(1+exp(\delta_i))$ where δ_i is the mean log dividend price ratio of portfolio i and k is a constant equal to $-log(\rho_i) - (1-\rho_i)log(\frac{1}{\rho_i} - 1)$.[3] Imposing the terminal condition that $\lim_{j\to\infty} E_t \rho^j p_{i,t+j} = 0$,[4] equation (1) can be solved forward to give:

$$p_{i,t} = \frac{k}{1-\rho} + (1-\rho)\, E_t \sum_{j=0}^{\infty} \rho^j d_{i,t+j+1} - E_t \sum_{j=0}^{\infty} \rho^j h_{i,t+j+1} \tag{2}$$

[2]Campbell and Shiller (1988b) define the one-period log holding return on stock i as $h_{i,t+1} \equiv \log(P_{i,t+1} + D_{i,t+1}) - \log P_{i,t}$, where $P_{i,t}$ is the real stock price measured at the end of period t and $D_{i,t}$ is the real dividend paid on stock i during period t.

[3]Following Cuthbertson et al (1998) $\rho = 0.99$ is adopted for all the countries.

[4]This condition prevents explosive behaviour and rules out "rational bubbles".

This enables the effect on the stock price of a change in the expected stock returns to be calculated. Campbell (1991) shows that it is possible to obtain a decomposition of the unexpected stock return:

$$\begin{aligned}\tilde{h}_{i,t+1} &\equiv h_{i,t+1} - E_t h_{i,t+1} \\ &= (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty} \rho^j \Delta d_{i,t+j+1} - \sum_{j=1}^{\infty} \rho^j h_{i,t+j+1}\right\}\end{aligned} \tag{3}$$

by substituting $p_{i,t}$ and $p_{i,t+1}$ out of equation (1). Although equation (2) is written in terms of real log stock returns, it is possible to define the excess stock return over a short term interest rate as $e_{i,t+1} \equiv h_{i,t+1} - r_{i,t+1}$ where $h_{i,t+1}$ is the expected return and $r_{i,t+1}$ is the real interest rate, such that the innovation in the excess return is given by:

$$\begin{aligned}\tilde{e}_{i,t+1} &= (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty} \rho^j \Delta d_{i,t+j+1} - \sum_{j=0}^{\infty} \rho^j r_{i,t+j+1} - \sum_{j=1}^{\infty} \rho^j e_{i,t+j+1}\right\} \\ &= \tilde{e}_{di,t+1} - \tilde{e}_{ri,t+1} - \tilde{e}_{ei,t+1}\end{aligned} \tag{4}$$

This states that the unexpected excess return on portfolio i, $\tilde{e}_{i,t+1}$ is equal to the news about future dividends on portfolio i, $\tilde{e}_{di,t+1}$, minus the news about future real interest rates, $\tilde{e}_{ri,t+1}$, and the news about future excess returns, $\tilde{e}_{ei,t+1}$.

3 Econometric Implementation

The beta decomposition is defined by using the unconditional variances and covariances of the innovations in returns and factors. The beta with respect to the kth factor (e.g. exchange rate changes) is defined as:

$$\beta_{i,k} = \frac{cov(\tilde{e}_i, \tilde{e}_k)}{var(\tilde{e}_k)} \tag{5}$$

which is simply the covariance between the unexpected excess return on portfolio i, $\tilde{e}_i$, and the unexpected excess return on factor k, $\tilde{e}_k$, divided by the variance of the unexpected excess return on the kth factor. $\beta_{i,k}$ can then be decomposed into:

$$\begin{aligned}\beta_{i,k} &= \frac{cov(\tilde{e}_{di},\tilde{e}_k)}{var(\tilde{e}_k)} - \frac{cov(\tilde{e}_{ri},\tilde{e}_k)}{var(\tilde{e}_k)} - \frac{cov(\tilde{e}_{ei},\tilde{e}_k)}{var(\tilde{e}_k)} \\ &= \beta_{di,k} - \beta_{ri,k} - \beta_{ei,k}\end{aligned} \tag{6}$$

where $\beta_{di,k}$ is the beta between the innovation in the kth factor (e.g. exchange rate changes) and news about portfolio i's future cash flows or dividends, $\beta_{ri,k}$ is the beta between the innovation in changes to the exchange rate and news about future real interest rates and $\beta_{ei,k}$ is the beta between the innovation in changes to the exchange rate and news about future excess returns.

In order to estimate the beta decomposition, it is necessary to construct empirical proxies for the news about future cash flows, excess returns and real interest rates. The excess return on each portfolio $\mathbf{e}_i$ under consideration is assumed to be a linear function of the chosen state variables $\mathbf{x}_t$ which are known to all participants in the market and which provide a summary of the state of the economy at the end of period t:

$$\mathbf{e}_{i,t+1} = \mathbf{a}_i \mathbf{x}_t + \tilde{\mathbf{e}}_{i,t+1} \tag{7}$$

Additionally, the vector of state variables is assumed to follow a first order VAR process:

$$\mathbf{x}_{t+1} = \Pi \mathbf{x}_t + \tilde{\mathbf{x}}_{t+1} \tag{8}$$

where $\tilde{x}_{t+1}$ is the innovation in the vector of state variables. Hence the expectation in the current period of any future values of the state variables is:

$$E_t \mathbf{x}_{t+j+1} = \Pi^{j+1} \mathbf{x}_t$$

and the revision in long horizon expectations of $\mathbf{x}_t$ made between the current period and the next is:

$$\left(E_{t+1} - E_t\right) \mathbf{x}_{t+j+1} = \Pi^j \tilde{\mathbf{x}}_{t+1} \tag{9}$$

Using the definitions of the news variables in equation (4) and the revision of expectations in the vector of state variables in equation (9), it is possible to derive the 'news' components of the portfolio returns:

$$\begin{aligned} \tilde{e}_{di} &= \tilde{\mathbf{e}}_{i,t+1} + \left(\iota_r' + \rho \mathbf{a}_i'\right) \left(\mathbf{I} - \rho \Pi\right)^{-1} \tilde{\mathbf{x}}_{t+1} \\ \tilde{e}_{ei} &= \rho \mathbf{a}_i' \left(\mathbf{I} - \rho \Pi\right)^{-1} \tilde{\mathbf{x}}_{t+1} \\ \tilde{e}_r &= \iota_r' \left(\mathbf{I} - \rho \Pi\right)^{-1} \tilde{\mathbf{x}}_{t+1} \end{aligned} \tag{10}$$

where $\tilde{\mathbf{e}}_i$ is the ith row of the vector $\tilde{\mathbf{e}}$ and $\mathbf{a}_i$ is the ith row of the coefficient matrix $\mathbf{A}$. ι_r is a selection vector which 'picks out' the real

interest rate from the VAR, i.e. $\iota_r' \mathbf{x}_{t+1} \equiv r_{t+1}$. The factor innovations are the residuals from the k individual VAR equations, i.e.:

$$\tilde{\mathbf{e}}_k = \tilde{\mathbf{x}}_{k,t+1} \tag{11}$$

where $\tilde{\mathbf{x}}_{k,t+1}$ is the kth row of the innovation vector $\tilde{\mathbf{x}}_{t+1}$. Having estimated equations (7), (8) and (9), and obtained the variables in equations (10) it is straightforward to calculate the relevant variances and covariances, and hence the betas in equation (6).

4 Data and Empirical Results

We apply the methodology to study the market, exchange rate and interest rate risks of 33 (Level 4) industry sector groupings in France, Germany, Italy and the UK over the period January 1973 to June 2004.[5] Not all the sectors exist for all countries. Although all 33 chosen portfolios exist for France, there is no Aerospace & Defence sector for Germany, no Food & Drug Retailers or Personal Care & Household Products portfolios for Italy and no Diversified Industrials sector in the UK sample. Additionally not all the sectors exist at the beginning of the sample period and hence some portfolios are estimated with shorter sample periods.[6]

The state vector contains the real market excess return, the real interest rate and the change in the real exchange rate. The real market excess return and industry excess returns are measured using the change in the log real total market and industry return indexes, incorporating prices and dividends from Datastream, in excess of the real short term interest rate. The real interest rate is calculated using the three month interbank rate minus the rate of inflation calculated from the CPI, and the exchange rate is the real effective exchange rate. The three state variables enter the VAR as deviations from their mean and the VAR is estimated with a lag length of one. The constraint of the value of ρ to be the same across each industry portfolio restricts the impact of each factor innovation on revisions to expectations of future real interest rates $\beta_{ri,k}$ to be the same across all industry sectors.

Table 1 reports the market excess return betas for each of the industrial sectors in the four countries. With only two exceptions, all the betas are significant at the 1% significance level. The significant estimates imply large deviations in risk premia, the range for France is 0.2799 for Real Estate to 1.4398 for Telecom Services, for Germany 0.3175 (Electricity) to 1.6998 (IT

[5]The sectors are the Level 4 sectors available from Datastream.

[6]Details of sample periods are given in appendix A.

Hardware), for Italy 0.5868 (Support Services) to 2.3427 (Software & Computer Services) and for the UK 0.5610 (Electricity) to 1.7848 (Steel & Other Metals). Thus for every 1% increase in market risk, there is a wedge of 1.16% driven between the two French sectors. A real market excess return of 4% therefore implies that the required return on the Telecom Services portfolio needs to be 4.6% higher than that on the Real Estate portfolio. However, there are also similarities between parameter estimates for certain industries, for example Banks (1.0383, 1.0669, 1.0424, 1.0619 for France, Germany, Italy and the UK respectively) and Pharmaceuticals & Biotechnology (0.8335, 0.7799, 0.8029, 0.8916). Thus market participants in the four markets respond in approximately the same manner to changes in market risk for these sectors, suggesting some degree of homogeneity between these industries.

The real exchange rate betas are reported in Table 2. There are significant differences between the four countries studied. For Germany 56% of the industries (18 out of 32) have significant exchange rate betas, for Italy 26% (8 out of 31), France 21% (7 out of 33) and the UK only 12.5% of industries (4 out of 32) have significant betas. Moreover, all the betas for Germany are estimated to be negative. They are also virtually all negative for France, although for the Life Assurance sector the exchange rate beta is both positive and significant. By way of contrast, the majority of betas are positive for Italy and they are all except Steel & Other Metals positive for the UK. Thus, currency appreciations have a negative impact on stock returns in France and Germany but increase expected returns in Italy and the UK. The findings for France and Italy of around one fifth to one quarter of the sample showing significant exposure to exchange rate risk is in line with the previous research discussed in section one. The level of significance in the UK is only slightly lower than that documented by El-Masry (2004). However, the results for Germany suggest a very high level of sensitivity to exchange rate changes. In general, participants respond differently in the four markets although there are some similarities between France and Germany and Italy and the UK. For example, between France and Germany the betas for the following portfolios Beverages, Electricity, Household Goods & Services and Support Services are similar while the sectors Electronic & Electrical Equipment, Forestry & Paper, Leisure & Hotels and Speciality & Other Finance have similar betas for Italy and the UK.

Table 3 presents the estimates of the real interest rate betas. Germany has the most industrial sectors that are sensitive to the real interest rate, with 11 out 32 (34%) significant betas. All the significant betas are negative. For France only 21% of the sectors (7 out of 33) are significant and again, with the exception of the Personal Care & Household Products sector, all the significant betas are negative. For France and Germany therefore, an increase in the real interest rate leads to a downward revision in expected

returns. However, typically the responses in France are much greater than those in Germany since the absolute values of the estimated betas is larger. For both Italy and the UK only two of the sectors have significant betas. Somewhat surprisingly, especially in the UK given the high prominence afforded to interest rates, it seems that changes to interest rates do not have a significant impact on expected returns in Italy and the UK. However, the beta decompositions will identify any important information mechanisms and whether changes to interest rates contain news about future dividends, real interest rates and excess returns.

The beta decompositions, news about future cash flows $\beta_{di,k}$ and news about future excess returns $\beta_{ei,k}$, are reported in Table 4. The future real interest rate beta, $\beta_{r,k}$, is reported in the final rows of Tables 1-3 for each of the respective factors. The future real interest rate beta is constrained to be the same for each sector over the sample sample period.[7] For all countries, an unexpected change in the excess market return is associated with a negative revision in expectations about future real interest rates, although only the beta for Germany is significant. Unexpected changes in both exchange rates and interest rates are associated with significant positive revisions in future real interest rates for all four countries. Forward looking behaviour by market participants implies that an unexpected currency appreciation leads to an increase in future real interest rates, ($\beta_{r,\Delta s}$ = 0.1546, 0.2894, 0.3039, 0.0762 for France, Germany, Italy and the UK respectively). Further a current positive surprise to interest rates leads to higher real interest rates in the future ($\beta_{r,r}$ = 2.1811, 1.1444, 2.1741, 2.1712), a manifestation of long memory or persistence in real rates.

Unexpected changes in excess market returns typically have a positive impact on revisions in expectations about both future cash flows and future excess returns. Moreover, the majority of estimated coefficients are statistically significant. Further, on the whole, the absolute value of the cash flow (dividend) betas is much larger than that of the future excess return betas, suggesting changes in stock returns associated with a change in the market excess return are due more to revisions in expectations about future dividends than future excess returns.

Changes in both exchange rate and interest rates are a source of news about future cash flows. Unexpected changes in exchange rates contain significant information about future dividends. For Germany 59% (19 out of 32) of the industrial sectors have significant betas, for Italy 45% (14 out of 31) of sectors are significant, for France 42% (14 out of 33) are significant and for the UK 31% (10 out of 32) of the sectors have significant cash flow betas. In line with the estimation of the real exchange rate betas, all the

[7]The betas reported are for the full sample 1973:01 - 2004:06. Betas for sectors estimated over shorter sample periods are available on request.

German cash flow betas are negative, as are the majority of the French betas. However for Italy and the UK the majority of the $\beta_{di,\Delta s}$ are positive.

Innovations in real interest rates have a slightly weaker impact on changes in expectations about future dividends. France has 39% significant sectors, the UK 37.5%, Italy 32% and Germany 25% There is an even spread between negative and positive revisions to expectations across the industry sectors in each country. The majority of the betas capturing news about future excess returns are significant. With respect to innovations in changes in exchange rates, the betas are mostly negative for German and Italian industry portfolios, while for France and the UK there is a relatively even split between negative and positive betas on the sectors. Typically the absolute values of the exchange rate dividend betas are greater than those of the excess return betas. However, for unexpected changes in real interest rates the excess return betas are larger in Germany, Italy and the UK than the cash flow betas. The results for the French sectors show that the magnitude of revisions to expectations about future dividends is greater than the changes to expectations about future excess returns.

Overall, the beta decomposition results highlight that movements in stock returns to changes in exchange rates are largely due to revisions in expectations about future dividend payments, while movements due to changes in interest rates can be apportioned to changes in expectations about future excess returns.

5 Conclusion

This study investigates the level of market, exchange rate and interest rate risk faced by industries in four major European economies, France, Germany, Italy and the UK. Using 33 industry portfolios the response of stock returns are measured to ascertain the extent of exposure of each industry to the market, exchange rates and interest rates. These responses are then decomposed into components attributable to news about future dividends, future real interest rates and future excess returns. This uncovers important information transmission mechanisms which may be hidden in the basic analysis.

The results provide significant evidence of exposure to market, exchange rate and interest rate risks. In line with previous studies we find that market excess return betas are significant and positive for virtually all industries in all four countries. However very few industries exhibit responses of similar magnitude across the four countries, suggesting that market participants in the different markets have different perceptions of sensitivity to market risk and also that there are possibly distinct differences in the make up of the industrial sector portfolio in each of the four countries.

Importantly, this paper establishes that significant levels of exchange rate exposure exist in all four economies. The findings for France, Italy and the UK are similar to those reported elsewhere in the literature. However, industry portfolios in Germany are much more sensitive to changes in exchange rates and interest rates than previously documented. Further, industrial sectors in France and Germany are exposed to significant levels of interest rate risk, although this is not the case in Italy or the UK.

The beta decompositions show that unexpected changes in market excess returns, exchange rate changes and real interest rates contain significant information about future cash flows, future real interest rates and future excess returns. For decompositions of both the market betas and the exchange rate betas, the magnitude of the betas for news about future dividends is greater than the magnitude of the betas for news about future excess returns. However for unexpected changes in real interest rates, the response is due more to changes in expectations about future excess returns than news about future dividends. For both exchange rate and interest rate innovations there are significant revisions in expectations about future real interest rates.

This study clearly establishes that industries in France, Germany, Italy and the UK face significant market and exchange rate risks; and industries in France and Germany face significant interest rate risk. However, it also shows that although risks (especially exchange rate exposure and interest rate risk) may be perceived as insignificant, they significant impacts on expectations about future dividends, real interest rates and excess returns.

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	France	Germany	Italy	UK		France	Germany	Italy	UK
Aerospace	1.0029*		1.1172*	1.0523*	Investment	1.0282*	0.8070*	1.4526*	1.0712*
& Defence	(0.0962)		(0.0775)	(0.0638)	Companies	(0.0767)	(0.1604)	(0.1940)	(0.0294)
Automobiles	1.1488*	1.0539*	1.1353*	1.0777*	Leisure	1.0490*	1.6494*	1.0652*	1.1418*
& Parts	(0.0585)	(0.0624)	(0.0473)	(0.0602)	& Hotels	(0.0705)	(0.2773)	(0.0943)	(0.0552)
Banks	1.0383*	1.0669*	1.0424*	1.0619*	Life	0.3284**	0.9603*	0.9746*	1.1649*
	(0.0930)	(0.0459)	(0.0488)	(0.0381)	Assurance	(0.1313)	(0.0725)	(0.0430)	(0.0579)
Beverages	0.8233*	0.5459*	-0.0376	0.8436*	Media	0.9845*	0.9148*	0.7875*	1.1673*
	(0.0589)	(0.0671)	(0.2622)	(0.0452)		(0.0648)	(0.1587)	(0.1103)	(0.0473)
Chemicals	0.7574*	0.9040*	1.0814*	0.9390*	Oil & Gas	0.8370*	0.5136*	0.7082*	0.9176*
	(0.0376)	(0.0344)	(0.0638)	(0.0576)		(0.0647)	(0.0876)	(0.0933)	(0.0409)
Construction &	0.9488*	0.7927*	1.0219*	1.1387*	Personal Care	0.9490*	0.6282*		0.9478*
Building Mats.	(0.0433)	(0.0611)	(0.0496)	(0.0361)	& Household Products	(0.0654)	(0.0545)		(0.0551)
Diversified	1.0556*	0.7119*	1.0000*		Pharmaceuticals	0.8335*	0.7799*	0.8029*	0.8916*
Industrials	(0.0377)	(0.0462)	(0.0459)		& Biotechnology	(0.0660)	(0.0525)	(0.1314)	(0.0545)
Electricity	0.8941*	0.3175*	0.7640*	0.5610*	Real	0.2799*	0.7737*	0.6989*	0.9695*
	(0.2227)	(0.0377)	(0.0832)	(0.0923)	Estate	(0.0375)	(0.1402)	(0.0600)	(0.0477)
Electronic &	1.0977*	1.2907*	0.6244*	1.1143*	General	1.0280*	0.8382*	0.9328*	1.0293*
Electrical Equip.	(0.0510)	(0.0517)	(0.0862)	(0.0618)	Retailers	(0.0620)	(0.0649)	(0.0603)	(0.0536)
Engineering	1.0509*	0.9836*	0.8686*	1.0934*	Software &	1.3698*	1.4361*	2.3427*	0.7115*
& Machinery	(0.0806)	(0.0356)	(0.0763)	(0.0576)	Computer Services	(0.1161)	(0.1399)	(0.6680)	(0.1206)
Food & Drug	0.8635*	0.0189*		0.8236*	Speciality &	1.0254*	0.6944*	1.1361*	1.1299*
Retailers	(0.0504)	(0.1613)		(0.0567)	Other Finance	(0.1122)	(0.1372)	(0.0497)	(0.0421)
Food Producers	0.7655*	0.3486*	0.7928*	0.8737*	Steel &	1.1173*	0.8153*	0.7596*	1.7848*
& Processors	(0.0426)	(0.0570)	(0.0792)	(0.0412)	Other Metals	(0.0745)	(0.0691)	(0.0572)	(0.2368)
Forestry	0.5864*	0.5603*	0.9050*	0.8192*	Support	0.9204*	0.8563*	0.5868*	0.9685*
& Paper	(0.0975)	(0.0766)	(0.0586)	(0.0803)	Services	(0.0802)	(0.0997)	(0.1078)	(0.0365)
Health	0.8470*	0.6395*	1.1473*	0.9102*	Telecom	1.4398*	1.0824*	0.9465*	0.9922*
	(0.0781)	(0.0788)	(0.2651)	(0.0509)	Services	(0.2515)	(0.0763)	(0.0409)	(0.0957)
Household Goods	1.0215*	0.7532*	0.8332*	0.8880*	Transport	0.7862*	0.9273*	0.9995*	0.9342*
& Textiles	(0.0619)	(0.0604)	(0.0688)	(0.0898)		(0.1044)	(0.0730)	(0.0663)	(0.0397)
IT Hardware	1.3594*	1.6998*	0.8366*	1.7613*	Other	0.9722*	0.6210*	0.8767*	0.6249*
	(0.0824)	(0.3245)	(0.0974)	(0.3164)	Utilities	(0.0602)	(0.0446)	(0.0537)	(0.0735)
Insurance	1.1478*	1.1921*	0.9382*	1.1163*	Real Interest	-0.0063	-0.0095**	-0.0001	-0.0035
	(0.0781)	(0.0570)	(0.0279)	(0.0552)	Rate $\beta_{r,m}$	(0.0047)	(0.0046)	(0.0081)	(0.0152)

Table 1 : Real Market Beta

* 1% significance, ** 5% significance and *** 10% significance.

	France	Germany	Italy	UK		France	Germany	Italy	UK
Aerospace	-1.2039*		-0.2711	0.1961	Investment	-0.5936	-3.9666***	-5.4631***	0.2491
& Defence	(0.4271)		(0.5013)	(0.2516)	Companies	(0.5426)	(2.2841)	(3.0286)	(0.2000)
Automobiles	-0.0706	-0.7882**	0.4263	0.0719	Leisure	-0.8269	-13.2166**	0.1694	0.1425
& Parts	(0.5510)	(0.3191)	(0.4558)	(0.2840)	& Hotels	(0.5026)	(6.4643)	(0.8228)	(0.2297)
Banks	-1.1374	-0.6363**	-0.2239	0.0222	Life	3.4539**	-0.5411	-0.1259	0.2154
	(0.8030)	(0.3101)	(0.4309)	(0.2217)	Assurance	(1.4394)	(0.3831)	(0.4070)	(0.2841)
Beverages	-0.2415	-0.3397	1.4065	0.4512**	Media	-0.7068	-0.9164	0.8962*	0.1647
	(0.4512)	(0.3577)	(2.0735)	(0.2016)		(0.5108)	(0.5952)	(0.3329)	(0.2433)
Chemicals	0.0640	-0.9109*	0.6769	0.0933	Oil & Gas	-0.1445	-0.2571	0.4038	0.0484
	(0.3437)	(0.2723)	(0.4823)	(0.1948)		(0.4352)	(0.4582)	(0.5182)	(0.2281)
Construction &	-0.3061	-0.7273**	0.7113	0.0493	Personal Care	-0.2366	-0.4376***		0.0080
Building Mats.	(0.4038)	(0.3353)	(0.5027)	(0.2230)	& Household Products	(0.5238)	(0.2486)		(0.2305)
Diversified	-0.2790	-0.6855**	0.3887		Pharmaceuticals	-1.5031*	-1.0680*	0.0284	0.0855
Industrials	(0.4524)	(0.2869)	(0.3804)		& Biotechnology	(0.5562)	(0.2909)	(0.5381)	(0.2120)
Electricity	-0.3058	-0.3827***	1.4720**	0.1552	Real	-0.1345	-3.3172*	-0.0817	0.3416
	(0.8878)	(0.2178)	(0.5776)	(0.2579)	Estate	(0.1952)	(1.2602)	(0.3164)	(0.2650)
Electronic &	-0.9535***	-0.8186**	0.4622	0.3942	General	-0.0538	-0.4714	0.7875***	0.4193***
Electrical Equip.	(0.5094)	(0.3172)	(0.3317)	(0.2616)	Retailers	(0.4876)	(0.3442)	(0.4602)	(0.2446)
Engineering	-0.1031	-1.0688*	0.7893	0.1940	Software &	-2.5128**	-1.1781	-7.6117	0.0672
& Machinery	(0.5561)	(0.2942)	(0.6362)	(0.2360)	Computer Services	(0.9673)	(0.7880)	(5.3926)	(0.3032)
Food & Drug	-0.1601	-0.0185		0.3296***	Speciality &	-2.0595**	-2.4122	0.4236	0.3971***
Retailers	(0.3575)	(0.6627)		(0.1961)	Other Finance	(0.9098)	(2.6792)	(0.3606)	(0.2133)
Food Producers	-0.1926	-0.0697	1.0758*	0.1960	Steel &	-0.6817	-1.0023**	0.3500	-0.7638
& Processors	(0.4115)	(0.2530)	(0.3147)	(0.1811)	Other Metals	(0.5363)	(0.4038)	(0.3206)	(0.7764)
Forestry	-1.2157	-0.3294	0.1995	0.1977	Support	-0.8213	-0.7464	0.7480***	0.3526
& Paper	(0.8669)	(0.4080)	(0.5320)	(0.2700)	Services	(0.6504)	(0.6163)	(0.3822)	(0.2210)
Health	-0.3392	-0.2336	0.4997	0.2633	Telecom	-5.6186**	-0.9041*	0.3900	0.2653
	(0.6058)	(0.4090)	(3.2704)	(0.2197)	Services	(2.3759)	(0.3366)	(0.3697)	(0.2713)
Household Goods	-0.4924	-0.4160	0.8881**	-0.2210	Transport	-1.2940	-0.5854***	0.1053	0.2026
& Textiles	(0.4297)	(0.3277)	(0.3903)	(0.3026)		(1.0705)	(0.3399)	(0.4102)	(0.2163)
IT Hardware	-0.4131	-2.8778**	0.9943***	1.1272	Other	0.0370	-0.6512**	0.3375	0.0479
	(0.5397)	(1.2928)	(0.5141)	(0.8394)	Utilities	(0.4314)	(0.2647)	(0.3943)	(0.2195)
Insurance	-0.7507	-0.6021	0.2202	0.2952	Real Interest	0.1546*	0.2894**	0.3039*	0.0762***
	(0.6644)	(0.3722)	(0.3335)	(0.2842)	Rate $\beta_{r,\Delta s}$	(0.0404)	(0.1271)	(0.0490)	(0.0460)

Table 2 : Real Exchange Rate Beta

* 1% significance, ** 5% significance and *** 10% significance.

	France	Germany	Italy	UK		France	Germany	Italy	UK
Aerospace	-1.1507		1.4564	-0.2083	Investment	0.8313	2.2561	-6.0147	0.4009
& Defence	(1.6554)		(1.6568)	(0.7233)	Companies	(1.7510)	(7.0312)	(11.3595)	(0.6503)
Automobiles	-1.6045	-1.1662	2.1012	-1.0036	Leisure	-2.4283***	-0.7915	-1.3219	-0.0906
& Parts	(1.4279)	(0.7709)	(0.4558)	(0.7138)	& Hotels	(1.4544)	(12.9938)	(1.7291)	(0.7309)
Banks	-1.5011	-0.7724**	-2.0655***	-0.1161	Life	2.3833	-0.3897	-0.8397	-0.1715
	(1.5998)	(0.3687)	(1.2486)	(0.7020)	Assurance	(3.5934)	(0.4392)	(1.1703)	(0.7721)
Beverages	0.3284	-0.5270	-0.9563	0.2087	Media	-4.0979**	-0.3875	-0.6636	0.4331
	(1.3682)	(0.5833)	(7.8176)	(0.6849)		(1.9124)	(0.5229)	(2.6055)	(0.7047)
Chemicals	0.2195	-0.9946	0.0990	-0.2255	Oil & Gas	-1.2441	-0.6984	-0.8144	-0.3603
	(1.0824)	(0.6948)	(1.5148)	(0.5178)		(1.3799)	(0.5589)	(2.1723)	(0.7117)
Construction &	-2.0358***	-1.1788**	-0.5708	-0.4654	Personal Care	2.2882***	-0.3681		-0.0352
Building Mats.	(1.1947)	(0.4942)	(1.2236)	(0.6715)	& Household Products	(1.3024)	(0.4575)		(0.7469)
Diversified	-0.9312	-0.8573*	0.2927		Pharmaceuticals	-2.1273	-0.2914	-2.1335	0.4944
Industrials	(1.4539)	(0.2943)	(1.0958)		& Biotechnology	(1.6937)	(0.3102)	(3.2992)	(0.6621)
Electricity	0.9129	-0.3706***	-1.4144	1.7282***	Real	-0.8187	-2.1081	-0.4870	-0.1108
	(2.6990)	(0.2083)	(2.5623)	(0.9824)	Estate	(0.7064)	(4.3489)	(1.0622)	(0.8706)
Electronic &	-2.8868**	-1.2306**	0.4958	0.3297	General	0.5507	-0.2557	1.2374	0.1283
Electrical Equip.	(1.4477)	(0.5745)	(2.7999)	(0.7036)	Retailers	(1.3521)	(0.6076)	(1.3898)	(0.8889)
Engineering	-2.2372	-1.4726**	-0.5477	-0.1371	Software &	-7.0171**	-1.3171**	2.8655	-1.4687***
& Machinery	(1.6047)	(0.6206)	(2.7504)	(0.6152)	Computer Services	(2.9010)	(0.6045)	(15.8256)	(0.7570)
Food & Drug	1.2850	0.1906		0.1905	Speciality &	-1.6927	1.6267	-0.0906	-0.1965
Retailers	(1.3044)	(0.6660)		(0.7078)	Other Finance	(2.2633)	(5.3570)	(1.0266)	(0.6063)
Food Producers	-0.3027	0.0714	3.3174	0.3405	Steel &	-2.3601	-0.7429	-0.5766	-3.4937
& Processors	(1.1437)	(0.3107)	(3.9441)	(0.6049)	Other Metals	(1.7157)	(0.4725)	(1.1214)	(2.3938)
Forestry	-2.9196	-0.6749	-0.3116	0.2228	Support	1.4013	-0.2529	-6.0491***	0.3289
& Paper	(2.0415)	(0.5883)	(1.1104)	(0.6810)	Services	(2.0164)	(0.4013)	(3.3073)	(0.5705)
Health	-0.8296	0.2252	-11.9706	-0.1866	Telecom	-11.0139	-1.1461**	0.7667	-0.4279
	(1.4400)	(0.4986)	(13.8244)	(0.6872)	Services	(6.8537)	(0.5595)	(1.0387)	(0.8259)
Household Goods	-0.4792	-0.6989	-0.1061	-0.7635	Transport	-7.1512*	-0.9610***	-1.4343	-0.0959
& Textiles	(1.2824)	(0.5489)	(2.5298)	(0.9050)		(2.4940)	(0.5680)	(1.5467)	(0.5924)
IT Hardware	-2.3377	-8.2223**	-2.1904	2.6284	Other	-0.9637	-0.8311*	0.0597	0.1226
	(1.9806)	(3.2988)	(2.9898)	(3.0788)	Utilities	(1.3774)	(0.2647)	(1.0783)	(0.8071)
Insurance	0.8563	-0.3071	-0.6575	-0.2287	Real Interest	2.1811*	1.1444*	2.1741*	2.1712*
	(1.8188)	(0.3437)	(0.9987)	(0.7174)	Rate $\beta_{r,r}$	(0.0180)	(0.0054)	(0.0225)	(0.0181)

Table 3 : Real Interest Rate Beta

* 1% significance, ** 5% significance and *** 10% significance.

	France						Germany					
	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$
Aerospace	1.1980*	0.2014*	-1.9311*	-0.8818*	-4.2066**	-5.2370*						
& Defence	(0.0983)	(0.0116)	(0.4759)	(0.1140)	(1.7842)	(0.2166)						
Automobiles	1.2052*	0.0627*	1.3399**	1.2559*	3.6278**	3.0512*	1.2601*	0.2157*	-1.3004*	-0.8017*	-0.7402	-0.7184*
& Parts	(0.0627)	(0.0115)	(0.5663)	(0.0394)	(1.5201)	(0.2545)	(0.0627)	(0.0068)	(0.3946)	(0.0488)	(0.8560)	(0.1030)
Banks	1.1721*	0.1471*	-2.0841**	-1.1888*	1.8077	1.2234*	1.1608*	0.1034*	-0.3086	0.0384	0.7287***	0.3567*
	(0.0963)	(0.0090)	(0.8398)	(0.0901)	(1.7461)	(0.2655)	(0.0455)	(0.0014)	(0.3748)	(0.0559)	(0.3931)	(0.0332)
Beverages	0.7781*	-0.0389*	0.8998**	0.9867*	2.9608**	0.4514**	0.6978*	0.1615*	-0.5463	-0.4960*	-0.2224	-0.8398*
	(0.0609)	(0.0090)	(0.4411)	(0.0190)	(1.3782)	(0.2202)	(0.0675)	(0.0044)	(0.3599)	(0.0643)	(0.5666)	(0.0652)
Chemicals	0.7321*	-0.0190**	-0.1137	-0.3322*	-1.2622	-3.6627*	0.9288*	0.0343*	-0.7186***	-0.0970	0.6478	0.4980*
	(0.0379)	(0.0078)	(0.3350)	(0.0659)	(1.0608)	(0.0215)	(0.0339)	(0.0028)	(0.3964)	(0.0848)	(0.7096)	(0.0249)
Construction &	1.0420*	0.0995*	0.4732	0.6247*	-0.4552	-0.6005*	0.9226*	0.1394*	-1.1914*	-0.7535*	0.0718	0.1062
Building Mats.	(0.0441)	(0.0069)	(0.4344)	(0.0493)	(1.3213)	(0.2185)	(0.0624)	(0.0080)	(0.3286)	(0.1180)	(0.4660)	(0.0959)
Diversified	1.0900*	0.0407*	0.1946	0.3190*	2.1372	0.8873*	0.7070*	0.0046*	-0.4456	-0.0495*	0.2382	-0.0489*
Industrials	(0.0388)	(0.0031)	(0.4631)	(0.0185)	(1.4925)	(0.0793)	(0.0458)	(0.0005)	(0.2898)	(0.0011)	(0.2939)	(0.0043)
Electricity	1.2087*	0.3292*	-0.8472	-0.8190*	2.3705	-0.7439	0.3454*	0.0374*	0.1471	0.2405**	0.3122	-0.4616*
	(0.2233)	(0.0018)	(0.9744)	(0.1803)	(2.7882)	(0.4716)	(0.0372)	(0.0045)	(0.2269)	(0.0954)	(0.2110)	(0.0313)
Electronic &	1.2604*	0.1691*	0.0772	0.8761*	0.6428	1.3485*	1.3306*	0.0494*	-0.9083**	-0.3791*	-0.1031	-0.0169
Electrical Equip.	(0.0502)	(0.0082)	(0.5642)	(0.0657)	(1.6257)	(0.2873)	(0.0511)	(0.0040)	(0.3715)	(0.0477)	(0.6003)	(0.0428)
Engineering	1.1525*	0.1080*	-0.9794***	-1.0308*	-5.9330*	-5.8768*	1.1011*	0.1271*	-1.7848*	-1.0053*	-0.9454	-0.6172*
& Machinery	(0.0825)	(0.0132)	(0.5879)	(0.1022)	(1.6377)	(0.1382)	(0.0366)	(0.0097)	(0.3670)	(0.0491)	(0.6962)	(0.1016)
Food & Drug	0.8499*	-0.0073	0.8563**	0.8619*	2.8169**	-0.6491*	0.0822	0.0703**	-2.2746*	-2.8468*	-0.8878	-2.1334*
Retailers	(0.0525)	(0.0089)	(0.3559)	(0.0349)	(1.3416)	(0.2211)	(0.1679)	(0.0329)	(0.6971)	(0.1467)	(0.6507)	(0.1994)
Food Producers	0.9070*	0.1479*	0.2622	0.3003*	0.7478	-1.1305*	0.3387*	-0.0003	-0.4061	-0.6258*	0.8633*	-0.3525*
& Processors	(0.0427)	(0.0049)	(0.4582)	(0.0654)	(1.2718)	(0.2099)	(0.0580)	(0.0066)	(0.2834)	(0.0282)	(0.2969)	(0.0521)
Forestry	0.7585*	0.1869*	-2.6972*	-1.7563*	-2.4733	-1.7327*	0.7083*	0.1575*	-0.9229**	-0.8829*	-0.3359	-0.8054*
& Paper	(0.0982)	(0.0120)	(0.9105)	(0.0837)	(2.1255)	(0.3370)	(0.0788)	(0.0080)	(0.4580)	(0.0338)	(0.6520)	(0.0939)
Health	1.0404*	0.2019*	-1.3101**	-1.1110*	2.1290	0.8296*	0.8892*	0.2592*	-0.2097	-0.2655***	0.1890	-1.1805*
	(0.0771)	(0.0103)	(0.6549)	(0.0817)	(1.5678)	(0.2941)	(0.0787)	(0.0050)	(0.4370)	(0.1415)	(0.5172)	(0.0806)
Household Goods	1.0759*	0.0608*	-0.1208	0.2171*	2.0705	0.3686*	0.8920*	0.1484*	-1.0173*	-0.8907*	-0.6448	-1.0903*
& Textiles	(0.0630)	(0.0021)	(0.4503)	(0.0233)	(1.3329)	(0.0881)	(0.0614)	(0.0081)	(0.3683)	(0.0505)	(0.6067)	(0.0873)
IT Hardware	1.4503*	0.0972*	0.3228	0.5813*	1.4828	1.6394*	1.6371*	-0.0406	-4.0493*	-1.4279*	-2.3196	4.8269*
	(0.0832)	(0.0056)	(0.5700)	(0.0413)	(2.0814)	(0.1637)	(0.3239)	(0.0349)	(1.2358)	(0.2747)	(3.3857)	(0.5781)
Insurance	1.2065*	0.0689*	-0.3663	0.2492**	-0.2908	-3.2487*	1.2774*	0.0948*	-0.4156	-0.1028	1.4103*	0.5731*
	(0.0784)	(0.0089)	(0.6982)	(0.0964)	(1.8838)	(0.1444)	(0.0570)	(0.0029)	(0.4469)	(0.1005)	(0.3500)	(0.0412)

Table 4 : Beta Decompositions

* 1% significance, ** 5% significance and *** 10% significance.

	France						Germany					
	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$
Investment	1.2710*	0.2491*	0.2172	0.6563*	1.0594	-1.9530*	1.0342*	0.2492*	-3.4881	0.3335	-3.0997	-6.2707*
Companies	(0.0770)	(0.0096)	(0.6054)	(0.1130)	(1.9406)	(0.3793)	(0.1507)	(0.0264)	(2.4432)	(0.4918)	(7.3114)	(0.8078)
Leisure	1.1707*	0.1280*	-0.4705	0.2019*	-0.8294	-0.5822*	2.0539*	0.4269*	-20.8792*	-7.8060*	15.5275	15.3950*
& Hotels	(0.0710)	(0.0031)	(0.5408)	(0.0522)	(1.5559)	(0.1673)	(0.3333)	(0.1215)	(6.9971)	(1.3383)	(15.3824)	(3.4524)
Life	0.4547*	0.1341*	1.5316	-2.2778*	0.7064	-2.9326*	1.2320*	0.2813*	-0.5238	-0.2721**	1.2728*	0.5181*
Assurance	(0.1233)	(0.0240)	(1.4712)	(0.1443)	(3.4650)	(0.6265)	(0.0729)	(0.0031)	(0.4822)	(0.1356)	(0.4679)	(0.1037)
Media	1.1806*	0.2025*	-0.7610	-0.2087*	-3.3875	-1.4707*	1.0772*	0.1659*	-0.5964	-0.2400	1.0531***	0.3761*
	(0.0642)	(0.0031)	(0.5649)	(0.0802)	(2.0752)	(0.2196)	(0.1585)	(0.0048)	(0.8681)	(0.2163)	(0.5732)	(0.0751)
Oil & Gas	0.9939*	0.1632*	-0.3380	-0.3481*	-4.5055*	-5.4424*	0.5598*	0.0532*	-0.6449	-0.9811*	-0.7670	-1.1251*
	(0.0659)	(0.0117)	(0.4932)	(0.1208)	(1.5184)	(0.1952)	(0.0867)	(0.0110)	(0.4799)	(0.1017)	(0.5901)	(0.0542)
Personal Care	0.8877*	-0.0549*	0.8702***	0.9522*	5.0197*	0.5504*	0.6465*	0.0278*	-0.9142*	-0.7659*	-0.3527	-1.1290*
& Household Products	(0.0672)	(0.0085)	(0.5126)	(0.0213)	(1.2944)	(0.2096)	(0.0551)	(0.0076)	(0.2336)	(0.0646)	(0.4330)	(0.0524)
Pharmaceuticals	0.9141*	0.0895*	-0.7468	0.6568*	-3.7934**	-3.6770*	0.8331*	0.0628*	-1.1474*	-0.3687*	1.0722*	0.2192*
& Biotechnology	(0.0668)	(0.0113)	(0.6207)	(0.1270)	(1.7394)	(0.2502)	(0.0539)	(0.0044)	(0.3920)	(0.0807)	(0.3094)	(0.0491)
Real	0.4239*	0.1503*	0.3548	0.3347*	0.5836	-0.7788*	0.8821*	0.1289*	-4.9911*	-1.8714*	-3.0376	-1.9136*
Estate	(0.0370)	(0.0046)	(0.2224)	(0.0633)	(0.7932)	(0.2123)	(0.1472)	(0.0201)	(1.2980)	(0.0828)	(4.6804)	(0.5754)
General	1.2264*	0.2047*	0.7690	0.6683*	3.9238**	1.1920*	0.7697*	-0.0589*	0.0669	0.2490*	0.9115	0.0228
Retailers	(0.0630)	(0.0065)	(0.5470)	(0.0784)	(1.5179)	(0.2876)	(0.0652)	(0.0024)	(0.3217)	(0.0326)	(0.6292)	(0.0335)
Software &	1.6132*	0.2539*	-3.5817*	-1.3052*	-6.4853**	-1.5758*	1.5459*	0.1168*	-2.3776**	-1.7899**	-0.0673	0.1949
Computer Services	(0.1154)	(0.0073)	(1.0366)	(0.1296)	(3.1231)	(0.3441)	(0.1439)	(0.0299)	(1.0358)	(0.6924)	(0.6466)	(0.2127)
Speciality &	1.2157*	0.2029*	-3.1069*	-1.2710*	-2.2670	-2.7800*	0.9028*	0.2357*	-5.9637***	-3.8364*	-0.1534	-2.7513
Other Finance	(0.1133)	(0.0074)	(0.9786)	(0.1154)	(2.4178)	(0.2913)	(0.1533)	(0.0533)	(3.2177)	(0.6706)	(6.5108)	(1.5621)
Steel &	1.1678*	0.0568*	-0.5957	-0.0686***	-1.6963	-1.5173*	1.0543*	0.2486*	-1.7795*	-1.0666*	-1.5169*	-1.9184*
Other Metals	(0.0745)	(0.0033)	(0.5475)	(0.0368)	(1.7510)	(0.0698)	(0.0709)	(0.0099)	(0.4415)	(0.1435)	(0.4762)	(0.1118)
Support	1.0449*	0.1361*	-2.6263*	-2.0296*	5.7979*	2.3679*	0.9223*	0.0736*	-1.4609***	-1.3286*	0.3083	-0.4901*
Services	(0.0744)	(0.0205)	(0.6865)	(0.1198)	(2.1242)	(0.3608)	(0.0997)	(0.0183)	(0.8535)	(0.2804)	(0.4241)	(0.1262)
Telecom	1.4404*	0.0057	-6.5068*	-1.2536**	-2.3388	7.3844*	1.1650*	0.0921*	-1.0455**	-0.4308**	0.9758	0.9776*
Services	(0.2538)	(0.0424)	(2.3101)	(0.4837)	(6.9631)	(0.9277)	(0.0770)	(0.0077)	(0.4904)	(0.1978)	(0.6112)	(0.0750)
Transport	0.8852*	0.1112*	-3.6462*	-2.5885*	-7.5701*	-2.5976*	1.0975*	0.1797*	-0.9182**	-0.6222*	-1.5023**	-1.6857*
	(0.1061)	(0.0188)	(1.0593)	(0.0253)	(2.5402)	(0.3819)	(0.0735)	(0.0071)	(0.3680)	(0.1623)	(0.6162)	(0.0669)
Other	1.0401*	0.0742*	0.4832	0.2917*	2.5113***	1.2939*	0.6189*	0.0074*	-0.2260	0.1358*	0.1557	-0.1577*
Utilities	(0.0610)	(0.0034)	(0.4450)	(0.0333)	(1.4322)	(0.0990)	(0.0444)	(0.0021)	(0.2601)	(0.0394)	(0.2780)	(0.0157)

Table 4 : Beta Decompositions

* 1% significance, ** 5% significance and *** 10% significance.

	Italy						UK					
	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$
Aerospace	1.2508*	0.1336*	0.2647	0.2319*	2.7317	-0.8988*	1.3003*	0.2515*	0.2976	0.0253	-1.5417***	-3.5045*
& Defence	(0.0775)	(0.0051)	(0.5332)	(0.0644)	(1.7426)	(0.1413)	(0.0633)	(0.0245)	(0.2885)	(0.0939)	(0.8328)	(0.1470)
Automobiles	1.3420*	0.2067*	0.3170	-0.4131*	5.1181*	0.8428*	1.3035*	0.2293*	-0.0763	-0.2244**	-2.7273*	-3.8950*
& Parts	(0.0492)	(0.0079)	(0.5004)	(0.0699)	(1.6550)	(0.2692)	(0.0635)	(0.0272)	(0.3258)	(0.0963)	(0.8140)	(0.1306)
Banks	1.1415*	0.0992*	0.2376	0.1576**	-1.7977	-1.9063*	1.1894*	0.1310*	-0.1801	-0.2785*	0.8809	-1.1742*
	(0.0477)	(0.0079)	(0.4647)	(0.0752)	(1.3191)	(0.1195)	(0.0384)	(0.0092)	(0.2406)	(0.0347)	(0.7760)	(0.0838)
Beverages	0.3359	0.3740*	-2.4423	-3.9805*	-5.5581	-5.5538	0.9163*	0.0761*	0.6070*	0.0796***	0.7311	-1.6488*
	(0.2464)	(0.0761)	(2.2651)	(0.8667)	(8.6535)	(5.3059)	(0.0461)	(0.0117)	(0.2113)	(0.0409)	(0.7187)	(0.0521)
Chemicals	1.1452*	0.0638*	1.4042*	0.4234*	3.4275**	1.1544*	1.1015*	0.1659*	-0.1383	-0.3078*	-0.3006	-2.2463*
	(0.0669)	(0.0062)	(0.4808)	(0.0219)	(1.5532)	(0.0862)	(0.0581)	(0.0162)	(0.2208)	(0.0573)	(0.6020)	(0.0993)
Construction &	1.1134*	0.0915*	1.2783**	0.2632*	-0.4590	-2.0624*	1.3460*	0.2107*	-0.0434	-0.1689**	-1.4782***	-3.1840*
Building Mats.	(0.0519)	(0.0092)	(0.5365)	(0.0798)	(1.3054)	(0.1344)	(0.0370)	(0.0222)	(0.2613)	(0.0813)	(0.7798)	(0.1201)
Diversified	1.1022*	0.1022*	0.1534	-0.5392*	-1.1956	-3.6624*						
Industrials	(0.0455)	(0.0140)	(0.4263)	(0.1012)	(1.1960)	(0.1291)						
Electricity	0.8080*	0.0420*	1.2070**	-0.2699*	-2.9128	-4.1355*	0.4312*	-0.1237*	0.4394***	0.2267*	2.9934*	-0.6220*
	(0.0832)	(0.0121)	(0.5937)	(0.0747)	(2.5883)	(0.1534)	(0.0950)	(0.0107)	(0.2453)	(0.0419)	(0.9323)	(0.1304)
Electronic &	0.7552*	0.1320*	-0.0509	-0.5196*	0.2497	-2.9803*	1.3111*	0.2003*	0.7276**	0.2572*	1.2150	-1.2859*
Electrical Equip.	(0.0882)	(0.0137)	(0.3578)	(0.0723)	(2.9934)	(0.4315)	(0.0630)	(0.0099)	(0.2874)	(0.0507)	(0.7930)	(0.1220)
Engineering	1.0222*	0.1516*	0.3250	-0.4693*	0.6546	-1.4348*	1.3489*	0.2590*	-0.0544	-0.3246*	-0.7175	-2.7515*
& Machinery	(0.0761)	(0.0098)	(0.6741)	(0.0637)	(3.0555)	(0.4438)	(0.0591)	(0.0197)	(0.2818)	(0.0776)	(0.7486)	(0.1517)
Food & Drug							1.0192*	0.1990*	0.7181*	0.3123*	0.7651	-1.5966*
Retailers							(0.0592)	(0.0124)	(0.2215)	(0.0561)	(0.7968)	(0.1263)
Food Producers	0.7466*	-0.0439	0.2486	-0.8235*	19.4495*	13.5393*	0.9673*	0.0970*	-0.1129	-0.3851*	0.1187	-2.3930*
& Processors	(0.0983)	(0.0419)	(0.3968)	(0.2468)	(3.8938)	(0.5881)	(0.0409)	(0.0175)	(0.1971)	(0.0522)	(0.6607)	(0.0649)
Forestry	0.9068*	0.0018	0.3900	-0.1134*	1.0096	-0.8529*	1.0319*	0.2161*	0.2703	-0.0035	-0.9404	-3.3344*
& Paper	(0.0590)	(0.0031)	(0.5248)	(0.0196)	(1.1069)	(0.0085)	(0.0804)	(0.0233)	(0.2840)	(0.0866)	(0.7325)	(0.1264)
Health	1.2383*	0.0928	-8.9464**	-9.6175*	-26.3356***	-15.5979*	0.9631*	0.9102*	-0.0476	-0.3870*	0.4838	-1.5008*
	(0.2829)	(0.1206)	(3.5266)	(0.4722)	(14.6271)	(5.0282)	(0.0497)	(0.0509)	(0.2268)	(0.0306)	(0.7224)	(0.0541)
Household Goods	0.8570*	0.0218	0.2043	-0.6888*	1.8507	-0.6803	1.2189*	0.3344*	0.0787	0.2235**	-2.1726**	-3.5802*
& Textiles	(0.0689)	(0.0109)	(0.3911)	(0.0167)	(2.5492)	(0.3563)	(0.0907)	(0.0253)	(0.3478)	(0.1069)	(1.0338)	(0.1995)
IT Hardware	0.8649*	0.0263***	1.1349**	0.1356	-4.1654	-4.6121*	2.2471*	0.5199*	1.9388**	0.7639*	2.9117	-2.4773*
	(0.0979)	(0.0138)	(0.5279)	(0.0843)	(3.0708)	(0.1383)	(0.3236)	(0.0313)	(0.8465)	(0.1383)	(3.2297)	(0.3748)
Insurance	1.0257*	0.0876*	0.3860	-0.1381*	0.7478	-0.7688*	1.1708*	0.0580*	0.1861	-0.1853*	1.3093***	-0.6333*
	(0.0282)	(0.0033)	(0.3514)	(0.0403)	(1.0795)	(0.0955)	(0.0560)	(0.0053)	(0.2882)	(0.0167)	(0.7515)	(0.0413)

Table 4 : Beta Decompositions

* 1% significance, ** 5% significance and *** 10% significance.

	Italy						UK					
	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$	$\beta_{di,m}$	$\beta_{ei,m}$	$\beta_{di,\Delta s}$	$\beta_{ei,\Delta s}$	$\beta_{di,r}$	$\beta_{ei,r}$
Investment	1.3134*	-0.1482**	-13.2398*	-7.8233*	-16.4574	-12.3307*	1.1731*	0.1054*	-0.0555	-0.3808*	0.7288	-1.8433*
Companies	(0.2034)	(0.0621)	(2.8802)	(0.3583)	(10.9442)	(2.3133)	(0.0312)	(0.0140)	(0.2176)	(0.0422)	(0.7130)	(0.0732)
Leisure	1.2574*	0.1922*	-0.5065	-0.9798*	-3.8935**	-4.7458*	1.4462*	0.3079*	0.3586	0.1399	-0.6522	-2.7328*
& Hotels	(0.0936)	(0.0201)	(0.8982)	(0.1393)	(1.9219)	(0.2667)	(0.0553)	(0.0192)	(0.2768)	(0.0880)	(0.8829)	(0.1795)
Life	1.0812*	0.1066*	-0.4875	-0.6655*	-0.4181	-1.7525*	1.2567*	0.0952*	0.5365***	0.2449*	2.3467*	0.3470*
Assurance	(0.0443)	(0.0106)	(0.4335)	(0.0554)	(1.3012)	(0.1865)	(0.0605)	(0.0043)	(0.2951)	(0.0167)	(0.8183)	(0.0605)
Media	0.8131*	0.0237*	0.7710**	-0.1302*	0.8975	-1.0759*	1.3501*	0.1863*	0.2637	0.0228	0.6935	-1.9108*
	(0.1094)	(0.0036)	(0.3359)	(0.0211)	(2.6256)	(0.0841)	(0.0473)	(0.0133)	(0.2729)	(0.0571)	(0.7992)	(0.1075)
Oil & Gas	0.7147*	0.0045	0.3237	-0.0852	-1.6746	-3.4974*	0.9822*	0.0681*	-0.2387	-0.3632*	-1.8844**	-3.6952*
	(0.0938)	(0.0099)	(0.5232)	(0.0617)	(2.1784)	(0.0235)	(0.0430)	(0.0261)	(0.2444)	(0.0777)	(0.7403)	(0.0394)
Personal Care							1.0323*	0.0879*	-0.4691***	-0.5533*	-0.5253	-2.6613*
& Household Products							(0.0563)	(0.0202)	(0.2432)	(0.0548)	(0.7925)	(0.0749)
Pharmaceuticals	0.7885*	-0.0164	-0.1964	-0.2298**	-4.9121	-5.4157*	1.0171*	0.1289*	-0.2480	-0.4097*	1.8382**	-0.8274*
& Biotechnology	(0.1341)	(0.0153)	(0.5499)	(0.0939)	(3.2924)	(0.0748)	(0.0569)	(0.0088)	(0.2305)	(0.0289)	(0.7305)	(0.0967)
Real	0.7810*	0.0821*	0.6458***	0.4236*	-0.7003	-2.3874*	1.1322*	0.1662*	1.1245*	0.7067*	-1.1288	-3.1892*
Estate	(0.0596)	(0.0118)	(0.3454)	(0.0901)	(1.1132)	(0.1703)	(0.0479)	(0.0257)	(0.2942)	(0.0875)	(0.9454)	(0.1693)
General	0.9993*	0.0665*	0.9797**	-0.1117*	3.8826*	0.4710*	1.1521*	0.1263*	0.7843*	0.2889*	-0.4264	-2.7259*
Retailers	(0.0609)	(0.0027)	(0.4718)	(0.0234)	(1.4250)	(0.0861)	(0.0550)	(0.0199)	(0.2654)	(0.0696)	(0.9499)	(0.1020)
Software &	2.2424*	-0.0994	-17.1242*	-9.5420*	-51.6361*	-55.8169*	0.9212*	0.2132*	0.0826	-0.0608	-2.0015**	-2.7040*
Computer Services	(0.7102)	(0.1741)	(5.3388)	(2.0033)	(15.6652)	(3.2468)	(0.1214)	(0.0188)	(0.3258)	(0.0738)	(0.8106)	(0.1222)
Speciality &	1.2547*	0.1186*	0.6337	-0.0938	0.4188	-1.6648*	1.4579*	0.3314*	0.9940*	0.5207*	0.6837	-1.2911*
Other Finance	(0.0503)	(0.0062)	(0.3949)	(0.0691)	(1.1280)	(0.1207)	(0.0458)	(0.0122)	(0.2631)	(0.0728)	(0.7754)	(0.2032)
Steel &	0.8556*	0.0961*	0.4914	-0.1625*	0.5038	-1.0937*	1.9459*	0.2006*	-0.2594	0.4606*	-0.0485	0.6464*
Other Metals	(0.0577)	(0.0044)	(0.3387)	(0.0488)	(1.1911)	(0.1039)	(0.2373)	(0.0138)	(0.8014)	(0.0513)	(2.4339)	(0.1533)
Support	0.4975*	-0.0877**	-0.9019**	-1.6400*	-12.2708*	-8.9175*	1.2092*	0.2442*	0.0967	-0.3321*	0.5853	-1.9148*
Services	(0.1120)	(0.0386)	(0.4118)	(0.1468)	(3.0699)	(1.0662)	(0.0369)	(0.0142)	(0.2590)	(0.0621)	(0.6885)	(0.1467)
Telecom	0.9797*	0.0332*	1.3528*	0.6589*	3.4712*	0.5304*	0.9490*	-0.0310	0.2745	0.0558	6.0862*	3.9656*
Services	(0.0446)	(0.0091)	(0.3675)	(0.0127)	(1.0496)	(0.1487)	(0.0950)	(0.0220)	(0.2849)	(0.0825)	(0.8229)	(0.0271)
Transport	1.1688*	0.1693*	1.0401**	0.6309*	1.4773	0.7375*	1.1158*	0.1851*	0.1525	-0.1263*	0.4559	-1.6194*
	(0.0681)	(0.0082)	(0.4448)	(0.0572)	(1.6668)	(0.1915)	(0.0404)	(0.0114)	(0.2423)	(0.0507)	(0.6785)	(0.1065)
Other	0.9215*	0.0448*	1.5119*	0.8704*	4.0149*	1.7811*	0.6489*	0.0528*	-0.0720	-0.1466*	3.0271*	0.2151*
Utilities	(0.0567)	(0.0124)	(0.3911)	(0.0199)	(1.1035)	(0.6191)	(0.0756)	(0.0044)	(0.2328)	(0.0154)	(0.8180)	(0.0489)

Table 4 : Beta Decompositions

* 1% significance, ** 5% significance and *** 10% significance.

Appendix A: Industrial sector sample start dates

	France	Germany	Italy	UK		France	Germany	Italy	UK
Aerospace & Defence	01/73	–	01/73	01/73	Investment Companies	01/73	05/98	05/97	01/73
Automobiles & Parts	01/73	01/73	01/73	01/73	Leisure & Hotels	01/73	08/98	01/73	01/73
Banks	08/86	01/73	01/73	01/73	Life Assurance	12/98	01/73	01/73	01/73
Beverages	01/73	01/73	09/01	01/73	Media	01/73	01/86	03/86	01/73
Chemicals	01/73	01/73	01/73	01/73	Oil & Gas	01/73	05/89	03/86	01/73
Construction & Building Mats.	01/73	01/73	01/73	01/73	Personal Care & Household Products	01/73	01/73	–	01/73
Diversified Industrials	01/73	01/73	01/73	–	Pharmaceuticals & Biotechnology	09/80	01/73	03/86	01/73
Electricity	06/89	01/73	03/86	06/91	Real Estate	01/73	11/93	01/73	01/73
Electronic & Electrical Equip.	01/73	01/73	01/89	01/73	General Retailers	01/73	01/73	01/73	01/73
Engineering & Machinery	01/73	01/73	03/86	01/73	Software & Computer Services	08/85	01/89	01/00	01/73
Food & Drug Retailers	01/73	02/89	–	01/73	Speciality & Other Finance	04/87	04/01	01/73	01/73
Food Producers & Processors	01/73	01/73	01/87	01/73	Steel & Other Metals	01/73	01/73	01/73	03/89
Forestry & Paper	01/73	09/89	01/73	01/73	Support Services	06/83	04/90	10/90	01/73
Health	12/75	01/73	08/01	01/73	Telecom Services	12/97	01/73	01/73	02/82
Household Goods & Textiles	01/73	01/73	03/86	01/73	Transport	03/88	01/73	01/73	01/73
IT Hardware	01/73	05/91	03/86	06/88	Other Utilities	01/73	01/73	01/73	03/87
Insurance	11/77	01/73	01/73	01/73					