The Determinants of Increasing Equity Market Comovement: Economic or Financial Integration[*]?

Lieven Baele[†]

Pilar Soriano[‡]

Abstract

This paper investigates to what extent the substantial increase in exposures of local European equity market returns to global (regional) shocks is mainly due to a convergence in cash flows ("economic integration"), to a convergence in discount rates ("financial integration"), or to both. We find that this increased exposure is nearly entirely due to increasing discount-rate betas. This finding is robust to alternative ways of calculating discount-rate and cash-flow shocks.

JEL Classification: G11, G12, G15, C32, F37

Keywords: Economic Integration, Financial Integration, GARCH, Cash-flow News, Discount-rate News.

---

[*] The authors greatly benefited from discussions with Pilar Abad, Geert Bekaert, Francisco Climent, Esther Eiling, Gerhard Illing, Koen Inghelbrecht, Ralph Koijen, Rafael Santamaria, and Rudi Vander Vennet, as well as seminar participants at the DIW in Berlin, the European Commission in Brussels, the University of Valencia, the University of the Balearic Islands, and the XV Foro de Finanzas in Palma de Mallorca. Financial support from the European Commission: DG Research in cooperation with DG ECFIN and DG ESTAT (Contract No. SCS8-CT-2004-502642); ERDF and Spanish Ministry of Education and Science (Contract No. SEJ2006-15401-C04-04/ECON); and Generalitat Valenciana (Contract No. GV/2007/082) is gratefully acknowledged.

[†] Corresponding author: Tilburg University, CentER, and Netspar. Department of Finance, PO Box 90153, NL 5000 LE Tilburg, The Netherlands. Tel.: +31 13 466 3257. Fax: +31 13 466 2875. Email: Lieven.Baele@uvt.nl

[‡] University of Valencia. Department of Financial Economics. Email: Pilar.Soriano-Felipe@uv.es

1. Introduction

There is increasing consensus that globalization and integration lead to substantially higher equity market betas and correlations. Apart from in emerging markets, the evidence is particularly strong in Europe, a region where integration has made considerable progress over the last twenty years[1].

A yet unresolved question is *what type of integration* is behind these increases in market betas and correlations. In fact, cross-country equity market correlations could increase because of economic integration through a convergence in cross-country cash flows, because of financial integration through a convergence in cross-country discount rates, or through both. The aim of this paper is to quantify the relative importance of economic and financial integration in explaining time-varying equity market betas and correlations.

Distinguishing between both effects is important for a number of reasons. First, cross-market interdependences and correlations have frequently been used as indirect measures of financial integration. By separately correcting for economic integration, we should obtain a cleaner measure of financial integration. Second, differences in the degree of and time variation in respectively economic and financial integration may explain why equity correlations vary substantially across countries and over time. For instance, is one market more correlated with the world equity market because its cash flows are more similar, because it is relatively better financially integrated, or a combination of both? Last but not least, by identifying the different sources of market comovement in 'normal' times, our analysis should also provide for a better identification of the various channels through which contagion may occur.

---

[1] See e.g. Longin and Solnik (1995), Bekaert and Harvey (2000), Baele et al. (2004), Baele (2005), Baele and Inghelbrecht (2006), and Bekaert et al. (2006).

To empirically study the relative importance of economic and financial integration, we focus on a large sample of 21 equity markets from both Western and Eastern Europe. We do this for a number of reasons. First, over the last decades, Europe has gone through an extraordinary period of increasing integration, including the introduction of the euro in 1999 and the accession of 10 new members to the European Union in 2004. Second, the comparison of countries in an economically homogeneous region with those that opted to stay out of the economic (and monetary) union offers an ideal test for the main hypothesis in this paper. Third, this analysis may hold important lessons for the recently emerged equity markets in Central and Eastern European Countries which have just embarked or are about to embark on the integration process.

We start the analysis by confirming the increase in market betas in nearly all European countries using a simple version of the two-factor volatility spillover model of Bekaert and Harvey (1997), where the two factors are return shocks in respectively the US and aggregate European equity market. An increasing proportion of total variance is explained by these two common factors, which in turn leads to a substantial increase in cross-market correlations.

In the main part of our analysis, we determine to what extent the increase in market betas with respect to the US is due to a convergence in cash-flow expectations (related to further economic integration) or in discount rates (resulting from increasing financial integration). To distinguish between both, we use the VAR methodology developed in Campbell and Shiller (1988a) and Campbell (1991) to decompose the return on the US market into a component due to revisions in future cash flows and a part due to news about future discount rates. Campbell and Mei (1993) decomposed the betas of industry and size portfolios into components attributable to news about future cash flows, real interest rates, and excess returns. In a recent paper, Campbell and Vuolteenaho (2004) showed that the size and value anomalies in stock returns can be explained by allowing stocks to have a different exposure to cash-flow and discount-rate news.

To our knowledge, this paper is the first to decompose country betas with respect to a common global market shock (here proxied by the US market) in a discount-rate and cash-flow beta. This allows us to quantify whether the increase in the total market beta is mainly due to an increase in the cash-flow beta (economic integration) or in the discount-rate beta (financial integration). We find that this increase is nearly fully the consequence of an increase in the discount-rate beta.

This paper is most closely related to the work of Ammer and Mei (1996), Phylaktis and Ravazzolo (2002), and Engsted and Tanggaard (2004). Ammer and Mei (1996) decompose the returns on the equity markets of 15 industrialized countries in a cash-flow and discount-rate component over the period 1974-1990. Consequently, they interpret the cross-country correlations between discount and cash-flow news as measures of respectively financial and economic integration. Among other things, they find that real linkages measured using stock market data are much stronger than those that are obtained from pair-wise correlations in industrial production growth rates. Phylaktis and Ravazzolo (2002) perform a similar analysis on a set of Pacific-Basin equity markets. They report increasing economic and financial integration for most countries. Interestingly, they find that economic integration provides an important channel for further financial integration. Engsted and Tanggaard (2004) is similar in spirit to Ammer and Mei (1996). They find that news about future excess returns is the main determinant of stock market volatility in both the US and the UK. This news component is highly cross-country correlated, which helps explain the high degree of comovement between both markets.

The main difference between these studies and ours is that we look at exposures to cash-flow and discount-rate shocks as measures of economic and financial integration instead of correlations in respectively cash-flow and discount-rate shocks. The main advantage of looking at exposures rather than at correlations is that the former are not vulnerable to the conditioning bias of Forbes and Rigobon (2002). More specifically, rising cross-country correlations may be purely the result of an increase in the volatility of cash-flow / discount-rate shocks rather than of increasing integration. An additional difference is that we consider a broad range of both Western and Eastern European countries, and that our sample period covers a wider range of data including the early 2000s, where the process of further European integration was still taking place.

The remainder of this paper is organized as follows. Section 2 measures global and regional integration through time. Section 3 describes, first, how global market shocks can be decomposed in news about future cash flows and discount rates and, second, how to measure cash-flow and discount-rate exposures. Section 4 reports the empirical results and some robustness checks. Finally, Section 5 concludes.

2. Measuring Global and Regional Integration

In this section, we present a very stylised volatility spillover model to document the effect of integration on market betas. While this version is a stripped down version of the ones used in Ng (2000), Fratzscher (2002), Baele (2005), and Baele and Inghelbrecht (2006), we believe it is still sufficiently rich to convey the main patterns in the data.

Consider the return $r_{i,t}$ of country i at time t, and its unexpected component $\varepsilon_{i,t} = r_{i,t} - \mu_{i,t-1}$. We decompose $\varepsilon_{i,t}$ as follows:

$$\varepsilon_{i,t} = e_{i,t} + \gamma_{i,t}^{EU} \hat{e}_{EU,t} + \gamma_{i,t}^{US} \hat{e}_{US,t} \qquad (1)$$

Equation (1) distinguishes between three sources of unexpected returns, namely i) a purely domestic shock, ii) a shock spillover from the regional European market, and iii) a shock spillover from the US equity market.

We are mainly interested in the evolution of the exposures to the European and US equity market shocks over time, respectively denoted by $\gamma_{i,t}^{EU}$ and $\gamma_{i,t}^{US}$. To keep the analysis as simple as possible[2], we make the spillover intensities a linear function of three dummy variables (*D80*, D90, and *D00*) that are equal to 1 in respectively the eighties, nineties, and the start of the new millennium, and zero otherwise. Thus,

$$\gamma_{i,t}^{j} = \gamma_{i,0}^{j} + \gamma_{i,80}^{j} D80 \ + \gamma_{i,90}^{j} D90 \ + \gamma_{i,00}^{j} D00 \tag{2}$$

where $j = \{US, EU\}$.

The country-specific shock $e_{i,t}$ may still exhibit heteroskedasticity, which we model using a standard asymmetric GARCH(1,1) specification:

$$e_{i,t} \left| \Omega_{t-1} \sim N(0, \sigma_{i,t}^2) \right. \tag{3}$$

$$\sigma_{i,t}^2 = \psi_{i,0} + \psi_{i,1} e_{i,t-1}^2 + \psi_{i,2} \sigma_{i,t-1}^2 + \psi_{i,3} e_{i,t-1}^2 I\{e_{i,t-1} < 0\} \tag{4}$$

Finally, we need to specify the joint process of US and aggregate European returns. Consider the vector of unexpected return[3] shocks $f_t = [\varepsilon_{US,t}, \varepsilon_{EU,t}]'$, distributed as follows:

$$f_t \left| \Omega_{t-1} \sim N(0, H_t) \right. \tag{5}$$

$$H_t = F_t R_t F_t \tag{6}$$

$$F_t = \begin{bmatrix} h_{US,t} & 0 \\ 0 & h_{EU,t} \end{bmatrix}, \qquad R_t = \begin{bmatrix} 1 & \rho_t \\ \rho_t & 1 \end{bmatrix} \tag{7}$$

---

[2] Bekaert and Harvey (1997), Ng (2000), and Fratzscher (2002) make the spillover intensities a function of some lagged instruments; Baele (2005) allows the intensities to switch between two states according to a latent regime variable; Baele and Inghelbrecht (2006) combine both approaches.

[3] We define return shocks as the residual from a first-order VAR in $r_t = [r_{US,t}, r_{EU,t}]'$.

The conditional variances of the US and European return shocks follow an asymmetric GARCH specification similar to equation (4). Instead of assuming that the correlation between US and European return shocks is constant, we allow the correlation to vary over the same subperiods as we allowed gammas to change through time:

$$\rho_{i,t} = \rho_{i,0} + \rho_{i,80} D80 \; + \rho_{i,90} D90 \; + \rho_{i,00} D00 \tag{8}$$

One would expect that as Europe as a whole becomes more integrated with world markets, also its correlation with the US equity markets increases over time.

Finally, we use the conditional variance-covariance matrix H_t to orthogonalize the US and the European return shocks[4]. We treat the US market shock as a global exogenous shock, and eliminate the US influence from the European market shocks. We denote the orthogonalized European and US innovations by $\hat{e}_{EU,t}$ and $\hat{e}_{US,t}$ and their variances by $\sigma^2_{EU,t}$ and $\sigma^2_{US,t}$.

Based on our model estimates, we calculate for each individual country the proportion of total volatility explained by respectively US and European-specific shocks[5]. These variance ratios ($VR^{US}_{i,t}$ and $VR^{EU}_{i,t}$) allow for a comparison of the relative importance of global and regional market shocks.

We estimate this model on a set of 21 European countries. Our sample consists of 12 EMU countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy,

---

[4] The orthogonalized European-specific shock $\hat{e}_{EU,t}$ is calculated as: $\varepsilon_{EU,t} - H_t(2,1)/H_t(1,1)\varepsilon_{US,t}$, where $\varepsilon_{EU,t}$ and $\varepsilon_{US,t}$ are the non-orthogonalized European and US equity return shocks.

[5] Under weak assumptions, the variance proportions $VR^{US}_{i,t}$ and $VR^{EU}_{i,t}$ are given by $(\gamma^{US}_{i,t})^2 \sigma^2_{US,t} / h_{i,t}$ and $(\gamma^{EU}_{i,t})^2 \sigma^2_{EU,t} / h_{i,t}$, where $h_{i,t}$ is the total local variance given by $\sigma^2_{i,t} + (\gamma^{EU}_{i,t})^2 \sigma^2_{EU,t} + (\gamma^{US}_{i,t})^2 \sigma^2_{US,t}$.

Luxembourg, The Netherlands, Portugal, and Spain), 3 non-EMU but EU members (Denmark, Sweden and UK), 3 non-EMU but new EU members (Czech Republic, Hungary and Poland), 1 EU candidate country (Turkey) and 2 other European countries (Norway and Switzerland). For all countries, we obtained monthly total returns from Datastream over the period 1973-2005[6]. Returns are denominated in US$ to match the currency of the cash-flow and discount-rate news variables (see Section 3). Finally, the EU index used for the empirical estimation of univariate spillover models for each country excludes this country from the index in order to focus only on shocks that are external to each market.

Figure 1 reports EU and US shock spillover intensities ($\gamma_{i,t}^{EU}$ and $\gamma_{i,t}^{US}$) over the different subperiods considered. This will enable us to understand the magnitude and evolution of shock spillover intensity through time, as well as the differences among the countries considered. In all countries, except Finland, Ireland, UK and Turkey, the sensitivity to EU shocks is considerably larger in the 2000s than in the first decade of data available. On average, the EU spillover intensity increased from about 0.70 in the second half of the 1970s to about 1.04 in the first half of the 2000s. The largest increases were observed in two new EU members, Poland and the Czech Republic, with an increase of around 100% and 67% respectively from the 1990s to the 2000s. They are followed by two EMU members, Germany and Austria, with an increase of, respectively, 61% and 60% from the 1970s to the 2000s.

The rise in US shock spillover intensity is also very pronounced. In all countries, except Greece, Portugal, UK, Hungary, Poland and Norway, the sensitivity to US shocks is considerably larger in the 2000s than in the first decade of data available. On average, the US spillover intensity increased from about 0.48 in the second half of the

[6] There is a somewhat shorter time period for a few countries where time series started later.

1970s to about 0.84 in the first half of the 2000s. The increase is strongly above the average in Turkey (415%), Luxembourg (114%) and Germany (64%).

In the most recent period, the countries with higher spillover intensities from the EU are Greece, Poland, the Czech Republic and Belgium, being the less affected by EU shocks the UK. Interestingly, among the first ones there are two EMU members and two new EU members. The countries with higher spillover intensities from the US are Turkey, Sweden and Finland, being Austria the less affected by US shocks. This time, the first countries are non-EMU countries, which implies a lower degree of integration with the EU, as compared to other countries.

Figure 2 reports the proportion of total return variance that can be attributed to EU and US shock spillovers ($VR_{i,t}^{EU}$ and $VR_{i,t}^{US}$). If we recall from the CAPM that expected local returns in a fully integrated market depend only on non-diversifiable international factors then, intuitively, the higher the proportion of variance explained by US and EU shocks, the higher the integration of local markets. If we add up the proportions of variance explained by US and EU shocks, the three countries with a higher proportion of variance explained by international factors are France, The Netherlands and Germany. On the other hand, among the 21 countries considered, the less integrated markets would be those of Austria, the Czech Republic and Turkey. If we look at the evolution of these proportions in time, all countries are in the 2000s more integrated than in the 1970s. Both the US and European markets have gained considerably in importance for individual European financial markets, though Europe has not taken over from the US as the dominant market in Europe (as suggested by Fratzscher, 2002). This would just be the case for new EU members where, in the 2000s, the proportion of variance explained by EU shocks is larger than the one explained by US shocks.

In general, among the 12 EMU members, the proportion of variance explained by EU shocks is larger in the 2000s than in the first decade of data available. The exceptions are Finland, Ireland, Luxembourg and The Netherlands, small countries where this proportion of variance has decreased. The same occurs with the proportion of variance explained by US shocks, which has increased except for Austria and Portugal. For EU but non-EMU members (Denmark, Sweden and UK) the proportion of variance explained by EU shocks has decreased while the one explained by US shocks has increased in time. For new EU members, EU shocks have gained importance in all countries, whereas the proportion of variance explained by US shocks has increased (Czech Republic), decreased (Poland) or remained the same (Hungary) depending on the country. In the last period, the highest EU variance ratios were observed in Hungary (50%), Portugal (44%) and Belgium (43%); the lowest in Turkey (2%), Finland (5%) and Denmark (9%). As expected, Germany (63%), France (62%), The Netherlands (61%) and UK (61%) have high US variance ratios, while especially Austria (4%) and the Czech Republic (6%) are relatively isolated from the US market. In general, the new EU members still have very low proportions of variance explained by US shocks.

3. Decomposing Global Risk into Cash-flow and Discount-rate News

Having confirmed the rise in common factor exposures in our set of 21 European countries, we now develop the empirical methodology to decompose total exposures or 'betas' into a component due to increased exposure to common cash-flow shocks, and into a component due to common discount-rate shocks. In this paper, we focus on decomposing the exposure with respect to the US, which is still the dominant market for most European countries. A similar decomposition could be obtained for regional market betas, i.e. the cash-flow and discount-rate betas with respect to the aggregate European market[7].

We start by showing how an unexpected return shock in the US can be decomposed into its cash-flow and discount-rate news components. Next, we show how the total beta of each country with respect to the US can be decomposed in a cash-flow and discount-rate beta.

3.1 Cash-flow and Discount-rate News

As in Campbell and Shiller (1988a) and Campbell (1991), we use the log-linear approximate decomposition of returns[8]:

$$r_{t+1} - E_t r_{t+1} = (E_{t+1} - E_t)\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j r_{t+1+j} \tag{9}$$

$$= N_{CF,t+1} - N_{DR,t+1} \tag{10}$$

where r_{t+1} is a log stock return, d_{t+1} is the log dividend yield, Δ denotes a one-period change, E_t denotes a rational expectation at time *t*, and ρ is a discount-rate coefficient. $N_{CF,t+1}$ denotes news about future cash flows at time *t+1*. Similarly, $N_{DR,t+1}$ represents news about future discount rates. Notice that equation (9) can be considered as a consistent model of expectations, since a positive (negative) unexpected return today

[7] Such an extension is not straightforward, given that we need to provide for a model of cash-flow and discount-rate news in an environment of time-varying capital market integration. This greatly complicates the modelling of expected returns and dividends: While under full integration only global / regional information variables are relevant, only local instruments are to be used in case of full market segmentation. A successful model should be able to accommodate for some (potentially latent) structural changes in the return generating process. We leave this analysis for further research. Apart from the presence of structural changes, the identification of European expected returns is also complicated by the relatively short time-series available, especially in comparison with the US.

[8] We considered including exchange rates in this decomposition, but decided not to do so. The main reason is that exchange rates are virtually unpredictable. Consequently, shocks to instruments have no long-lasting effects on future exchange rates, and hence on returns. There could be a contemporaneous but relatively small effect though.

must be only associated with an upward (downward) revision in expectations about future cash flows, a downward (upward) revision in expectations about future returns, or a combination of both.

To implement this decomposition, we follow Campbell (1991) and estimate the cash-flow news and discount-rate news series using a vector autoregressive (VAR) model. This VAR methodology first estimates the terms $E_t r_{t+1}$ and $(E_{t+1} - E_t)\sum_{j=1}^{\infty} \rho^j r_{t+1+j}$ and then uses r_{t+1} and equation (9) to back out the cash-flow news. This practice has an important advantage - one does not necessarily have to understand the short-run dynamics of dividends. Understanding the dynamics of expected returns is enough.

We assume that the data are generated by a first-order VAR model

$$\mathbf{z}_{t+1} = \mathbf{a} + \mathbf{\Gamma z}_{\mathrm{t}} + \mathbf{u}_{t+1} \tag{11}$$

where $\mathbf{z}_{t+1}$ is a m-by-1 state vector with r_{t+1} as its first element, $\mathbf{a}$ and $\mathbf{\Gamma}$ are an *m*-by-*1* vector and *m*-by-*m* matrix of constant parameters, and $\mathbf{u}_{t+1}$ an i.i.d. *m*-by-*1* vector of shocks. Of course, this formulation also allows for higher-order VAR models via a simple redefinition of the state vector to include lagged values.

Provided that the process in equation (11) generates the data, *t+1* cash-flow and discount-rate news are linear functions of the *t+1* shock vector:

$$N_{CF,t+1} = (\mathbf{e1}' + \mathbf{e1}'\lambda)\mathbf{u}_{t+1} \tag{12}$$

$$N_{DR,t+1} = \mathbf{e1}'\lambda\mathbf{u}_{t+1} \tag{13}$$

The VAR shocks are mapped to news by λ, defined as $\lambda = \rho\mathbf{\Gamma}(\mathbf{I} - \rho\mathbf{\Gamma})^{-1}$. The long-run significance of each individual VAR shock to discount-rate expectations is captured by $\mathbf{e1}'\lambda$, where $\mathbf{e1}$ is a vector whose first element is equal to one and zero otherwise. The greater the absolute value of a variable's coefficient in the return prediction equation (the top row of $\mathbf{\Gamma}$), the greater the weight the variable receives in the discount-rate-news formula. More persistent variables should also receive more weight, which is captured by the term $(\mathbf{I} - \rho\mathbf{\Gamma})^{-1}$.

3.2 Measuring Global Cash-flow and Discount-rate Exposures

We showed in the previous section how returns can be decomposed into two components. An interesting question is whether increasing exposure to global shocks is a result of increasing exposure to cash-flow news or increasing exposure to discount-rate news. Moreover, different countries may have different betas or exposures to these two components of the global market. Following Campbell and Vuolteenaho (2004), we define the cash-flow beta as

$$\beta_{i,CF} \equiv \frac{Cov(r_{i,t}^{e}, N_{CF,t})}{Var(r_{US,t}^{e} - E_t r_{US,t}^{e})} \tag{14}$$

and the discount-rate beta as

$$\beta_{i,DR} \equiv \frac{Cov(r_{i,t}^{e}, -N_{DR,t})}{Var(r_{US,t}^{e} - E_t r_{US,t}^{e})} \tag{15}$$

Therefore, the global market beta can be decomposed into components in a simple way:

$$\beta_{i,US} = \beta_{i,CF} + \beta_{i,DR} \tag{16}$$

We define betas by using unconditional variances and covariances. However, we will report betas using the whole sample period and also betas using the same subperiods as before, in order to get an idea of their evolution in time. An increase in economic and financial integration would be consistent with an increase in respectively $\beta_{i,CF}$ and $\beta_{i,DR}$. This framework enables us to analyse the variation across countries and across time in the two components of the market beta.

4. Empirical Results

In this section, we first discuss the decomposition of global (US) equity market shocks into cash-flow and discount-rate news. Second, we decompose the exposures of 21 European equity markets to US equity market shocks into a cash-flow and discount-rate beta. Finally, we present some robustness checks.

4.1 US Cash-flow and Discount-rate News

Section 3 explained how unexpected stock returns can be decomposed into a component due to revisions in future cash flows and a part due to revisions in future discount rates within a straightforward first-order VAR framework. To operationalize this VAR approach, we need to specify the variables to be included into the state vector ($\mathbf{z}_{t+1}$). Following Campbell and Vuolteenaho (2004), we choose the following four state variables: the excess market return (measured as the log excess return on the CRSP value-weighted index over Treasury bills), the yield spread between long-term and short-term bonds (measured as the yield difference between ten-year constant-maturity taxable bonds and short-term taxable notes, in annualized percentage points), the market's smoothed price-earnings ratio (measured as the log ratio of the S&P500 price index to a ten-year moving average of S&P500 earnings), and the small-stock value spread (measured as the difference between the log book-to-market ratios of small value and small growth stocks). Our monthly data covers the period January 1929 - December 2005. For January 1929 - December 2001, data is taken from Tuomo Vuolteenaho's website. For the rest of the sample period, we obtain the variables following Campbell and Vuolteenaho (2004). Thus, excess market return data is from CRSP, yield spread data is from FRED (Federal Reserve Economic Data), the price-earnings ratio is from Shiller (2000), and the small-stock value spread is constructed from the data made available by Professor Kenneth French on his web site[9]. Summary statistics are reported in Table 1.

The first two predictor variables have become standard instruments in the return predictability literature. The term spread variable is consistently shown to be a leading indicator of real economic activity, and hence stock prices. Estrella and Hardouvelis (1991) and Estrella and Mishkin (1998) show that for the United States the yield spread significantly outperforms other financial and macroeconomic indicators in forecasting recessions. Bernard and Gerlach (1996), Estrella and Mishkin (1997), and Ahrens (2002) present similar results for other countries. In addition, several papers (e.g., Campbell, 1987; Fama and French, 1989; Campbell and Yogo, 2006) have found a positive relation between the term structure and equity returns. Second, high price-earnings ratios are associated with low long-run expected returns, at least to the extent that earnings growth is constant. For instance, Fama and French (1988) and Campbell and Shiller (1988b) find that price-dividend and price-earnings ratios predict future real equity returns, and, more recently, Campbell and Vuolteenaho (2004) and Hecht and Vuolteenaho (2006) also provide evidence on how log price-earnings ratios negatively predict returns. The third, less standard, variable is the small-stock value spread. Campbell and Vuolteenaho (2004) offer a number of reasons for why this variable may be linked to expected returns. First, small growth stocks may generate cash flows in the more distant future and therefore their prices are more sensitive to changes in discount rates. Second, small growth companies may be particularly dependent on external financing and thus are sensitive to equity market and broader financial conditions. Finally, they argue that episodes of irrational investor optimism are likely to have a particularly powerful effect on small growth shocks.

[9] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table 2 reports the parameter estimates for the VAR model. Row 1 to 4 correspond to respectively the equations for the excess equity market returns, the term spread, the price-earnings ratio, and the small-stock value spread. The first five columns report coefficients on the five explanatory variables: a constant, and lags of the excess market return, term yield spread, price-earnings ratio, and small-stock value spread. OLS standard errors and Bootstrap standard errors are also reported. The final two columns report the R^2 and F statistics for each regression. The first row of Table 2 shows that all predictor variables have a statistically significant relation with the excess market returns. The coefficient on the lagged market return amounts to 0.0949, consistent with a modest degree of momentum. The term yield spread positively predicts the market return. The term spread accounts for a term or maturity risk premium, therefore leading to that positive relation (see Fama and French, 1989). The smoothed price-earnings ratio is - consistent with previous findings - negatively related to expected returns. Finally, the small-stock value spread negatively predicts stock returns, consistent with findings in Eleswarapu and Reinganum (2004) and Brennan et al. (2004). The R^2 is reasonable for a monthly expected return model. Rows 2 till 4 summarize the dynamics of the explanatory variables. The term spread has a high degree of autocorrelation (AR(1) coefficient of 0.9138). Interestingly, also the small-stock value spread has some predictive power for the term spread. Finally, the price-earnings ratio and the small-stock value spread ratio are both highly persistent, with roots (very) close to unity.

Table 3 reports summary statistics of the cash-flow and discount-rate news variables as implied by the VAR estimates. A first observation is that discount-rate news is double as volatile as cash-flow news (a monthly volatility of respectively 4.84% and 2.62%). This confirms the finding of Campbell (1991) that discount-rate news is the dominant component of the market return. The table also shows that the two components of return are almost uncorrelated with one another. Following Campbell and Vuolteenaho (2004), Table 3 also reports the correlations of each state variable innovation with the estimated news terms, and the coefficients $(\mathbf{e1}'+\mathbf{e1}'\lambda)$ and $\mathbf{e1}'\lambda$ that map innovations to cash-flow and discount-rate news. Innovations to returns are highly negatively correlated with discount-rate news, reflecting the mean reversion in stock prices that is implied by our VAR system. Market-return innovations are weakly positively correlated with cash-flow news, indicating that some part of a market rise is typically justified by underlying improvements in expected future cash flows. Innovations to the price-earnings ratio, however, are weakly negatively correlated with cash-flow news, suggesting that price increases relative to earnings are not usually justified by improvements in future earnings growth.

4.2 Cash-flow and Discount-rate Betas

In this section, we investigate whether the 21 local European equity returns considered have become more exposed to US equity market shocks, and to what extent this increased exposure is due to a convergence in cash-flow and/or discount-rate news.

Table 4 reports estimates of the total, cash-flow and discount-rate beta with respect to the US market for all countries over the full period and the subperiods 1973-1979, 1980-1989, 1990-1999, and 2000-2005. Figure 3 plots the average total, cash-flow and discount-rate betas over the four subperiods, while Figure 4 compares the cash-flow and discount-rate betas across countries. Consistent with Baele (2005) and Baele and Inghelbrecht (2006), we find a substantial increase in the exposure of local European equity markets to US equity market shocks. More specifically, the average US market exposure increased from about 0.48 in the second half of the 1970s to 0.61 in the 1980s, 0.68 in the 1990s, and 0.88 in the period 2000-2005. Panel B and C of Table 4 and Figure 4 clearly show that this increase is nearly entirely the result of an increase in discount-rate betas. Cash-flow betas are generally very small, statistically insignificant, and if anything, decreasing over time. We conclude from this analysis that the increased exposure of local European equity markets to the US market is largely the result of increased European financial market integration. This analysis also shows that global (regional) market exposures are a useful measure of financial market integration in a sense that the effect of further economic integration on market betas is only of second order.

4.3 Robustness Checks

In this section, we present a number of additional exercises we have performed in order to examine the robustness of our results in the decomposition of global shocks into cash-flow and discount-rate factors. Many of our robustness checks are inspired by a recent paper by Chen and Zhao (2006) that showed that many results in Campbell and Vuolteenaho (2004) are not robust to (small) specification changes.

4.3.1 Post-1952 data

According to Chen and Zhao (2006), an interesting robustness check is to estimate cash-flow and discount-rate news using only postwar data. They suggest it is worth analysing this because Campbell (1991) documents a shift in variance from cash-flow news to discount-rate news after 1952 and CAPM breaks down only in the postwar period. In Table 5, model 2, we report the results for the benchmark case when only postwar data is used. In this case, discount-rate news continues to be more important than cash-flow news, though, surprisingly, there is now less difference between both. Discount-rate betas continue to be more important than cash-flow betas and their evolution in time is similar to the benchmark case. The only exception is the average of the 12 EMU members. In this case, there seems to be an increasing trend (instead of decreasing trend) in cash-flow betas from the 1970s to the 2000s.

4.3.2 Sensitivity to changes in VAR state variables

Following Campbell and Vuolteenaho (2004), our benchmark VAR model includes the excess market return, the term spread, the market's smoothed price-earnings ratio, and the small-stock value spread. However, there are other variables that are often used to predict stock returns. In Table 5 we report some of the results obtained in this study when we include other variables in the VAR system. We report the variance of cash-flow news and discount-rate news, their covariance, cash-flow betas, discount-rate betas, and their evolution in time. We report average betas for: i) the 12 EMU members, ii) the 3 non-EMU but EU members and, iii) 3 non-EMU and new EU members.

In the first column, model 1, where the benchmark case is used, the cash-flow variance is 0.07% and the discount-rate variance is 0.23%. Therefore, consistent with Campbell and Ammer (1993) and Campbell and Vuolteenaho (2004), discount-rate news far exceeds cash-flow news in driving US equity returns. In model 3, following Chen and Zhao (2006), we replace the price-earnings ratio from the benchmark case by a similar variable that also works as a proxy for expected returns[10], the dividend yield. We find that the cash-flow variance is 0.16% and the discount-rate variance is 0.10%. This is, the trend is reversed. In model 4, we use the average value spread instead of the small-stock value spread. The results are very similar to those reported for the benchmark model. Following Liu and Zhang (2006), in models 5 and 6, we use the book-to-market spread and market-to-book spread instead of the value spread as useful predictors of returns. The results are also similar to the benchmark case. In model 7, we follow Campbell and Vuolteenaho (2004) and add to the benchmark case two variables that are often used to predict stock returns: the dividend yield and the Treasury bill rate. With this combination of variables, results are also very similar to those reported for the

[10] See Campbell and Shiller (1988a), Campbell and Ammer (1993), Campbell and Mei (1993), and Campbell and Vuolteenaho (2004).

benchmark case. Finally, model 8 includes the set of variables from Petkova (2006): the excess market return, the term spread, the dividend yield, the default spread (Baa yield over Aaa yield), and the Treasury bill rate. As it happened in model 3, replacing the price-earnings ratio by the dividend yield, will make the cash-flow news more important.

If we focus on betas and we exclude models 3 and 8 from our analysis, all models seem to point out that discount-rate betas are higher than cash-flow betas. This result is also robust across countries. Moreover, both betas are higher for less EU-integrated countries. For instance, the 3 new EU members have always higher betas than the 12 EMU members. If we focus on the evolution of betas in time, discount-rate betas have increased both in the 12 EMU members and in the 3 non-EMU but EU members. However, they have decreased in the 3 new EU member states. These results are robust across models. Regarding cash-flow betas, there is a general decreasing trend across models if we look at the 3 non-EMU but EU members and the 3 new EU members, but there is not homogeneity in results across models if we look at the 12 EMU members (some models account for a decrease in cash-flow betas and some of them for an increase in betas).

The results are robust to adding many other known return predictors to the VAR system as long as the price-earnings ratio is included in the system. Therefore, it should be noted that our results depend critically on the inclusion of the price-earnings ratio in our aggregate VAR system. If we exclude the price-earnings ratio from the system (models 3 and 8) we no longer find that discount-rate betas are higher than cash-flow betas. As Campbell and Vuolteenaho (2004) and Chen and Zhao (2006) point out, the importance of any state variable depends on the coefficient in the VAR estimation and its persistence. In our benchmark case, the price-earnings ratio is the dominant factor due to its persistence. Campbell and Vuolteenaho (2004) contains a detailed discussion of various reasons why this variable should predict stock returns and should, therefore, be included in the VAR. In fact, the benchmark case gives the best predictive power (adjusted R^2 at 2.10%), if we compare it with those of models 3 (adjusted R^2 at 1.67%) and 8 (adjusted R^2 at 1.14%).

Finally, the results are also robust to estimating the VAR using real (instead of excess) market returns.

4.3.3 Directly modeling cash-flow news

The return decomposition framework treats cash-flow news as a residual component of the stock return. As pointed out by Campbell and Mei (1993), if equation (9) is an accurate approximation, and if the VAR system fully describes the true process for expected returns, then this residual calculation procedure should accurately measure cash-flow news. However, if the VAR process used is misspecified, then the residual cash-flow news measure may be a poor proxy for actual cash-flow news. This is one of the reasons why we rely on the results obtained with our benchmark VAR model. It gives the best predictive power among the models analysed in the robustness check. According to Campbell and Ammer (1993), if one finds that most of the variability of unexpected returns is due to the component obtained as a residual, then its large estimated magnitude may be spurious simply as the result of insufficient predictability in the VAR system. In our benchmark case, even though the cash-flow news is obtained as a residual, most of the variability is due to discount-rate news, which gives robustness to our results. Nevertheless, following Campbell and Mei (1993) and Chen and Zhao (2006), among others, we directly model cash-flow news in order to obtain a further robustness check for our results.

We adopt a separate VAR system for the dividend growth rate and we revise our earlier log-linear approximation as follows:

$$r_{t+1} - E_t r_{t+1} = N^*_{CF,t+1} - N_{DR,t+1} + residual \tag{17}$$

where $N_{DR,t+1}$ is the same as before. The residual variable is the component of unexpected returns not captured by our modeled cash-flow news and discount-rate news.

If we propose now a first-order VAR model where $\mathbf{z}^*_{t+1}$ is a state vector with the dividend growth rate as its first element and excess market return and dividend yield as the other components, it can be easily shown that:

$$N^*_{CF,t+1} = \mathbf{e1}'\lambda^*\mathbf{u}^*_{t+1} \tag{18}$$

where $\lambda^* = (\mathbf{I} - \rho\mathbf{\Gamma}^*)^{-1}$, $\mathbf{\Gamma}^*$ is the companion matrix, and $\mathbf{u}^*_{t+1}$ is the residual vector from this new VAR. Finally, we obtain the residual component after $N_{DR,t+1}$ and $N^*_{CF,t+1}$ are both considered.

In Table 6 we report cash-flow ($\beta^*_{i,CF}$) and discount-rate betas ($\beta_{i,DR}$) when both components are directly modeled. In addition, we present the residual beta and the cash-flow beta plus the residual beta, which is equivalent to the cash-flow beta ($\beta_{i,CF}$) if we model only the discount-rate news but back out the cash-flow news as the residual. As seen, the results for this new decomposition system still indicate that, in all countries analysed, discount-rate news account for most of the variation in stock returns. These results confirm and strengthen the results from Table 4.

5. Conclusions

This paper investigates to what extent the increase in global market betas is mostly due to a convergence of cash flows, of discount rates, or both. We interpret the first as being the result of economic integration, the second as a consequence of financial integration.

We use the framework of Campbell and Shiller (1988a) and Campbell (1991) to decompose the return on the US equity market – our proxy for global news – into its cash-flow and discount-rate news components. Next, following Campbell and Vuolteenaho (2004), we decompose the total beta of a country with respect to the US into a cash-flow and a discount-rate beta. This paper is – to our knowledge – the first to decompose country betas in these two components.

We first confirm existing findings in the literature of increasing global and regional market betas. We then show that this increase is nearly fully the result of an increase in discount-rate betas. We conclude that the increase in total market betas is mainly the result of increased financial integration. Finally, we show that this result is robust to alternative ways of calculating cash-flow and discount-rate news.

This paper suggests a number of paths for future research. First, it would be interesting to also decompose the beta with respect to the European equity market into its cash-flow and discount-rate components. Given the substantial degree of economic integration within Europe, one would expect that the cash-flow beta would be a more important contributor to the rising equity market beta. Such an analysis requires, however, a correct identification of cash-flow and discount-rate news for the aggregate European market. A second task for future research is to develop such a model. The Campbell – Shiller framework is less suitable in this case, because it does not account for time-varying integration and potential regime changes and structural breaks. The approach recently developed by Van Binsbergen and Koijen (2007) looks like a more promising starting point, as it does not rely on instruments to identify cash-flow and discount-rate shocks, and it is more easily adaptable to account for structural changes.

References

Ahrens, R., 2002, Predicting recessions with interest rate spreads: a multicountry regime-switching analysis, *Journal of International Money and Finance* 21, 519–537.

Ammer, J., and J. P. Mei, 1996, measuring international economic linkages with stock market data, *Journal of Finance* 51, 1743–1763.

Baele, L., 2005, Volatility spillover effects in European equity markets, *Journal of Financial and Quantitative Analysis* 40, 373–402.

Baele, L., A. Ferrando, P. Hordahl, E. Krylova, and C. Monnet, 2004, Measuring European financial integration, *Oxford Review of Economic Policy* 20, 509–530.

Baele, L., and K. Inghelbrecht, 2006, Time-Varying Integration and International Diversification Strategies, *Working Paper*.

Bekaert, G., and C. R. Harvey, 1997, Emerging equity market volatility, *Journal of Financial Economics* 43, 29–77.

Bekaert, G., and C. R. Harvey, 2000, Foreign speculators and emerging equity markets, *Journal of Finance* 55, 565–613.

Bekaert, G., R. J. Hodrick, and X. Zhang, 2006, International stock return comovements, *CEPR Discussion Paper* No. 5955.

Bernard, H., and S. Gerlach, 1996, Does the term structure predict recessions? the international evidence, *Working Paper*.

van Binsbergen, J. H., and R. S. J. Koijen, 2007, Predictive regressions: a present-value approach, *Working Paper*.

Brennan, M. J., A. W. Wang, and Y. H. Xia, 2004, Estimation and test of a simple model of intertemporal capital asset pricing, *Journal of Finance* 59, 1743–1775.

Campbell, J. Y., 1987, Stock returns and the term structure, *Journal of Financial Economics* 18, 373–399.

Campbell, J. Y., 1991, A variance decomposition for stock returns, *Economic Journal* 101, 157–179.

Campbell, J. Y., and J. Ammer, 1993, What moves the stock and bond markets? a variance decomposition for long-term asset returns, *Journal of Finance* 48, 3–37.

Campbell, J. Y., and J. P. Mei, 1993, Where do betas come from - asset price dynamics and the sources of systematic-risk, *Review of Financial Studies* 6, 567–592.

Campbell, J. Y., and R. J. Shiller, 1988a, The dividend-price ratio and expectations of future dividends and discount factors, *Review of Financial Studies* 1, 195–228.

Campbell, J. Y., and R. J. Shiller, 1988b, Stock-prices, earnings, and expected dividends, *Journal of Finance* 43, 661–676.

Campbell, J. Y., and T. Vuolteenaho, 2004, Bad beta, good beta, *American Economic Review* 94, 1249–1275.

Campbell, J. Y., and M. Yogo, 2006, Efficient tests of stock returns predictability, *Journal of Financial Economics* 81, 27–60.

Chen, L., and X. Zhao, 2006, Return decomposition, *Working Paper*.

Eleswarapu, V. R., and M. R. Reinganum, 2004, The predictability of aggregate stock market returns: Evidence based on glamour stocks, *Journal of Business* 77, 275–294.

Engsted, T., and C. Tanggaard, 2004, The comovement of US and UKstock markets, *European Financial Management* 10, 593–607.

Estrella, A., and G. A. Hardouvelis, 1991, The term structure as a predictor of real economic activity, *Journal of Finance* 46, 555–576.

Estrella, A., and F. S. Mishkin, 1997, The predictive power of the term structure of interest rates in Europe and the United States: Implications for the European Central Bank, *European Economic Review* 41, 1375–1401.

Estrella, A., and F. S. Mishkin, 1998, Predicting US recessions: Financial variables as leading indicators, *Review of Economics and Statistics* 80, 45–61.

Fama, E. F., and K. R. French, 1988, Dividend yields and expected stock returns, *Journal of Financial Economics* 22, 3–25.

Fama, E. F., and K. R. French, 1989, Business conditions and expected returns on stocks and bonds, *Journal of Financial Economics* 25, 23–49.

Forbes, K. J., and R. Rigobon, 2002, No contagion, only interdependence: Measuring stock market comovements, *Journal of Finance* 57, 2223–2261.

Fratzscher, M., 2002, Financial market integration in Europe: On the effects of EMU on stock markets, *International Journal of Finance and Economics* 7, 165–193.

Hecht, P., and T. Vuolteenaho, 2006, Explaining returns with cash-flow proxies, *Review of Financial Studies* 19, 159–194.

Liu, N., and L. Zhang, 2006, Is the value spread a useful predictor of stock returns?, *Working Paper*.

Longin, F., and B. Solnik, 1995, Is the correlation in international equity returns constant: 1960-1990?, *Journal of International Money and Finance* 14, 3–26.

Ng, A., 2000, Volatility spillover effects from Japan and the US to the Pacific-Basin, *Journal of International Money and Finance* 19, 207–233.

Petkova, R., 2006, Do the Fama-French factors proxy for innovations in predictive variables?, *Journal of Finance* 61, 581–612.

Phylaktis, K., and F. Ravazzolo, 2002, Measuring financial and economic integration with equity prices in emerging markets, *Journal of International Money and Finance* 21, 879–903.

Shiller, R. J., 2000, *Irrational Exuberance* (Princeton University Press).

Table 1: Descriptive statistics of the VAR state variables

The table shows the descriptive statistics of the VAR state variables estimated from the full sample period 1928:12-2005:12, 925 monthly data points. $r^e_{M,t}$ is the excess log return on the CRSP value-weight index. TY_t is the term yield spread in percentage points, measured as the yield difference between ten-year constant-maturity taxable bonds and short-term taxable notes. PE_t is the log ratio of S&P 500's price to S&P 500's ten-year moving average of earnings. VS_t is the small-stock value spread, the difference in the log book-to-market ratios of small value and small growth stocks. "Stdev." denotes standard deviation and "Autocorr." the first-order autocorrelation of the series.

Variable	Mean	Median	Stdev.	Min	Max	Autocorr.
$r^e_{M,t}$	0.0043	0.0093	0.0548	-0.3442	0.3222	0.1022
TY_t	0.7059	0.5700	0.7373	-1.3500	3.1400	0.9268
PE_t	2.8878	2.8868	0.3742	1.5006	3.8906	0.9914
VS_t	1.6511	1.5250	0.3668	1.1922	2.7134	0.9909
Correlations	$r^e_{M,t}$	TY_t	PE_t	VS_t		
$r^e_{M,t}$	1					
TY_t	0.0580	1				
PE_t	-0.0064	-0.1134	1			
VS_t	-0.0314	-0.3679	-0.3154	1		

Table 2: VAR parameter estimates

The table shows the OLS parameter estimates for a first-order VAR model including a constant, the log excess market return ($r^e_{M,t}$), term yield spread (TY_t), price-earnings ratio (PE_t), and small-stock value spread (VS_t). Each set of three rows corresponds to a different dependent variable. The first five columns report coefficients on the five explanatory variables, and the remaining columns show R^2 and F statistics. OLS standard errors are in square brackets and bootstrap standard errors are in parentheses. Bootstrap standard errors are computed from 2500 simulated realizations. Sample period for the dependent variables is 1928:12-2005:12, 925 monthly data points.

	Constant	$r^e_{M,t}$	TY_t	PE_t	VS_t	R^2 %	F
$r^e_{M,t+1}$	0.0656	0.0949	0.0051	-0.0156	-0.0122	2.52	5.95
	[0.0191]	*[0.0326]*	*[0.0026]*	*[0.0050]*	*[0.0054]*		
	(0.0113)	*(0.0236)*	*(0.0029)*	*(0.0144)*	*(0.0012)*		
TY_{t+1}	-0.0372	0.0144	0.9138	-0.0006	0.0717	86.38	1457.21
	[0.0959]	*[0.1639]*	*[0.0131]*	*[0.0003]*	*[0.0275]*		
	(0.0663)	*(0.1210)*	*(0.0150)*	*(0.0742)*	*(0.0076)*		
PE_{t+1}	0.0237	0.5164	0.0010	0.9923	-0.0028	99.06	24258.38
	[0.0128]	*[0.0218]*	*[0.0017]*	*[0.0033]*	*[0.0036]*		
	(0.0079)	*(0.0156)*	*(0.0019)*	*(0.0095)*	*(0.0009)*		
VS_{t+1}	0.0166	-0.0062	-0.0006	-0.0009	0.9916	98.27	13126.80
	[0.0170]	*[0.0290]*	*[0.0023]*	*[0.0044]*	*[0.0048]*		
	(0.0103)	*(0.0211)*	*(0.0026)*	*(0.0127)*	*(0.0011)*		

Table 3: Cash Flow and Discount Rate news for the market portfolio

The table shows the properties of cash-flow news (N_{CF}) and discount-rate news (N_{DR}) implied by the VAR model of Table 2. The upper-left section of the table shows the covariance matrix of the news terms. The upper-right section shows the correlation matrix of the news terms with standard deviations on the diagonal. The lower-left section shows the correlation of shocks to individual state variables with the news terms. The lower right section shows the functions $\left(e1'+e1'\lambda, e1'\lambda\right)$ that map the state-variable shocks to cash-flow and discount-rate news. We define $\lambda \equiv \rho\Gamma\left(I-\rho\Gamma\right)^{-1}$, where Γ is the estimated VAR transition matrix from Table 2 and ρ is set to 0.95 per annum. $r^e_{M,t}$ is the excess log return on the CRSP value-weight index, TY_t is the term yield spread, PE_t is the price-earnings ratio, and VS_t is the small-stock value spread. Bootstrap standard errors (in parentheses) are computed from 2500 simulated realizations.

News covariance	N^{US}_{CF}	N^{US}_{DR}	News corr/std	N^{US}_{CF}	N^{US}_{DR}
N^{US}_{CF}	0.0007	0.0000	N^{US}_{CF}	0.0262	0.0359
	(0.0001)	*(0.0001)*		*(0.0012)*	*(0.0600)*
N^{US}_{DR}	0.0000	0.0023	N^{US}_{DR}	0.0359	0.0484
	(0.0001)	*(0.0002)*		*(0.0600)*	*(0.0019)*
Shock correlations	N^{US}_{CF}	N^{US}_{DR}	**Functions**	N^{US}_{CF}	N^{US}_{DR}
$r^e_{M,t}$ shock	0.4451	-0.8647	$r^e_{M,t}$ shock	0.6358	-0.3642
	(0.0515)	*(0.0118)*			
TY_t shock	0.1138	0.0540	TY_t shock	0.0284	0.0284
	(0.0345)	*(0.0359)*			
PE_t shock	-0.0081	-0.0885	PE_t shock	-0.8293	-0.8293
	(0.0509)	*(0.0474)*			
VS_t shock	-0.0581	-0.0253	VS_t shock	-0.2688	-0.2688
	(0.0444)	*(0.0436)*			

Table 4: Total, Cash Flow and Discount Rate betas

Panel A: Total Beta with respect to US market

	TOTAL BETA				
	Full sample	1970s	1980s	1990s	2000s
Austria	0.24	0.15	0.24	0.38	0.27
Belgium	0.52	0.49	0.57	0.45	0.58
Finland	1.08			1.03	1.25
France	0.73	0.74	0.70	0.63	0.997
Germany	0.58	0.29	0.50	0.64	1.09
Greece	0.64			0.58	0.67
Ireland	0.70	0.56	0.75	0.66	0.87
Italy	0.49	0.29	0.42	0.59	0.79
Luxembourg	0.48			0.22	0.91
Portugal	0.48			0.42	0.55
Spain	0.84			0.79	0.85
Netherlands	0.98	0.57	0.73	0.56	0.93
Denmark	0.49	0.40	0.48	0.42	0.79
Sweden	0.84		0.55	0.83	1.29
UK	0.75	0.88	0.80	0.59	0.73
Czech Rep	0.60			0.79	0.60
Hungary	0.88			1.37	0.82
Poland	1.14			1.63	0.91
Turkey	0.85			0.27	2.10
Norway	0.90		1.00	0.84	0.85
Switzerland	0.55	0.48	0.59	0.53	0.61
Average	0.69	0.48	0.61	0.68	0.88

Panel B: Cash Flow Beta with respect to US market

	CASH FLOW BETA				
	Full sample	1970s	1980s	1990s	2000s
Austria	0.06	0.00	0.12	0.05	0.00
Belgium	0.08	0.16	0.10	0.07	-0.01
Finland	0.07			0.11	0.01
France	0.14	0.22	0.19	0.13	-0.02
Germany	0.05	0.03	0.09	0.08	0.00
Greece	-0.03			-0.09	0.07
Ireland	0.06	0.12	0.12	0.00	-0.07
Italy	0.02	0.04	0.02	0.08	-0.09
Luxembourg	-0.05			0.02	-0.13
Portugal	0.03			0.11	-0.06
Spain	0.12			0.12	0.01
Netherlands	0.07	0.17	0.07	0.07	-0.03
Denmark	0.00	0.02	-0.03	0.04	0.00
Sweden	0.06		0.13	0.08	-0.04
UK	0.13	0.25	0.11	0.08	0.07
Czech Rep	0.11			0.16	0.04
Hungary	0.13			0.27	0.05
Poland	0.12			0.33	-0.04
Turkey	-0.09			-0.23	0.11
Norway	0.13		0.19	0.11	0.04
Switzerland	0.08	0.11	0.12	0.05	-0.01
Average	0.06	0.11	0.10	0.08	0.00

Panel C: Discount Rate Beta with respect to US market

	DISCOUNT RATE BETA				
	Full sample	1970s	1980s	1990s	2000s
Austria	0.19	0.15	0.12	0.33	0.27
Belgium	0.43	0.33	0.48	0.38	0.59
Finland	1.01			0.92	1.24
France	0.59	0.52	0.51	0.50	0.99
Germany	0.52	0.26	0.41	0.56	1.09
Greece	0.67			0.67	0.60
Ireland	0.64	0.44	0.64	0.66	0.94
Italy	0.47	0.25	0.40	0.51	0.88
Luxembourg	0.53			0.20	1.04
Portugal	0.44			0.31	0.61
Spain	0.72			0.67	0.84
Netherlands	0.61	0.40	0.65	0.49	0.96
Denmark	0.49	0.38	0.51	0.38	0.79
Sweden	0.78		0.41	0.75	1.33
UK	0.62	0.63	0.68	0.51	0.66
Czech Rep	0.49			0.62	0.56
Hungary	0.74			1.09	0.77
Poland	1.01			1.30	0.95
Turkey	0.94			0.50	1.98
Norway	0.77		0.81	0.73	0.82
Switzerland	0.47	0.37	0.47	0.47	0.62
Average	0.63	0.37	0.51	0.60	0.88

Table 5: Robustness checks

We study news and betas when alternative VAR specifications are used. We report the variances of the cash-flow news and discount-rate news, and their covariances for the equity market portfolio. We also report the magnitude and time variation of betas. In order to do so, we report average betas for the: i) 12 EMU countries, ii) 3 non-EMU but EU countries and, iii) 3 new EU countries. The plus signs indicate the state variables and sample period included in the VAR model. Excess return refers to the excess log return on the CRSP value-weight index; Term spread is the term yield spread, measured as the yield difference between ten-year constant-maturity taxable bonds and short-term taxable notes; PE ratio is the log ratio of S&P 500's price to S&P 500's ten-year moving average of earnings; Small-stock value spread is the difference in the log book-to-market ratios of small value and small growth stocks; Dividend yield is the dividend-price ratio of the market portfolio; Value spread is the difference in the log book-to-market ratios of value and growth stocks; Book-to-market spread and Market-to-book spread are calculated following Liu and Zhang (2006); Default spread is Baa yield over Aaa yield; Treasury bill rate is the 1-month Treasury bill yield.

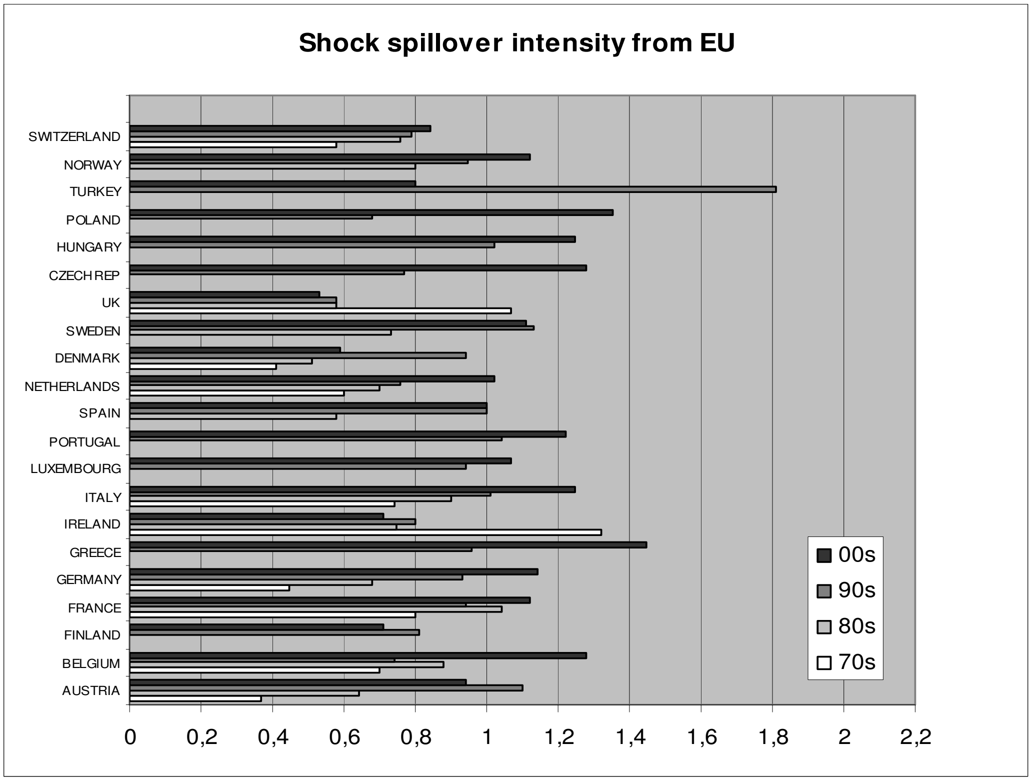
		Models							
		1	2	3	4	5	6	7	8
1929-2005		+		+	+	+	+	+	+
1952-2005			+						
Excess return		+	+	+	+	+	+	+	+
Term spread		+	+	+	+	+	+	+	+
PE ratio		+	+		+	+	+	+	
Small-stock value spread		+	+	+				+	
Dividend yield				+				+	+
Value spread					+				
Book-to-market spread						+			
Market-to-book spread							+		
Default spread									+
Treasury bill rate								+	+
Variance of CF		0.07%	0.05%	0.16%	0.06%	0.05%	0.05%	0.08%	0.20%
Variance of DR		0.23%	0.08%	0.10%	0.20%	0.19%	0.19%	0.22%	0.09%
Cov(CF,DR)		0.00%	-0.02%	-0.01%	-0.02%	-0.02%	-0.03%	0.00%	0.00%
12 (EMU)	Beta CF	0.05	0.23	0.51	0.11	0.14	0.10	0.19	0.61
	Beta DR	0.57	0.41	0.12	0.52	0.49	0.54	0.42	0.03
	ΔBeta CF	-196%	59%	100%	-19%	118%	745%	132%	102%
	ΔBeta DR	136%	125%	105%	129%	120%	127%	137%	46%
3 (non EMU + EU)	Beta CF	0.06	0.26	0.51	0.13	0.17	0.13	0.19	0.63
	Beta DR	0.63	0.45	0.19	0.57	0.53	0.58	0.50	0.07
	ΔBeta CF	-103%	-1%	85%	-58%	-32%	-62%	331%	76%
	ΔBeta DR	81%	88%	-34%	86%	85%	93%	54%	24%
3 (new EU)	Beta CF	0.12	0.42	0.71	0.28	0.32	0.25	0.30	0.95
	Beta DR	0.75	0.50	0.18	0.60	0.58	0.66	0.57	-0.05
	ΔBeta CF	-89%	-42%	-34%	-49%	-46%	121%	-59%	-27%
	ΔBeta DR	-22%	-27%	-33%	-24%	-26%	-38%	-25%	-1276%

Table 6: Betas when cash-flow news is directly modelled

We directly model both cash-flow news and discount-rate news using two separate VAR systems. The VAR to predict discount-rate news includes the same variables as in the benchmark case. The VAR to predict cash-flow news includes dividend growth rate, market excess return, and dividend yield. Because we directly model both cash-flow and discount-rate news, they will not add up exactly to the return news, leaving a residual component. For all three news components —cash-flow news, discount-rate news, and residual news— we present the betas. In addition, we present the cash flow beta plus the residual beta, which is equivalent to the cash flow beta if we model only the discount rate news but back out the cash flow news as the residual. We report average betas for the: i) 12 EMU countries, ii) 3 non-EMU but EU countries and, iii) 3 new EU countries.

	12 (EMU)	3 (non EMU + EU)	3 (new EU)
Beta CF*	0.45	0.15	0.51
Beta DR	0.57	0.63	0.75
Beta Residual	-0.40	-0.08	-0.39
Beta CF*+Beta Residual = Beta CF	0.05	0.06	0.12

Figure 1: Shock spillover intensity over time



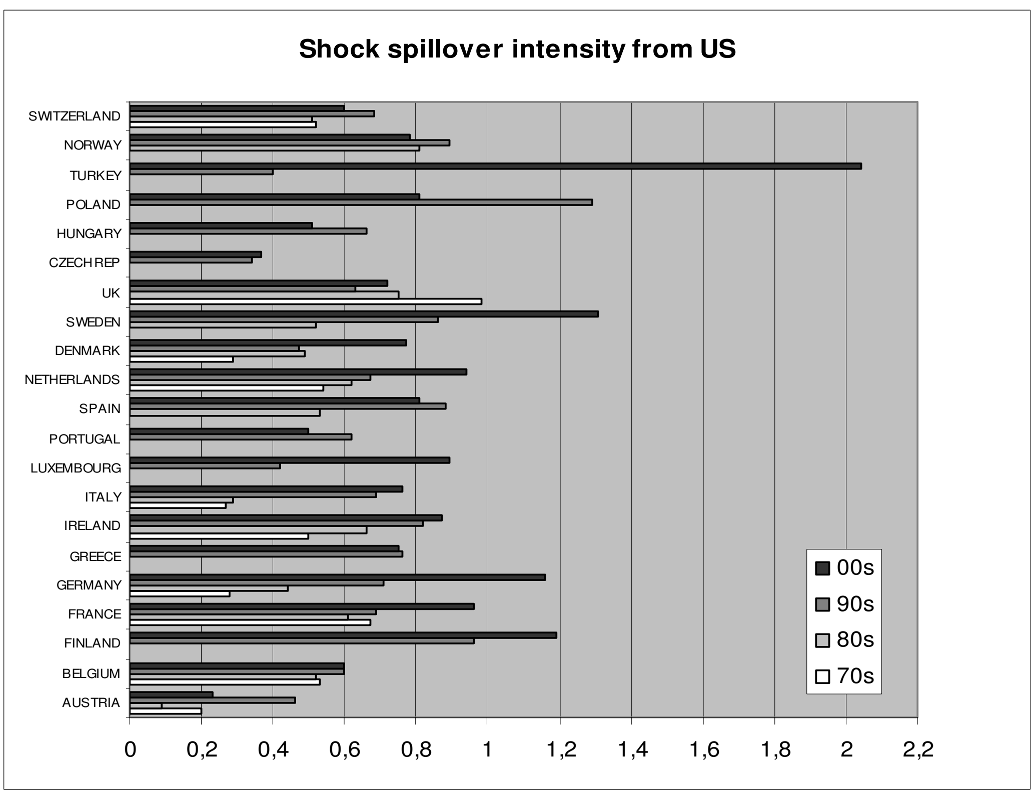
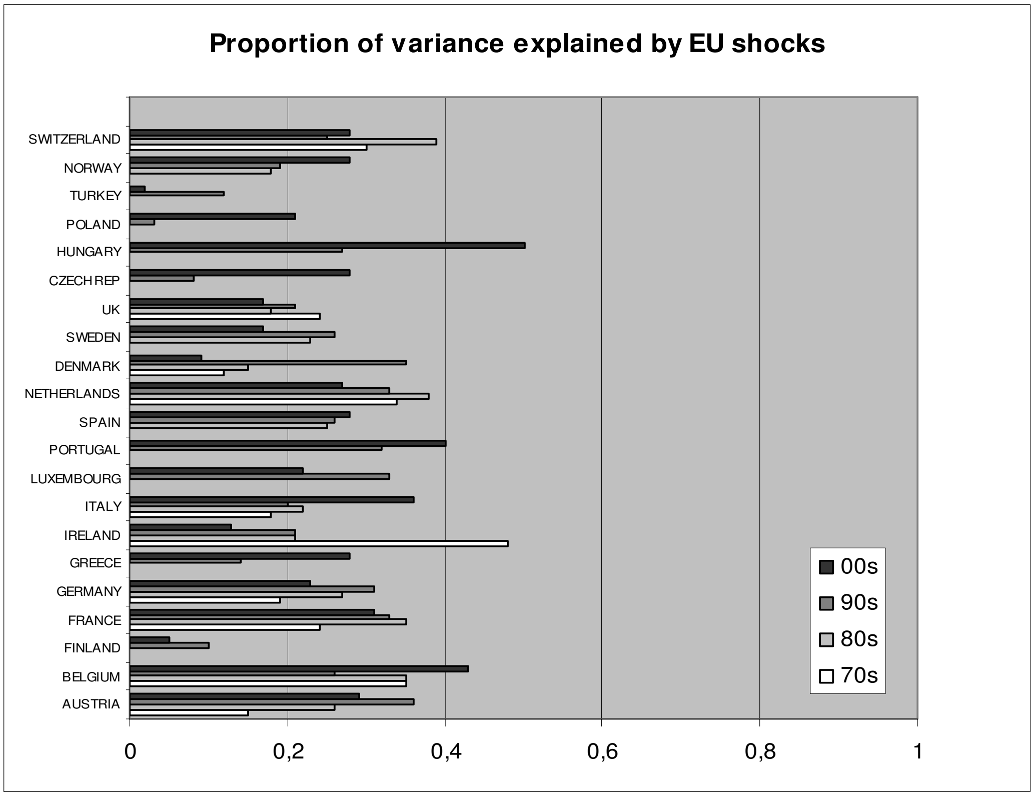


Figure 2: Variance proportions over time



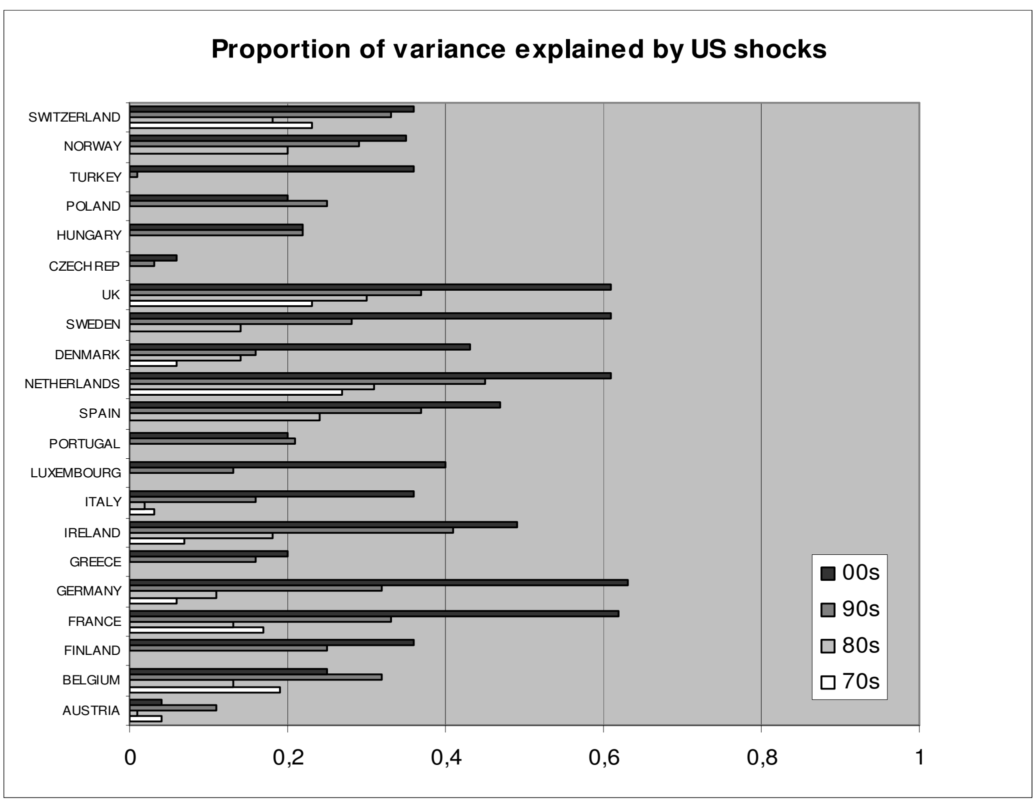


Figure 3: Average Cash Flow and Discount Rate betas over time

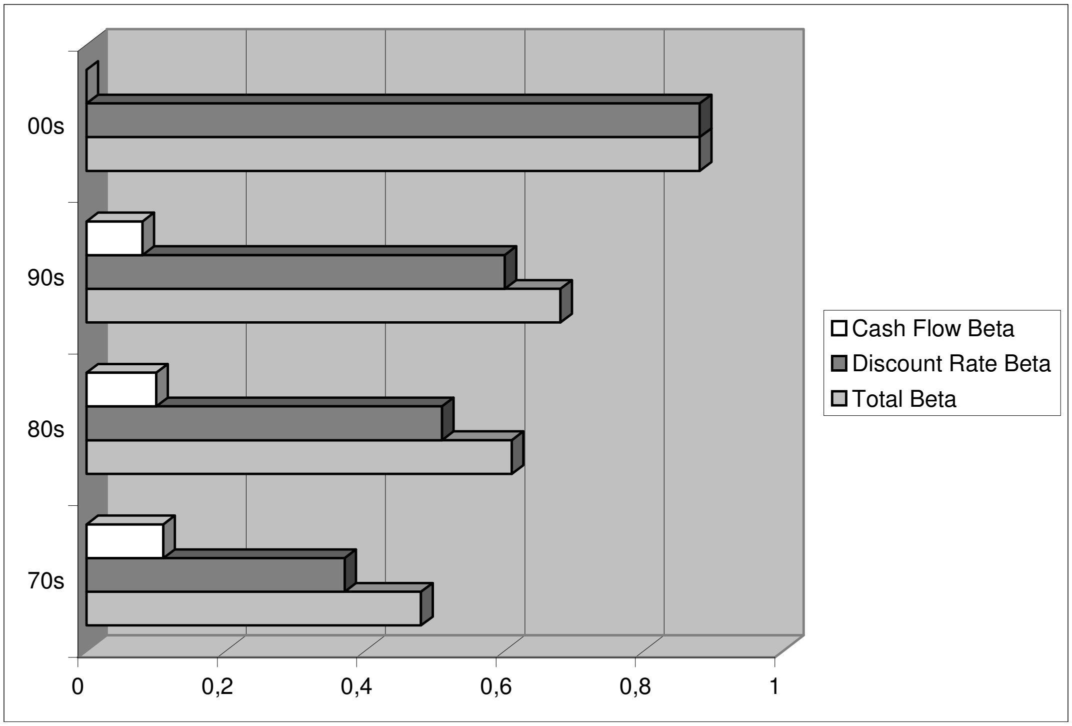
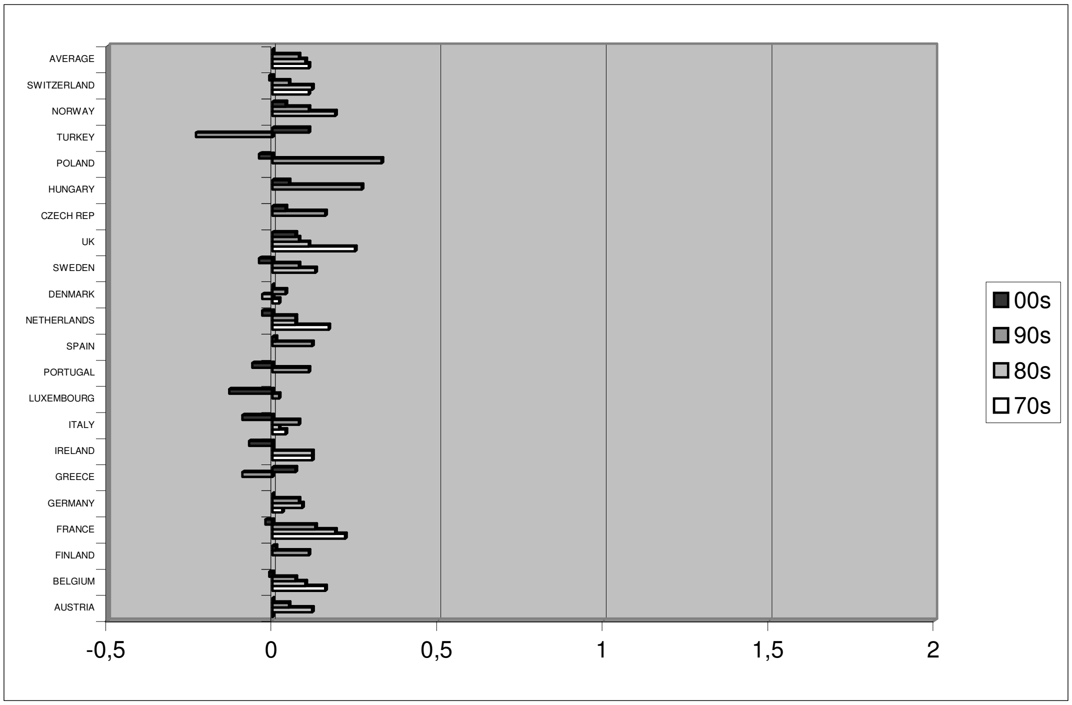


Figure 4: Cash Flow and Discount Rate betas over time

Panel A: Cash Flow betas with respect to US market



Panel B: Discount Rate betas with respect to US market