The Impact of Globalization on the Equity Cost of Capital

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Abstract: This paper investigates the effect of stock market integration in Europe on the cost of equity capital. Over the 1990s it is shown that the cost of equity within European Union sectors falls by between 0.5 and 3 percentage points. There is strong evidence of convergence in the cost of equity across different countries in the same sector. However, convergence across different sectors is small. An implication of this is that country effects are becoming smaller and sector effects larger as stock market integration increases.

We are grateful to the Fondation Banque de France for providing generous financial support. We thank Henri Pagès, Bernt Arne Ødegaard for helpful comments and Intersec Research for providing us with data. Hardouvelis is from the economic office of the Prime Minister, Greece, the University of Piraeus and CEPR. Malliaropulos is from the Department of Finance and Banking, University of Piraeus and the National Bank of Greece. Priestley is from the Department of Financial Economics, Norwegian School of Management, Sandvika, N1301 Norway. Tel + 47 67557104. Fax + 47 67557675. E-mail: richard.priestley@bi.no.

1 Introduction

When enacting stock market liberalization policies, the aim of regulators is to integrate the domestic stock market into world markets. A major argument in favour of increased integration is that it leads to international risk sharing and, as a result, lowers the cost of equity capital (Stulz 1999). Examining this issue is important for a host of reasons. First, there is an ongoing debate on the benefits of globalization. Baldwin (1990) estimates that the benefit from a reduction in the cost of capital in the EU of 0.5% could lead in the long term to a cumulative increase in GDP of between 5 and 10%. Second, integration of financial markets has important implications for asset allocation strategies. In particular, as markets become more integrated, country effects gradually disappear and hence sector allocation strategies gain in importance, compared to country allocation[1].

This paper studies the impact of globalization on the cost of equity capital using a data set on European Union (EU) stock market sectors. We examine the EU, rather than the typical emerging markets, because apart from the rich array of regulatory, economic and political liberalizations aimed at globalizing these economies, they have the unique feature of adopting the single currency which has led to a gradual increase in integration of EU stock markets in the late 1990s. The integration of European stock markets has occurred through both the elimination of barriers to intra-European investments and the launch of the common currency. The adoption of the euro eliminated currency risk and nullified legal barriers on the foreign currency composition of institutional investors (Hardouvelis et al. 2001).

An additional advantage of examining EU sectors is that it allows for a cross-sectional analysis across disparate sectors, in which we might expect globalization to have different effects. Whilst extant studies have examined country level effects, there is no reason to assume that all sectors in a country will benefit from globalization because the country does. For example, non-tradable or semi-tradable sectors like resources and utilities are likely to be affected differently than industries, which are already internationalized, such as information technology (IT), consumer goods and financials. If globalization is important, we should see it impacting differently on different sectors. Furthermore, by examining sectoral data, we are able to assess whether globalization has led to a convergence in the cost of equity within a

[1] Adjaute et al. (2000) examine the performance of sector allocation versus country allocation strategies in the EU. Their results suggest that sector portfolios outperform coutry portfolios in terms of return to risk measures. However, the authors do not test the significance of the differences in performance measures between the two portfolios.

given sector across EU countries, across sectors in a given country or across aggregate sectors within the EU. The issue of the convergence in the cost of capital has important investment implications with respect to whether optimal asset allocation takes place across countries or across sectors.

We define globalization as both a change in the regulatory environment that removes barriers to free trade and a process of increased stock market integration in which the pricing of local stocks is increasingly dominated by international risk factors. This calls for measuring the impact on the cost of equity (i.e. the benefit) from globalization using a formal asset pricing model that allows for a time-varying degree of stock market integration.

The rest of the paper is organized as follows: Section 2 discusses issues of measurement of the cost of equity and describes the channels through which economic and monetary integration in Europe affects the cost of equity. Section 3 presents the model we use to measure the cost of equity when markets are partially integrated. Section 4 describes the data. Section 5 presents the results and section 6 concludes.

2 Stock Market Integration and the Cost of Equity Capital

2.1 Measuring the Cost of Equity Capital

The cost of equity capital is the real return required by investors in order to hold one company share. Its importance lies in the fact that it determines the fair price of equity as the discounted value of all future dividend payments over the holding period of the share. Hence, if the required real return on equity is high, investors will be willing to pay a low price for one share of equity, consequently raising equity capital by the firm to finance new investment projects is more costly.

Measuring the cost of equity capital is not an easy task. Empirical studies often refer to the present value formula as a useful theoretical framework of obtaining a measure of the cost of equity capital. Based on the standard present value model, the fair price of a share P_0, in the absence of a speculative bubble, is given as the discounted value of (conditionally) expected dividends $E(d_t)$ in the indefinite future: $P_0 = \sum_{t=1}^{\infty} \frac{E(d_t)}{(1+r)^t}$, where the discount rate r is the cost of equity capital. Unfortunately, expected dividends are unobservable, making it impossible to make inferences about the cost of equity capital from current (observable, although not necessarily 'fair') share prices. In order to attain a more tractable representation of fair prices, one has to impose restrictions on the stochastic process driving dividends, thus calculating the conditional expectation $E(d_t)$ into the indefinite future. Assuming that log dividends follow a random walk with drift factor g, expected dividends $E(d_t)$ are given by $d_0(1+g)^t$ and we obtain $P_0 = \frac{d_0(1+g)}{r-g} = \frac{d_1}{r-g}$, or $r = \frac{d_1}{P_0} + g$. This equation is known as the Gordon growth model (Gordon 1962). It says that, in equilibrium, the cost of equity equals the return on equity. The latter is given as the sum of the dividend yield and the rate of capital gains, g, since with constant payout ratios, dividends, earnings and share prices all grow at a constant rate. Based on the Gordon growth model, there are two obvious methods to measure the cost of equity capital: (i) the historical total return on equity; (ii) the dividend yield, adjusted with the constant growth rate of dividends.

Both methods have been extensively used in empirical event studies, which attempt to measure the impact of liberalization on the cost of equity capital. Bekaert and Harvey (2000) and Henry (2000) both employ event windows to examine changes in the cost of equity around dates of liberalization policies. They both focus on liberalization dates, assumed to be unexpected, to form event windows. Henry (2000) calculates abnormal returns, while Bekaert and Harvey (2000) focus on dividend yield changes to measure changes in the cost of equity. Whilst both studies find some evidence of a fall in the cost of equity capital post-liberalization, the effects are small relative to what is expected by finance theory (see Stulz (1999)). For example, Bekaert and Harvey (2000) calculate a reduction in the cost of equity of between only 5 and 75 basis points.

Stulz (1999) notes a number of specific and general problems with employing event studies to measure the impact of liberalization on the cost of equity, which may account for the somewhat small effects found so far in the literature. For example, within Henry's framework, the estimate of the impact of liberalization on the cost of equity capital is sensitive to the assumption that dividend growth rates are constant. If liberalization leads to increased growth in the economy, dividend growth rates will also increase giving rise to higher required rates of return and, hence, higher cost of capital post-liberalization. Puzzlingly, however, assuming constant growth rates of dividends should lead to an overestimation of the effect of liberalization on the cost of capital. Measuring the cost of capital with historical total returns on equity in small samples is also problematic. When nominal interest rates fall, share prices increase as a result of lower expected discount rates. While such an increase in share prices implies lower expected returns on equity and, hence, lower cost of capital, in a small sample the data indicate a higher cost of capital as a result of the large capital gains, which correspond to the increase in share prices.

In addition to problems of measurement, event studies suffer under three further shortcomings: First, the timing of liberalization events is unknown and the researcher does not know whether liberalizations were anticipated or, at the other extreme, whether their effects occurred with a time lag. Multiple events may be difficult to time, may occur over a period of time and generally make it difficult to partition the period before and after the liberalization. More importantly, liberalizations may be endogenous in the sense that they are themselves determined by the cost of equity capital (Chari and Henry 2001). This may occur if governments choose to liberalize after a period when the stock market has done well.

Second, one common assumption of event studies is the assumption that, due to liberalization, the market jumps from a state of complete segmentation to a state of complete integration with world markets. It is probably closer to reality to assume that markets are neither fully segmented nor fully integrated and that regulatory changes affect the degree of integration with world markets gradually over time.

Third, the cost of equity capital is a conditional variable in the sense that it is the required rate of return on equity given information up to the present time period. In a given national market the required rate of return is determined by two factors: (i) the risk free interest rate which is the opportunity cost of investing in equities and (ii) the equity risk premium required by investors to compensate for uncertainty about the future value of their investment. Consequently, estimating the cost of capital requires the use of an asset pricing model which measures in a compact form required rates of return given risk attitudes of investors, risk factors and investment opportunities of the economy.

Summing up, in order to measure cost of equity capital, we require a conditional asset pricing model of partially integrated markets, where the degree of integration evolves over time.

Black (1974), Stehle (1977), Stulz (1981), Errunza and Losq (1985), Merton (1987) and Cooper and Kaplanis (2000), among others, propose asset pricing models of partially integrated markets. Unlike standard models of international portfolio choice, models of partial integration predict that investors' portfolios can be biased towards home assets. Stulz (1981) shows that investors exclude from their portfolio those foreign assets which do not provide an expected return large enough to offset the cost of holding them.

Cooper and Kaplanis (2000) expand the Stulz model in a multi-country setting. In this model local assets can be thought of as domestic assets which provide an expected return lower than the associated cost of holding them by foreign investors and, thus, are excluded from foreign investors' portfolios. The expected return of a global asset is determined by a wealth-weighted cost term and the asset's covariance with the global portfolio. The expected return (cost of equity) on a composite local asset – the domestic stock market index – is determined (in addition to a cost term) by a premium for its covariance with the global market index (global risk), and a premium for the part of its risk that is unrelated to global assets (local risk). The relative importance of local risk depends on the proportion of local assets in world market value. A similar result is also obtained in Errunza and Losq (1985), where some investors are precluded from holding some securities.

Merton (1987) illustrates how broadening the investor base for a given stock, and by extension for a local stock market, leads to a decrease in the cost of equity through risk sharing. In Merton's model, investors are assumed to invest only in an exogenously determined subset of the investment universe. Expected returns in a segmented market contain a risk premium that is an increasing function of the market's conditional variance, investors' degree of risk aversion and the market's share in world market capitalization and a negative function of the proportion of international investors investing in that market. As the share of international investors in the local market increases, the cost of equity decreases because international investors are better diversified than local investors and, consequently, they require a lower reward for each unit of local market risk they undertake.

2.2 The Effect of EMU on the Cost of Equity Capital

Economic and monetary integration in Europe has both a direct and an indirect effect on the cost of equity capital. The direct effect is straightforward and consists of a reduction in real risk free rates. In fact, as a precondition to EMU entry, inflation and interest rates converged among EU countries towards the typically low levels of Germany, which used to be considered as the benchmark country. This convergence also resulted in lower real rates, implying that the opportunity cost of investing in equity decreased, reducing the cost of equity capital. The magnitude of this effect differs across countries and is most pronounced in countries which had historically high interest rate differentials vis-á-vis Germany. By tying their monetary policy to the Bundesbank, the central banks of these countries gained reputation as inflation fighters and, thus, were able to stabilize nominal interest rates, inflation and real interest rates at lower levels. The magnitude of this reputation effect differs across countries and is most pronounced in countries which had historically high interest rate differentials vis-á-vis Germany. This effect on the cost of capital in European countries, other than Germany, can be approximated by the difference in real short term interest rates from the German rates prior to the period when it became apparent to market participants that EMU may materialize with high probability, i.e. prior to 1995. In the period 1980-1994, the difference in real rates ranges from 0.59 percentage points in the Netherlands to 2.15 percentage points in Belgium (see Table 1).

However, most importantly, economic and monetary convergence has also an indirect effect on the cost of equity capital which consists in a decrease of the equity risk premium, the second component of the cost of equity capital. This effect is due to the gradual abolition of barriers to intra-EU investments and the launch of the common currency. First, investment barriers were lifted during the 1990s in an increased effort of EU governments to harmonize the regulatory framework of financial markets[2]. Second, the launch of the common currency eliminated currency risk and lifted all remaining restrictions on the currency composition of institutional investors like pension funds and life insurance companies[3]. As a result of both decreasing barriers and the launch of the common currency, risk sharing among EU investors increased, reducing the required equity risk premium and, hence, lowering the cost of equity capital. In fact, the effect of EMU on the equity risk premium of EU sectors is the main focus of this paper.

The impact of EMU on the pricing of stocks should have been felt even before the introduction of the common currency since European stock market integration was a gradual process rather than a one-off event. After all, the launch of the euro did not come as a surprise but was widely anticipated at least since February 1992, when the Maastricht Treaty was signed. The expectation of the future elimination of currency-related barriers on asset allocation ought to have affected required returns and the cost of equity capital prior to 1999. This effect should be stronger the higher the probability of euro occurring and the closer the time span to the launch of the euro. It follows that a model of partial stock market integration that purports to explain the European experience of the 1990s ought to incorporate features associated with the likelihood and the time of EMU occurring.

Evidence already exists with regard to the extent of the anticipated introduction of the single currency on cross border equity flows. Relative

[2] For a survey on the regulatory and legislative aspects of European stock market integration see Licht (1998).

[3] In most countries national regulations imposed limits on the share of foreign assets in their portfolios. For example, in France pension funds were restricted by a 95% currency matching rule between assets and liabilities. In Germany the corresponding restriction was 80%.

to the early 1990s, by mid 1998 cross border equity flows had nearly tripled to around \$120-\$140 billion. Estimates of the total rebalancing of equity portfolios from domestic to pan-European portfolios are in the region of \$1.5 trillion (more than one third of market capitalization) (Euromoney, August 1998). Two client surveys shortly before the launch of the euro[4] found that over one quarter of fund managers had already implemented some change in their equity portfolios, over 50% had already well ahead in their preparations for EMU and three-quarter indicated that they would be reconsidering their assets allocation as a direct result of EMU. Dathine et al (2000) report increased holdings of foreign assets by domestic residents within the EU. Table 2 reports actual foreign equity holdings of pension funds and life insurance companies as a percentage of total equity holdings. Data are from Intersec Research. Foreign equity holdings of pension funds in EMU countries increased on average from 29% of total equity holdings in 1992 to more than 50% in 1999. In sharp contrast, foreign equity holdings of pension funds in non-EMU countries remained unchanged at around 20% over the same period. The portfolio reallocation towards foreign equity is even stronger for life insurance companies. Life insurance companies in EMU countries increased their foreign equity holdings from 11% of total equity holdings in 1992 to 30% in 1999. In contrast, foreign equity holdings of life insurance companies in non-EMU countries increased only slightly from 24% in 1992 to 27% in 1999. These portfolio shifts towards foreign equity in EMU countries suggest that risk sharing increased among EMU investors, decreasing the cost of capital.

3 Empirical Model

The empirical model is based on the intuition of partial integration discussed in the previous section. We consider a small European country whose equity market consists of a number of n sectors. Investors care about expected returns and the variance of expected returns. They are rewarded for bearing risk by a risk premium. In order to abstract from the effect of interest rate convergence on the cost of equity, we assume that investors have access to a single risk free asset across the EU. However, due to the existence of barriers to international investment, investors are restricted from holding the EU market portfolio. As a result, the home equity market is partially integrated into the EU market. Hence, the expected excess return on a

[4] Dresdner Klienwort Benson (March/April 1998) and Goldman Sachs and Watson Wyatt (March 1998)

domestic sector is determined as a weighted average of a premium for its covariance with the EU market excess return (market risk) and a premium for local risk. For a particular country i, the vector of expected excess returns of the n sectors can be written as:

$$\mathbf{r}_{i,t} = \theta_{i,t-1}\left(\boldsymbol{\beta}_i^{EU} r_t^{EU}\right) + (1-\theta_{i,t-1})\left(\boldsymbol{\beta}_i^{L} r_t^{L}\right) + \mathbf{e}_{i,t} \tag{1}$$

where $\mathbf{r}_{i,t}$ is the $1 \times n$ vector of sector excess returns in country i over a common EU risk-free rate, $\boldsymbol{\beta}_i^{EU}$ is a $1 \times n$ vector of sector betas with respect to the EU-wide index, defined as r_t^{EU}, $\boldsymbol{\beta}_i^{L}$ is a $1 \times n$ vector of sector betas with respect to the local index of country i, defined as r_t^{L}, $\theta_{i,t-1}$ is the degree of integration of country i into the EU market, conditional on information up to time $t-1$ and $\mathbf{e}_{i,t}$ is a vector of sector residuals.

Equation (1) may be viewed as an approximation of expected returns in partially integrated markets where both global and local risk factors are priced and the degree of integration is evolving over time. At a given moment in time, the model resembles the static formulation in Cooper and Kaplanis (1999) or Errunza and Losq (1985), with a few differences. First, in those models the two risk factors are orthogonal, whereas we do not impose such a restriction in our framework because we tie our factors to observable portfolios. Second, our model accounts for a time-varying degree of integration. Third, in Cooper and Kaplanis and in Errunza and Losq, the global risk factor is the covariance with a portfolio of 'global' ('eligible') assets which are held by both domestic and foreign investors. This portfolio is unobservable. In our empirical model the global portfolio is proxied by the value-weighted EU-11 portfolio.

The time-varying degree of integration, $\theta_{i,t-1}$, is proxied by a function of the forward interest rate differential between country i and Germany because this differential is related to the probability of joining the single currency. Hence, $\theta_{i,t-1}$ is modelled as follows:

$$\theta_{i,t-1} = \gamma_{0,i} + \exp\left(\gamma_{1,i}\left|s_{i,t-1}\right|\right) \tag{2}$$

where $s_{i,t-1}$ is the forward interest rate differential between country i and Germany, the benchmark country, $\gamma_{0,i}$, $\gamma_{1,i}$ are country-specific parameters and exp(.) denotes exponentiation. When the forward interest rate differential, $s_{i,t-1}$, is zero, $\exp(.)$ becomes unity. When $s_{i,t-1}$ deviates from zero and $\gamma_{1,i} < 0$ but finite, then $0 < \exp(.) < 1$. The larger the deviation of $s_{i,t-1}$ from zero, whether it is positive or negative, the closer $\exp(.)$ is to zero and the further away from unity. The constant term $\gamma_{0,i}$ in equation

(2) acts as an intercept correction on the level of integration. For example, spreads may be zero by chance but markets may not be fully integrated due to, say, capital market or ownership restrictions. When equation (2) is estimated, $\gamma_{1,i}$ is negative and $\gamma_{0,i}$ is very close to zero, thus the level of integration $\theta_{i,t-1}$ ends up being bounded between zero and unity.

It should be noted that the forward interest rate differential between two countries reflects the expected change in the exchange rate between two *future* points in time. Since January 1, 1999 the exchange rates of the EMU countries are fixed. Consequently, if market participants were expecting that country i and Germany would join EMU in 1999, then the forward interest rate differential between country i and Germany, which connects two future points in time — both dates occurring after January 1, 1999 — ought to be zero. Conversely, if market participants were expecting that country i would not join EMU in 1999, or that EMU itself may not materialize, then the forward interest rate differential between country i and Germany would be different from zero. Thus, market expectations of economic and monetary integration are incorporated into forward interest rate differentials.

In order to obtain the level of integration and the betas, the system of equations (1)-(2) is estimated for each country i by maximum likelihood.[5] Once sector betas and the level of integration are obtained, we follow market convention and calculate the cost of equity in each sector as the product of the betas and their respective equity market premiums (weighted by the time-varying level of integration). The equity premiums are calculated from long historical arithmetic averages. From this conventional framework we are able to track how a change in the level of integration affects the cost of capital of sector j in country i by taking the partial derivative of expected returns with respect to the conditional degree of integration:

$$\frac{\vartheta r_{ij,t}}{\vartheta \theta_{i,t-1}} \Delta\theta_{i,t-1} = (\beta_{ij}^{EU} \bar{r}^{EU} - \beta_{ij}^{L} \bar{r}_i^{L})(\theta_{i,t-1} - \theta_{i,t-2}) \tag{3}$$

where $r_{ij,t}$ is the cost of equity capital for sector j in country i, $\Delta\theta_{i,t-1}$ is the change in θ_i between time $t-1$ and t conditional on information at time $t-2$ and $t-1$, respectively, β_{ij}^{EU} is the beta of sector j in country i with respect to the EU index, $\bar{r}^{EU}$ is the long term equity market premium on

[5] By estimating country by country and not as one system we run the risk of loosing some efficiency if the residuals across countries are correlated. However, estimating a full system is not possible due to the large number of linear and non-linear paramaters. To get a feel for the extent of the problem we calculated the correlation coefficients of the residuals from different countries. The average is around 0.2 and thus the problem does not appear to be too serious.

the EU index, β_{ij}^{L} is the beta of sector j in country i with respect to the local market index and $\bar{r}_{i}^{L}$ is the long term equity market premium on the local market i index.

4 Data

4.1 Returns

Of the eleven countries[6] which joined the single currency on January 1, 1999, we collect data for Belgium, France, Germany, Italy, Netherlands and Spain. Data on the following ten major sectors are collected: Resources, Basic Industries, General Industrial, Utilities, Information Technology, Financials, Cyclical Consumer Goods, Non-Cyclical Consumer Goods, Cyclical Services and Non-Cyclical Services. We use weekly, euro denominated, total (i.e. dividend-adjusted), continuously compounded stock returns based on Friday closing prices. A value weighted index of the 11 EU countries was used to proxy the EU market portfolio. We calculate excess returns as national returns in euros minus the 1 month euro interest rate, which is transformed to reflect the return over a weekly horizon. The data source is Datastream international. The sample period for the analysis is 28:06:91 to 25:12:98. The selection of both the countries and the sample period is dictated by the availability of interest rate swaps which are used to calculate forward interest rate differentials. Data for the following sectors was not available over the sample period for a sufficient period of time: Utilities in Netherlands and France, Information Technology in Spain, and Cyclical Consumer Goods in Belgium.

Table 3 presents summary statistics on the euro-denominated excess returns of the individual sectors in the EU countries. The Table is split into ten parts, reflecting these sectors. The excess returns of the sectors display some interesting properties. For example, there is considerable cross sectional variation in both mean excess returns and volatilities. Average volatility is highest in the IT and Cyclical Consumer Goods sectors and lowest in the Cyclical Services and the Utilities sectors. There is no observable pattern between mean excess returns and volatilities across sectors. For example, the Information Technology sector has the highest excess returns whilst the Cyclical Consumer Goods sector has the smallest excess return, both being sectors with high return volatility.

[6] The eleven members of the single currency are: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. Greece joined EMU later, in January 1, 2001, and became the 12th member.

The correlation coefficients reported in Table 3 reveal that, as expected, in all but two cases (Germany: Resources, France: Utilities) the correlation coefficient with the local market index is higher than with the EU index. The highest average correlations with the local market index are in the Financial, Basic Industries, General Industrial and Cyclical Services sectors. Similar patterns with respect to the correlation with the EU index are also observed. The highest difference between the local market and the EU market correlation coefficient is in the Financial sector. The smallest difference is in the IT sector where, if Italy is ignored, the correlation coefficients are essentially the same.

The observation that the correlation coefficients with respect to the EU index are lower than with respect to the local market index provide some initial evidence that the cost of equity capital may well be lower in an integrated EU market than in a segmented/partially integrated market. This follows from the beta estimate which is a function of the correlation coefficient: a lower correlation coefficient implies a lower beta, all else constant. Of course, the variances and the market premiums are an important element in the calculation of the equity cost of capital which may offset any differences in the correlation coefficient.

4.2 Forward Interest Rate Differentials

For each of the countries, we report summary statistics of forward interest rate differentials. The differentials are calculated from swap rates between fixed and floating rate government bonds, collected from Datastream International. Forward interest rate differentials provide a measure of convergence towards EMU, which is independent of the stock market. They have been widely used by market participants in order to assess the probability of individual countries to participate in EMU.[7]

Although over longer periods of time forward interest differentials ought to be stationary since they correspond to future forward premia in the foreign exchange market, nonstationarity may be a serious problem in small samples.[8] Since European interest rates were on a downward trend since 1992, forward interest differentials may have co-trended with interest rates.

[7] See, for example, Goldman Sachs: 'European Bond Spreads and the Probability of EMU', May 1996, JP Morgan: 'The EMU Calculator', October 1996, Paribas: 'EMU countdown', February 1997.

[8] In fact, standard Dickey Fuller tests for a unit root cannot reject the null hypothesis that forward interest rate differentials are nonstationary in four out of six cases: Germany, France, Italy, Spain.

In this case it would be more appropriate to measure forward interest differentials relative to the level of interest rates. Therefore, we take the ratio between the forward interest differential and the German long bond yield.

Table 4 presents summary statistics on the forward interest rate differentials including the mean, standard deviation and maximum and minimum values. The mean values of these differentials are quite revealing: the core EU countries of France, Belgium and the Netherlands have small mean differentials, whereas the countries which have been struggling to fulfil the Maastricht criteria for EMU participation (Italy, and Spain) have larger mean differentials. This is also revealed in the standard deviations and minimum and maximum values. Germany has a negative mean differential with the ECU rate, reinforcing our choice of Germany as the country to measure the remaining EU countries against.

5 Empirical Results

5.1 Model Estimates

Table 5 reports the estimates of the betas and the integration parameters from the system given by equations (1), (2). One system is estimated for each country. By doing this we are able to impose the restriction that the level of integration in the country is the same across all sectors. The integration parameters are all negative and statistically significant. This implies that when the spreads fall, integration increases. Inspection of the levels of integration (available on request) reveals a strong upward trend over the sample period. In all cases the level of integration approaches unity at the end of the sample.

The betas with respect to the local and global indices are reported for each sector, country by country. In the vast majority of cases the local beta is greater than the global beta. The most interesting exceptions here are the IT and Cyclical Consumer Goods sectors where global betas are bigger in half of the countries. Furthermore, the highest recorded betas are in the IT sector with respect to the global index. It is also interesting to note that betas with respect to the global index for Financials are sometimes bigger and their differences are smaller relative to the local betas. The betas in this sector are in sharp contrast to the Resources, Basic industries and General Industrial sectors, where in most cases the local betas are larger than the global betas. Presumably, the explanation for this lies in the international nature of the IT and Cyclical Consumer Goods sectors.

5.2 Estimates of Equity Premia

We follow standard procedures for calculating the cost of capital. This requires a measure of the equity market premium. It is conventional to estimate the equity risk premium not over the sample of estimation but to use a long run measure. For example, in the United States, the equity premium is often calculated from annual data going back to the early twentieth century. Data over such a long time period are more difficult to obtain for our sample of countries. We employ total return data from 1973 provided by Datastream to estimate the equity market premium.

Table 6 reports the arithmetic mean equity premia for the countries, calculated using annual data over the period 1973-1998. The excess returns are calculated in euro. The EU index is a market value weighted average of the EU-11 countries. The risk free rate is the short term German rate since no euro rates are available back to 1973. The equity premium is highest in Italy which is around double the level of Germany and Belgium. Germany has the lowest equity premium and the average across the EU-11 is 9.76%.

Table 7 reports the estimated cost of capital for each sector in each country. The table is organized by industry, allowing for a comparison of the industry cost of capital across countries. For each industry, the first row reports estimates of the average cost of capital and the second row reports end of sample estimates. In addition, we also report the contribution of the global (EU-specific) cost of capital component to the total cost of capital in parentheses. Some striking features are apparent from this simple comparison of the cost of capital. First, on average all sectors experience a decrease in the cost of equity with the exception of the Information Technology sector. The final column in the table reports the average cost of capital in the respective sectors over the whole sample and the estimated cost of capital in the final period. In many cases the difference is greater than one percentage point, especially in the so called 'old economy' sectors. At the end of the sample the Utilities sector has the lowest cost of capital and the IT sector has the highest. This result is in line with our earlier observation that volatility is highest in the IT and among the lowest in the Utilities sector.

The contribution of global risk to total expected returns is given in parentheses in Table 7. Whilst, in most sectors, global risk contributes on average over the whole sample between 30% and 37% to the total cost of capital, at the end of the sample, as the level of integration approaches one, its contribution exceeds 90%. Over the whole sample period the contribution of global risk is highest in the IT sector. It is lowest in the General Industrial sector and Utilities sector. This result is probably related to the fact that the latter industries are more exposed to country-specific factors such as the make up of natural resources, regulatory influences (especially in the state-controlled public utilities' sector) and local market conditions.

Table 8 reports the total cumulative saving in the cost of equity over the whole sample. In Panel A, for each sector, the cumulated saving in the cost of capital is averaged across countries using equal weights. Over the 1990s, the reduction in the cost of capital has been substantial in the old economy industries of Resources, General Industries, Basic industries and Utilities, approximately 2-3 percentage points each. The Financial sector records a more modest fall in the cost of equity. The IT sector, on the other hand, reports an increase in the cost of capital of just over 0.6 percentage points over the sample period, although this is not statistically different from zero. The various Goods and Services sectors display more modest, but still significant falls, except Cyclical Goods, where the change in the cost of capital is insignificant.

Figures 1 and 2 display the estimates of the cumulative average saving in the sectors' cost of capital due to integration of European stock markets over time. As expected, the effect of integration on the cost of capital is relatively low during the first half of the sample, when markets were less integrated, and relatively high towards the end of the sample, particularly in 1997, the year when most of the convergence in European bond yields took place. It should be noted that, according to the Maastricht Treaty, 1997 was the year during which the convergence criteria had to be satisfied for joining EMU in 1999.

Panel B reports the average reduction in the cost of equity within a country. We take an equal weight of the ten sectors in each country and then cumulate the saving in the cost of equity. We report two numbers for each country. The first is the average across all ten sectors, the second is across nine omitting the IT sector. All countries except Germany report a statistically significant fall in the cost of capital, ranging from around 0.5 percentage points in Belgium to 3.5 percentage points in Italy. Germany reports a significant increase of 2 percentage points. When the IT sector is excluded, the drop in the cost of capital becomes larger in Belgium and France and the increase in the cost of capital becomes smaller in Germany.

5.3 Is there a Reduction in the Dispersion of the Equity Premium across Sectors and across Countries?

The finding that the cost of capital in Europe has decreased over the 1990s as a result of higher stock market integration does not necessarily imply that there was convergence in the equity premium across sectors in a particular country or across countries in a particular sector. By convergence, we mean a tendency towards the reduction over time of the dispersion in the equity premium across sectors or across countries. In this section, we examine whether equity premia across countries and sectors have converged over time. This issue is of particular importance for both corporate managers and investors. If, for example, equity premia converge across countries, then cross-listed firms face no comparative advantage in raising equity capital. Similarly, the importance of country allocation strategies for international investors decreases.

Finance theory predicts that in perfectly integrated markets the dispersion of equity premia is reduced only if the exposure of firms to different risk factors converges over time. For example, in the framework of the standard CAPM, the equity premium across sectors converges if there is a tendency for the exposure of sectors to market risk (betas) to approach each other over time. However, there is no a-priori economic reason why this should happen. The same result applies in the framework of the international CAPM, which relates excess stock returns to the excess return of the global market portfolio: convergence in the equity premium in a particular sector across countries is related to convergence of sectorial betas with respect to the global portfolio return. In imperfectly integrated markets, however, convergence in the equity premium can be related to the evolution over time of the degree of market integration plus the degree of convergence in local betas. We would expect that, as stock markets become more integrated, the equity premium in a particular sector should converge across countries due to the elimination of local risk. Convergence in the equity premium should be positively related to the degree of market integration the higher is the cross-country dispersion of local betas and local market premia and the lower is the cross-country dispersion of global betas.

In order to illustrate this claim, consider the equity premium for sector j in country i from equation (1). In the case of perfect segmentation ($\theta = 0$), $r_{ji,t} = \beta_{ij}^{L}\bar{r}_{i}^{L}$, whereas in the case of perfect integration ($\theta = 1$), $r_{ji,t} = \beta_{ij}^{EU}\bar{r}^{EU}$. Assume for simplicity that the sectors' exposures to market risk is equal across countries, $\beta_{ij}^{L} = \beta_{j}^{L}$, $\beta_{ij}^{EU} = \beta_{j}^{EU}$, where i denotes the country and j the sector. Then, the variance of the equity premium in sector j across countries in the case of perfect segmentation is given as: $(\beta_{j}^{L})^{2}var(\bar{r}_{i}^{L})$. In words, the within-sector cross-country variance of the equity premium is positively related to the cross-country variance of market premia. When markets are perfectly integrated, however, the cross-country variance of the equity premium in sector j is: $(\beta_j^{EU})^2 var(\bar{r}_i^{EU}) = 0$, since $var(\bar{r}_i^{EU}) = 0$. In words, given that stocks are exposed to a single, identical risk factor (the EU market portfolio), the equity premium shows no cross-country variation. Of course, this result is subject to our simplifying assumption that betas are equal across countries. Allowing betas to differ across countries generally introduces a lower bound on the cross-country variance of local betas for the equity premium to converge when the degree of integration increases. This lower bound is given as a weighted difference between the cross-country variance of global betas and the cross-country variance of local market premia.[9] Given the empirical evidence that cross-country variation in market risk premia is more important than cross-country variation in betas, this lower bound should be easy to meet under a fairly wide range of parameter values.

In order to test the hypothesis that increased market integration in Europe has led to a convergence in the equity premium, we utilise two techniques of convergence analysis which have been frequently used in the growth literature to study convergence of per capita income across regions and countries.[10] The concept of "σ"$-$convergence involves testing whether the dispersion of the equity premium across sectors or countries decreases over time. "β"-convergence, on the other hand, requires that in a cross-section of equity premium estimates the average (weekly) change in the equity premium over the sample period is negatively related to the initial level of the equity premium.

Table 9 reports the results of "σ"$-$convergence across countries within a given sector. Panel A reports the estimated slope coefficient from a regression of the standard deviation of the equity premium on a constant and a time trend. In all sectors, to varying degrees, we observe that the dispersion of the equity premium across countries falls from the first to the last

[9] This can be obtained from a first order Taylor series approximation of returns as follows: for $\theta = 0$ returns can be approximated as $r_{ji} = \beta_{ij,0}^L(\bar{r}_i^L - \bar{r}_{i,0}^L) + \bar{r}_{i,0}^L(\beta_{ij}^L - \beta_{ij,0}^L)$, where $\beta_{ij,0}^L$ is the cross-country mean of the local beta and $\bar{r}_{i,0}^L$ is the cross-country mean of the local market premium. Similarly, for $\theta = 1$ returns can be approximated as $r_{ji} = \bar{r}_0^{EU}(\beta_{ij}^{EU} - \beta_{ij,0}^{EU})$. Computing the variance of returns for $\theta = 0$ and $\theta = 1$ gives $(\bar{r}_{i,0}^L)^2 var(\beta_{ij}^L) + (\beta_{ij,0}^L)^2 var(\bar{r}_i^L)$ and $(\bar{r}_0^{EU})^2 var(\beta_{ij}^{EU})$, respectively. Hence, the cross-country variance of the equity premium decreases when the markets go from a state of perfect segmentation to a state of perfect integration if $var(\beta_{ij}^L) > (\frac{\bar{r}^{EU}}{\bar{r}_i^L})^2 var(\beta_{ij}^{EU}) - (\frac{\overline{\beta_{ij}^L}}{\beta_{ij}^{EU}})^2 var(\bar{r}_i^L)$.

[10] See, for example, Barro and Sala i Martin (1991) and Sala i Martin (1995), among others.

observation. The estimates of the trend coefficient suggest that dispersion decreases by 0.2 to 0.6% per week, corresponding to roughly 10 to 30% per annum. Panel B reports the results of "σ" convergence across sectors within a given country. The results are mixed with the two main stock markets of France and Germany experiencing a divergence in the equity premium across sectors. The remaining four countries experience a convergence, although this is modest in Italy.

In Figure 3 we plot the average cross-country dispersion of the equity premium across sectors over time. The figure reinforces the results in Table 9 and illustrates the downward trend in the variation of the sectoral equity premia. The average cross-sectoral dispersion of the equity premium across the six countries is depicted in Figure 4. There appears at best only a slight fall over the sample period in the variance of the equity premium within a country .

In order to test for "β" convergence, we run a cross-sectional regression of the change in the equity premium in every sector and every country on a constant and the initial level of the equity premium. The value b of the slope coefficient indicates that in a typical sector b% of the equity premium differential with respect to the cross-section average is eliminated each week. The estimated slope coefficient is -0.0007 (s.e. 0.0001), suggesting that the differences in the equity premium across sectors are disappearing at a slow pace (3.6% per annum).

Our results have important implications for both corporate managers and investors. First, if equity premia converge across countries within a given sector, then cross-listing of companies in different national bourses as a strategy to take advantage of differences in cost of equity capital is increasingly loosing in importance. Second, evidence of cross-country convergence in sector equity premia indicates that country allocation effects are becoming less important as markets become more integrated. Hence, sector allocation strategies gain in importance.

5.4 The Cases of Complete Segmentation and Complete Integration

The estimated model of partial integration imposes a set of restrictions on the models of complete segmentation and complete integration. The two alternative specifications are nested within the model of partial integration. Consequently, a likelihood ratio test can be performed by estimating the two alternatives and testing the restrictions they place on the partial integration model. The likelihood ratio test is distributed χ^2 with degrees of freedom equal to the number of restrictions. Table 10, panel A, reports these tests and shows that in all but one case we can reject the restrictions that either complete integration or complete segmentation places on the partial integration model. The exception is Italy where we cannot reject complete segmentation. This result is probably due to the low level of integration in this market in the first part of the sample. Interestingly, the rejections of full integration are much stronger than the corresponding rejections of full segmentation. This is important to note given the predominance of the assumption of perfect integration in many empirical studies of international asset pricing.

An informal way to test the appropriateness of the models is to compare the cost of capital estimates they produce. The complete integration and complete segmentation models produce a scalar estimate over the entire sample. The partial integration model produces a time series of cost of capital estimates. Therefore, it is possible to compare the mean of the cost of capital from the partial integration model with the scalar of the two alternatives using a t-test. The average absolute differences in the cost of capital estimates are reported in panel B of table 10. With respect to complete segmentation, the differences range from just over 2% per annum in Belgium to just over 0.2% per annum in Italy. The average across all countries is just under 1%. Out of the 55 individual differences, 23 are statistically significant. With respect to complete integration, the differences range from just over 2% per annum in Belgium to just over 1% per annum in Italy. The average across all countries is 1.5%. Out of the 55 individual differences, 33 are statistically significant. In line with the results of the likelihood ratio tests, the estimates of the cost of equity from the different models suggest greater differences with respect to complete integration than complete segmentation.

6 Conclusion

We examined whether the process of economic and monetary integration in Europe during the 1990s and the adoption of the euro has led to a reduction in the cost of equity capital. First, convergence of interest rates and inflation to the (generally lower) German levels has led to a decrease in real risk free rates, thus reducing the cost of capital within each country. Second, economic and monetary convergence has also led to a decrease in the equity risk premium, the second component of the cost of equity capital. This effect is due to the gradual abolition of barriers to intra-EU investments and the launch of the common currency, which eliminated currency risk and currency-related restrictions on the portfolio composition of institutional investors. As a result, the increase in portfolio diversification across EU countries has led to increased risk sharing among EU investors and, hence, to a decrease in diversifiable risk.

We used a conditional asset pricing model in order to assess the impact of globalization on the cost of equity capital, which has the attractive feature of tying the impact of globalization on the cost of equity to the change in the level of stock market integration. Using data from various EU sectors we have shown that globalization has led to a significant reduction in the equity premium in the vast majority of sectors. The exception is the IT sector which records an increase in the cost of equity. At the country level the sector results translate into a significant fall in the equity premium in all countries but Germany. Overall, on average, European stock market integration has reduced the equity premium. This in turn should lead to more profitable investment opportunities as net present values rise and thus can boost economic growth and improve welfare.

We also assessed the convergence in the equity premium both across sectors and countries. As integration increases, returns are increasingly determined by global rather than local risk factors. This results in a convergence of the sectoral equity premium across countries. This issue is important given the growth in cross border business. Convergence in equity premia across different sectors is much less pronounced and reflects the differences in global sector betas. This result has potentially far-reaching implications for portfolio management. Differences between sectors seem to remain whilst differences between countries seem to be disappearing. Therefore, a fruitful avenue for future research is the role of country and sector effects in portfolio management.

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Table 1
Average Interest Rate Differentials 1980-1994

Nominal interest rates are one month euro market rates from Datastream International with the exception of Spain, where we use the money market rate from the IFS database. Inflation is annualized month-on-month CPI inflation from the IFS database. Real rates are computed by subtracting one month ahead (annualized) consumer price inflation from nominal rates. Country codes are BE: Belgium, FR: France, IT: Italy, NL: Netherlands, SP: Spain, GE: Germany.

	BE	FR	IT	NL	SP	GE
Nominal Interest Rate	10.18	11.31	14.34	7.34	13.77	6.94
Inflation Interest Rate	3.98	5.25	8.41	2.70	8.01	2.89
Real Interest Rate	6.20	6.06	5.93	4.64	5.76	4.04
Difference with Germany	2.15	2.02	1.89	0.59	1.71	0.00

Table 2
Equity Holdings of Pension Funds and Life Assurance Companies

The Table reports the actual foreign equity holdings of pension funds and life insurance companies as a percentage of total equity holdings in 1992 and 1999. Both private and public pension funds are considered. Data are from Intersec Research Corp.

	Pension Funds		Life Insurance Companies	
	1992	1999	1992	1999
EMU countries				
Austria	—	38.9	6.5	25.0
Belgium	50.0	80.8	7.1	58.8
France	14.3	37.3	7.9	19.4
Germany	18.3	31.7	5.2	34.7
Ireland	56.5	69.2	0.0	48.5
Italy	0.0	10.9	33.0	12.8
Netherlands	56.3	76.0	23.3	31.3
Spain	6.3	59.4	3.3	9.0
Average EMU	28.8	50.5	10.8	29.9
Non-EMU countries				
Australia	26.2	25.5	30.1	21.6
Canada	29.1	24.1	38.4	39.3
Japan	22.9	35.4	10.0	26.7
Sweden	12.5	11.1	37.0	36.0
UK	28.1	32.4	17.5	29.0
US	7.8	15.9	2.9	3.2
Average non-EMU	19.4	20.9	24.0	26.9

Table 3
Summary Statistics: Excess Returns (1/5/1991-12/25/1998)

The weekly excess returns are measured as national returns in euros minus the 1 month euro interest rate, which is transformed to reflect the return over a weekly horizon. Columns refer to countries as follows: BE: Belgium, FR: France, GE: Germany, IT: Italy, NL: Netherlands, SP: Spain. All statistics are reported separately for each sector. The first row reports the mean excess return, r. The second row reports the standard deviation of the excess return, σ. The third row reports correlation coefficient, ρ_l, of excess returns between the sector and its local market index. The fourth row reports the correlation coefficient, ρ_{EU}, of excess returns between the sector and the EU-11 market index. The fifth row reports the difference between the two correlation coefficients, $\rho_l - \rho_{EU}$. The final column of the table reports the average for the sector across all countries. The local market excess returns are total market excess returns. The EU-11 index is a value weighted average of the 11 EMU countries. All data are collected from Datastream. When sector data is not available a blank is recorded in the table.

	BE	FR	GE	IT	NL	SP	Avg.
			Resources				
r	0.009	0.129	-0.156	0.265	0.171	0.194	0.102
σ	2.734	3.581	2.685	2.289	2.572	2.786	3.312
ρ_l	0.448	0.427	0.149	0.377	0.404	0.474	0.380
ρ_{EU}	0.281	0.424	0.154	0.229	0.353	0.396	0.306
$\rho_l - \rho_{EU}$	0.167	0.003	-0.005	0.148	0.051	0.078	0.074
			Basic				
r	0.075	0.081	0.080	-0.099	0.093	0.063	0.049
σ	2.252	2.392	2.291	3.651	2.742	2.982	2.718
ρ_l	0.539	0.532	0.418	0.523	0.418	0.498	0.488
ρ_{EU}	0.369	0.499	0.378	0.384	0.391	0.418	0.406
$\rho_l - \rho_{EU}$	0.170	0.033	0.040	0.139	0.027	0.080	0.082
			General Industrials				
r	0.228	0.132	0.036	-0.167	0.201	0.137	0.095
σ	2.201	2.642	2.196	3.884	3.991	2.687	2.934
ρ_l	0.534	0.538	0.499	0.503	0.317	0.487	0.480
ρ_{EU}	0.407	0.516	0.435	0.340	0.298	0.403	0.400
$\rho_l - \rho_{EU}$	0.127	0.022	0.064	0.163	0.019	0.084	0.080
			Utilities				
r	0.296	0.272	0.133	0.315	——	0.352	0.274
σ	1.944	3.437	1.327	3.540		2.655	2.581
ρ_l	0.438	0.228	0.177	0.519		0.603	0.393
ρ_{EU}	0.261	0.229	0.156	0.370		0.488	0.301
$\rho_l - \rho_{EU}$	0.177	-0.001	0.021	0.149		0.115	0.092
			Information Technology				
r	0.687	0.095	0.743	–0.066	0.395	——	0.371
σ	5.606	3.945	5.295	3.744	4.192		4.556
ρ_l	0.139	0.509	0.273	0.388	0.261		0.314
ρ_{EU}	0.135	0.509	0.271	0.249	0.252		0.283
$\rho_l - \rho_{EU}$	0.004	0.000	0.002	0.139	0.009		0.031

	BE	FR	GE	IT	NL	SP	Avg.
			Financials				
r	0.252	0.135	0.117	0.115	0.322	0.222	0.194
σ	2.084	3.001	2.531	3.138	2.406	3.106	2.711
ρ_l	0.577	0.476	0.418	0.577	0.506	0.589	0.524
ρ_{EU}	0.428	0.460	0.341	0.378	0.461	0.495	0.427
$\rho_l - \rho_{EU}$	0.149	0.016	0.077	0.199	0.045	0.094	0.097

Cyclical Consumer Goods							
r	——	0.098	0.113	0.079	0.076	-0.147	0.044
σ		2.088	2.382	3.756	3.545	5.699	4.245
ρ_l		0.491	0.436	0.558	0.187	0.175	0.369
ρ_{EU}		0.465	0.422	0.397	0.173	0.156	0.321
$\rho_l - \rho_{EU}$		0.026	0.014	0.161	0.014	0.019	0.048
Non-Cyclical Consumer Goods							
r	0.393	0.226	0.089	0.107	0.282	0.123	0.203
σ	2.623	2.376	1.880	3.610	2.242	2.823	2.592
ρ_l	0.424	0.556	0.419	0.459	0.444	0.485	0.465
ρ_{EU}	0.349	0.513	0.393	0.338	0.406	0.376	0.396
$\rho_l - \rho_{EU}$	0.075	0.043	0.026	0.121	0.038	0.109	0.069
Cyclical Services							
r	0.199	0.098	0.114	0.014	0.260	0.288	0.162
σ	2.124	2.087	2.341	2.630	2.037	2.523	2.290
ρ_l	0.449	0.521	0.414	0.481	0.465	0.549	0.480
ρ_{EU}	0.347	0.491	0.382	0.368	0.449	0.429	0.411
$\rho_l - \rho_{EU}$	0.102	0.030	0.032	0.113	0.016	0.120	0.069
Non-Cyclical services							
r	0.112	0.444	0.233	0.415	0.258	0.393	0.309
σ	3.333	2.692	3.082	4.274	2.686	3.450	3.253
ρ_l	0.477	0.388	0.455	0.515	0.306	0.523	0.444
ρ_{EU}	0.364	0.362	0.413	0.389	0.296	0.391	0.369
$\rho_l - \rho_{EU}$	0.113	0.026	0.042	0.126	0.010	0.132	0.075

Table 4
Forward Interest Differentials: Summary Statistics

For each of the countries we report summary statistics of forward interest differentials vis-á-vis Germany. The forward interest differentials are calculated from swap rates between fixed and floating rate government bonds as follows: define $w_{i,\tau}$ as the swap rate for an interest rate contract on government bonds of country i in which the interest payments of a variable rate government bond with τ years to maturity are exchanged against the interest payments of a fixed rate government bond with the same years to maturity. Let $f_{i,T}^{n}$ denote the n-year forward rate T years from now. From the swap rates we can calculate the forward rates as:

$$f_{i,T}^{n} = \left[\frac{(1 + w_{i,T+n})^{T+n}}{(1 + w_{i,T})^{T}} \right]^{\frac{1}{n}} - 1$$

We set $n = 8$ and $T = 2$ and hence for each market the eight year forward rate in two years time is calculated. From this we calculate interest differentials for each market vis-á-vis Germany: $s_{i,t} = f_{i,2}^{8} - f_{GE,2}^{8}$. For Germany, the forward interest differential is calculated against the ECU: $s_{GE,t} = f_{GE,2}^{8} - f_{ECU,2}^{8}$. Interest rate swap yields for Belgium are converted to a 360 day year by multiplying by (360/365). In all other countries the day count basis is 360. The interest rate swap data are Friday quotes of the all-in cost of the fixed-side of the swap outright from Datastream International. The data are sampled weekly from 28:6:91 to 25:12:98.

Country	Mean	Standard Deviation	Minimum	Maximum
Belgium	0.388	0.327	-0.090	1.042
France	0.282	0.458	-0.328	1.339
Germany	-0.518	0.399	-1.779	0.036
Italy	2.776	1.625	-0.016	5.734
Netherlands	0.053	0.150	-0.186	0.438
Spain	2.482	1.584	-0.028	5.704

Table 5
Partial Integration Estimates of Equity Betas

Estimates of local and global betas and the integration parameter from the following regression are reported:

$$\mathbf{r}_{i,t} = \theta_{i,t-1}\left(\boldsymbol{\beta}_i^{EU} r_t^{EU}\right) + (1-\theta_{i,t-1})\left(\boldsymbol{\beta}_i^{L} r_t^{L}\right) + \mathbf{e}_{i,t}$$
$$\theta_{i,t-1} = \gamma_{0,i} + \exp\left(\gamma_{1,i}\,|s_{i,t-1}|\right)$$

where $\mathbf{r}_{i,t}$ is the $1 \times n$ vector of sector excess returns in country i, $\boldsymbol{\beta}_i^{EU}$ is a $1 \times n$ vector of sector betas with respect to the EU-wide index, defined as r_t^{EU}, $\boldsymbol{\beta}_i^{L}$ is a $1 \times n$ vector of sector betas with respect to the local index of country i, defined as r_t^{L}, $\theta_{i,t-1}$ is the degree of integration of country i into the EU market, conditional on information up to time $t-1$, $s_{i,t-1}$ and $\mathbf{e}_{i,t}$ is a vector of sector residuals. Robust standard errors are in parentheses. * denotes statistically significant at the 1% level. The abbreviations are as follows: RS: Resources, BS: Basic Industries, GI: General Industrials, UT: Utilities, IT: Information Technology, FI: Financials, CG: Cyclical Consumer Goods, NG: Non-Cyclical Consumer Goods, CS: Cyclical Services, NS: Non-Cyclical Services.

Belgium

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.42*	0.42*	0.50*	0.25*	0.56*	0.54*	—	0.54*	0.39*	0.78*
	(0.06)	(0.03)	(0.04)	(0.03)	(0.17)	(0.02)		(0.05)	(0.04)	(0.06)
β^{L}	0.94*	0.87*	0.74*	0.61*	0.12	0.59*	—	0.62*	0.66*	0.85*
	(0.09)	(0.07)	(0.07)	(0.09)	(0.24)	(0.08)		(0.11)	(0.07)	(0.12)
γ_1	−47.30*									
	(2.87)									

France

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.63*	0.52*	0.59*	—	1.12*	0.65*	0.64*	0.57*	0.43*	0.46*
	(0.05)	(0.03)	(0.03)		(0.04)	(0.03)	(0.03)	(0.03)		(0.04)
β^{L}	0.79*	0.60*	0.69*	—	0.58*	0.66*	0.57*	0.59*	0.53*	0.48*
	(0.15)	(0.06)	(0.05)		(0.15)	(0.09)	(0.08)	(0.05)	(0.05)	(0.08)
γ_1	−23.77*									
	(1.122)									

Germany

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.31* (0.07)	0.36* (0.03)	0.43* (0.02)	0.15* (0.03)	0.99* (0.10)	0.44* (0.03)	0.62* (0.03)	0.34* (0.02)	0.45* (0.05)	0.67* (0.04)
β^{L}	−0.06 (0.11)	0.57* (0.07)	0.56* (0.06)	0.04 (0.05)	0.24 (0.16)	0.51* (0.08)	0.56* (0.08)	0.44* (0.06)	0.44* (0.08)	0.59* (0.07)
γ_1	−34.02* (2.23)									

Italy

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.45* (0.15)	0.61* (0.08)	0.57* (0.07)	0.52* (0.06)	0.17** (0.08)	0.54* (0.03)	0.60* (0.04)	0.66* (0.08)	0.47* (0.06)	0.67* (0.07)
β^{L}	0.55* (0.07)	0.601*	0.62* (0.03)	0.62* (0.04)	0.59* (0.05)	0.56* (0.03)	0.70* (0.03)	0.48* (0.05)	0.37* (0.03)	0.70* (0.04)
γ_1	−6.95* (0.53)									

Netherlands

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.31* (0.04)	0.52* (0.04)	0.45* (0.06)	—	0.42* (0.09)	0.63* (0.03)	0.28* (0.08)	0.51* (0.03)	0.49* (0.03)	0.39* (0.04)
β^{L}	1.14* (0.15)	0.70* (0.18)	1.21* (0.23)	—	1.02* (0.25)	0.52* (0.13)	0.44 (0.31)	0.46* (0.11)	0.50* (0.10)	0.54* (0.18)
γ_1	−35.895* (1.97)									

Spain

	RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
β^{EU}	0.43* (0.07)	0.52* (0.07)	0.61* (0.09)	0.56* (0.05)	—	0.93* (0.04)	0.78* (0.31)	0.52* (0.07)	0.48* (0.05)	0.82* (0.07)
β^{L}	0.56* (0.04)	0.58* (0.04)	0.45* (0.05)	0.65 (0.04)	—	0.57* (0.05)	0.18 (0.13)	0.53* (0.04)	0.56* (0.04)	0.62* (0.06)
γ_1	−32.82* (1.85)									

Table 6
Equity Market Premia: 1973-1998

The arithmetic equity premia for the countries is calculated using annual data over the period 1973-1998. The excess returns are calculated in euros. The EU index is a market value weighted average of the EU-11 countries. The risk free rate is the short term German rate.

	BE	FR	GE	IT	NL	SP	EU-11
Mean	8.09	12.85	6.18	15.10	10.57	13.52	9.76
Standard Deviation	21.89	31.77	23.70	41.94	21.83	29.08	22.65

Table 7
Estimates of Equity Premia

Each column represents a different country. The last column provides an arithmetic mean of the six countries. In each industry, the first row reports estimates of the average equity premium and the second row reports end of sample estimates, denoted in percent. Inside the parentheses is the contribution of the global (EU-specific) equity premium component to the total equity premium. The sample period is from 1/5/1991 to 12/25/1998.

	BE	FR	GE	IT	NL	SP	Avg.
Resources							
Full Sample	6.469	8.302	1.006	7.439	6.344	7.025	6.098
	(20%)	(28%)	(100%)	(14%)	(30%)	(10%)	(37%)
Final Observation	4.291	6.270	2.996	4.426	3.731	4.168	4.314
	(91%)	(96%)	(100%)	(98%)	(74%)	(99%)	(93%)
Basic Industries							
Full Sample	6.113	6.489	3.538	8.421	5.961	7.447	6.328
	(21%)	(36%)	(40%)	(16%)	(57%)	(11%)	(30%)
Final Observation	4.237	5.174	3.542	6.008	5.288	5.139	4.898
	(92%)	(96%)	(100%)	(98%)	(90%)	(99%)	(96%)
General Industrial							
Full Sample	5.650	7.439	3.763	8.494	7.479	6.054	6.479
	(27%)	(36%)	(45%)	(15%)	(37%)	(15%)	(29%)
Final Observation	4.954	5.812	4.226	8.679	5.039	5.964	5.779
	(94%)	(97%)	(100%)	(98%)	(80%)	(99%)	(95%)
Utilities							
Full Sample	4.153	—	0.721	8.405	—	8.245	5.381
	(18%)		(82%)	(14%)		(10%)	(31%)
Final Observation	2.529	—	1.454	5.094	—	5.495	3.643
	(90%)		(100%)	(98%)		(99%)	(97%)
Information Technology							
Full Sample	2.383	9.111	4.787	7.297	6.530	—	6.022
	(73%)	(56%)	(81%)	(5.3%)	(40%)		(51%)
Final Observation	5.203	10.861	9.662	1.768	4.659	—	6.431
	(99%)	(98%)	(100%)	(94%)	(82%)		(95%)
Financials							
Full Sample	4.924	7.457	3.583	7.776	5.928	7.946	6.269
	(36%)	(39%)	(48%)	(16%)	(66%)	(17%)	(37%)
Final Observation	5.254	6.383	4.255	5.277	6.139	9.035	6.057
	(97%)	(97%)	(100%)	(98%)	(93%)	(99%)	(97%)

Cyclical Consumer Goods							
Full Sample	——	6.839 (43%)	4.515 (54%)	9.531 (14%)	3.464 (50%)	3.202 (36%)	5.510 (39%)
Final Observation	——	6.253 (97%)	6.021 (100%)	5.899 (98%)	2.905 (87%)	7.555 (99%)	5.727 (96%)
Non-Cyclical Consumer Goods							
Full Sample	5.079 (33%)	6.659 (39%)	2.935 (45%)	7.112 (21%)	4.930 (63%)	8.835 (15%)	5.925 (36%)
Final Observation	5.283 (95%)	5.610 (97%)	3.289 (100%)	6.412 (99%)	4.952 (92%)	8.976 (98%)	5.754 (97%)
Cyclical Services							
Full Sample	4.880 (25%)	5.641 (35%)	3.426 (52%)	5.420 (20%)	4.926 (61%)	7.171 (10%)	5.244 (34%)
Final Observation	3.894 (93%)	4.297 (96%)	4.431 (100%)	4.618 (99%)	4.782 (92%)	4.760 (99%)	4.463 (97%)
Non-Cyclical Services							
Full Sample	7.108 (34%)	6.768 (31%)	4.832 (55%)	9.711 (16%)	4.493 (53%)	8.358 (15%)	6.878 (34%)
Final Observation	7.612 (96%)	4.607 (96%)	6.558 (100%)	6.623 (98%)	3.946 (89%)	8.010 (100%)	6.226 (97%)

Table 8
Cumulative Effect of Integration on the Equity Premium Across Sectors

Panel A reports for each sector the cross-country average of the total change in the equity premium using equal weights. Panel B reports for each country the cross-sectoral average of the total change in the equity premium using equal weights. We report two numbers for each country. The first is the average across all ten sectors, the second is across nine omitting the IT sector. $^*(^\dagger)$ denotes statistically significant at the 1% (5%) level.

Panel A: Average Cross-Country Effect

RS	BS	GI	UT	IT	FI	CG	NG	CS	NS
-2.88^*	-2.07^*	-2.18^*	-2.15^*	0.63	-0.48^*	0.11	-0.65^*	-1.07^*	-0.61^*

Panel B: Average Cross-Sectoral Effect

	BE	FR	GE	IT	NL	SP
All Industries	-0.57^*	-1.55^*	2.08^*	-3.61^*	-2.40^*	-1.07^*
Ex-IT	$-1.16^\dagger$	-2.13^*	1.46^*	-3.24^*	-2.12^*	-1.07^*

Table 9
Convergence in the Equity Premium (Sigma Convergence)

Panel A reports estimates of the trend coefficient in the equity premium across countries. For a given sector j, we compute the cross-country standard deviation of the equity premium in each week t and test for the existence of a negative trend over time from the following regression:

$$\sigma_{jt} = a_0 + a_1 trend + u_{jt}$$

where σ_{jt} is the cross sectional standard deviation of sector j in week t, a_0 and a_1 are estimated coefficients and u_{jt} is an error term.
Panel B reports estimates of the trend coefficient in the equity premium across sectors. For a given country i, we compute the cross-sectoral standard deviation of the equity premium in each week t and test for the existence of a negative trend over time from the following regression:

$$\sigma_{it} = a_0 + a_1 trend + u_{it}$$

where σ_{jt} is the cross sectional standard deviation of country i in week t, a_0 and a_1 are estimated coefficients and u_{it} is an error term.
* denotes statistically significant at the 1% level.

Panel A: Cross-Country Dispersion within a Sector

	RS	BS	GI	UT	IT
a_1	-0.006*	-0.002*	-0.005*	-0.005*	-0.003*
	FI	CG	NG	CS	NS
a_1	-0.002*	-0.005*	-0.002*	-0.003*	-0.002*

Panel B: Cross-Sectoral Dispersion within a Country

	BE	FR	GE	IT	NL	SP
a_1	-0.006*	0.005*	0.004*	-0.001*	-0.011*	-0.004*

Table 10
Tests of Restricted Models
Panel A: Likelihood Ratio Tests

This table reports likelihood ratio tests of the restricted models (complete segmentation and complete integration) against the unrestricted model (partial integration). The tests are distributed $\chi^2(2)$. Probability values are reported in brackets.

	BE	FR	GE	IT	NL	SP
Complete Segmentation	20.13	18.37	24.39	4.860	20.02	18.06
	[0.045]	[0.073]	[0.018]	[0.960]	[0.045]	[0.081]
Complete Integration	100.58	28.93	40.42	72.68	40.11	78.15
	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]

Panel B: Average Differences in Estimated Equity Premia

The average absolute differences in the estimated equity premia between the partially integrated model and the two restricted models are reported below in percentage terms.

	BE	FR	GE	IT	NL	SP
Complete Segmentation	2.17	1.33	0.62	0.27	0.51	0.57
Complete Integration	1.46	0.98	1.94	2.01	0.97	1.47

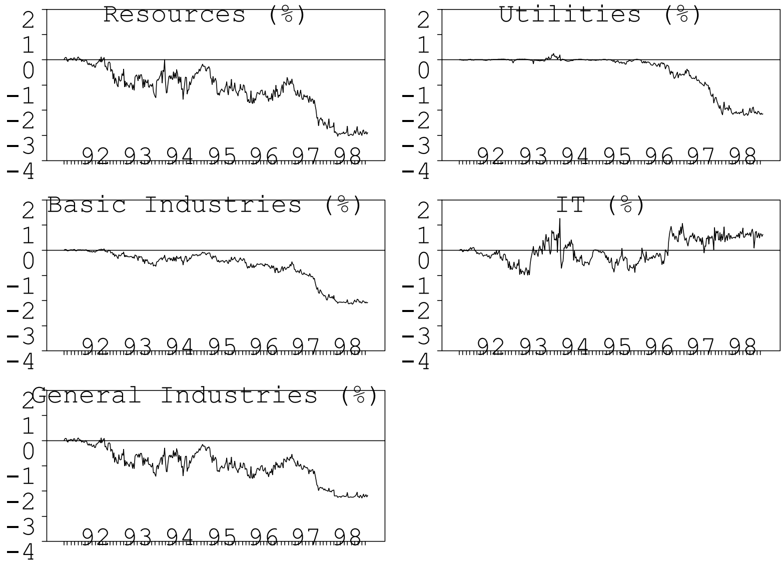

Figure 1: Reduction in Equity Premium

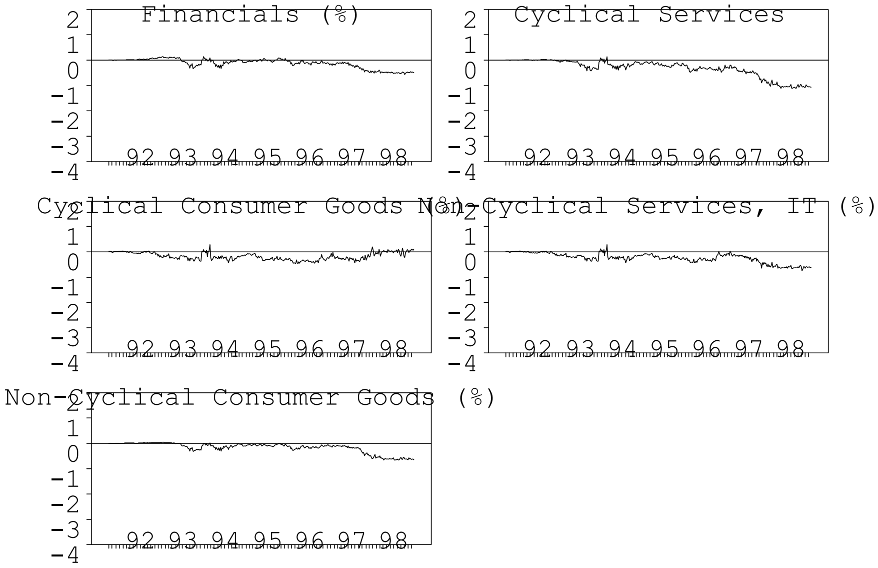

Figure 2: Reduction in Equity Premium

Figure 3: Average Cross-Country Dispersion of Equity Premium within a Sector

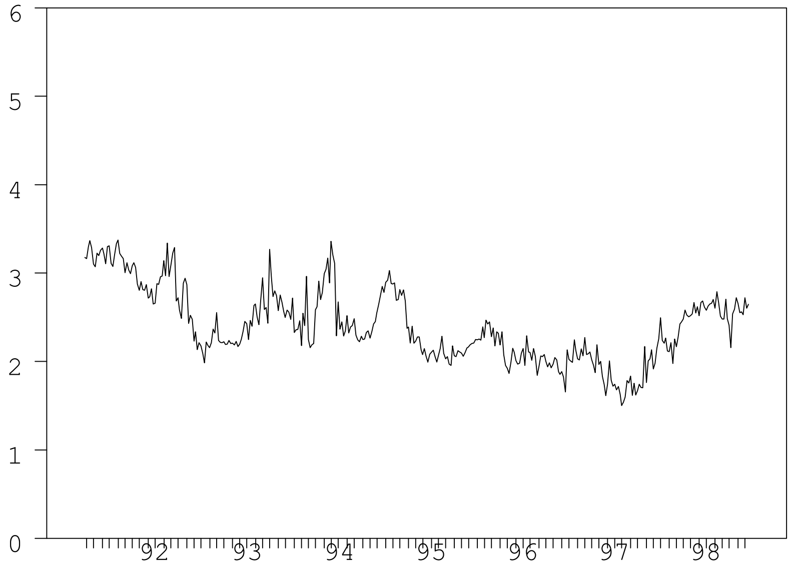

Figure 4: Average Cross-Sectoral Dispersion in Equity Premium within a Country