WINTON CAPITAL MANAGEMENT

Research Brief

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The relative importance of country and sector factors in stock returns

Does globalisation mean that the performance of a company is related to that of its sector more than its country? We measure the contributions of sector and country factors to the returns of the constituents of the MSCI World index. We find that over the past 25 years companies in developed markets have actually seen a stronger relationship with their home country than their sector. However, this domestic dominance does not hold for all countries and sectors, with energy and information technology being notable exceptions.

Over the past 25 years we have seen increased integration of world markets due to factors such as a decrease in the number of trade barriers, the development of numerous trade agreements, and the rise of conglomerates. If companies are now indeed globalised, do they no longer follow region-specific trends? Is the sector of a company more important than where it is located? Understanding these issues is essential when building desirable portfolios in equity investing.

To answer this "region versus sector" question we attribute global stock returns to sector and country factors. We consider the constituents of the MSCI World index from January 1990 to November 2015, and the MSCI sector[1] and country indices represent our factors. We regress out the market[2] from the returns of the stocks and the factors to produce market-neutral returns which we adjust to the same volatility. A linear, multivariate regression model is then fitted using the relevant country and sector factors for each stock. For example, in order to measure the country and sector contributions towards the returns of Google, we would use the MSCI USA Total Return index and the MSCI Information Technology Total Return index for the country and sector factors respectively. Regressions are performed at the end of each month, over the previous 36-month period, using daily returns[3,4].

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[1] Sectors are defined using the Global Industry Classification Standard (GICS).

[2] Represented by the MSCI World Total Return index.

[3] In order to diminish any effects from the different closing times of exchanges we use rolling 5-day returns for all response and explanatory variables.

[4] The returns are all in USD. Using local currencies does not materially change the results.

Performing a regression using market-neutral, volatility-adjusted returns for the response and explanatory variables results in regression coefficients that are straightforward to interpret. If the factors are uncorrelated[5], then each regression coefficient is equal to the correlation between stock and factor. The square of a regression coefficient then gives the fraction of the stock's volatility that can be explained by the volatility of the factor. It is worth noting that this type of analysis does not attempt to measure contributions to a stock's long-term performance but instead describes how a stock's return co-moves with the sector and country returns. It also does not indicate causation, it simply measures the strength of the relationship between stock and factor.

We separate our analysis into four sections. In the first section, we introduce stock-level results for two companies. In the following two sections, we average the results of companies within sectors and countries. And in our final section, we measure the sector and country contributions for all constituents of the MSCI World index.

Companies

We begin by looking at the contributions of country and sector factors to the returns of two companies, both within the energy sector. The results for Exxon Mobil and Showa Shell Sekiyu K.K. are shown in Figure 1, with sector coefficients in red and country coefficients in blue. The standard errors[6] of the regression coefficients are indicated by the shaded regions.

Exxon Mobil is one of the largest energy companies globally; to supply energy to many countries it uses resources from all over the world. As we would expect from a large multinational corporation, its location has had less bearing on how the company has performed than whether the global energy sector has done well.
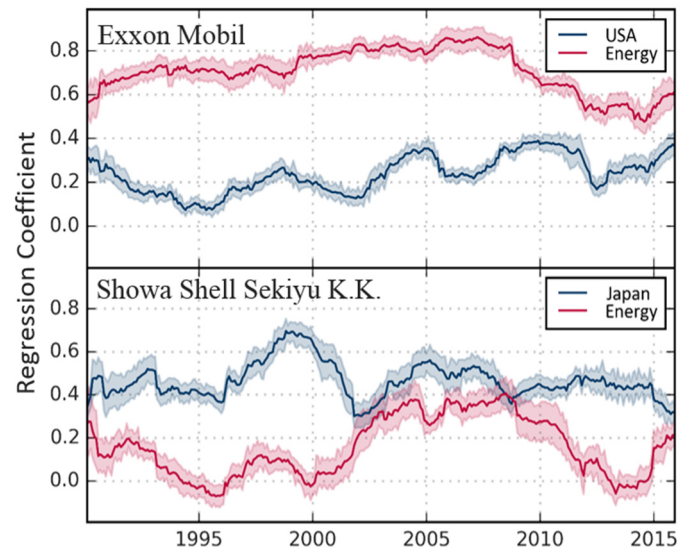

Figure 1. Sector (red) and country (blue) contributions towards the returns of Exxon Mobil (top) and Showa Shell Sekiyu K.K. (bottom).

In contrast to Exxon Mobil, Showa Shell Sekiyu K.K. is more domestically focussed. Although it sells products internationally through Royal Dutch Shell's global network, most of its revenues come from Japan. Figure 1 shows that the company has historically seen a stronger relationship with the Japanese market than the energy sector. The results of these two companies highlight the extent of differences which occur even within the same sector.

Sectors

We now turn our attention to average results across different sectors. In Figure 2, we show the market capitalisation weighted average contributions of country and sector factors to the returns of stocks within each sector. The shaded error represents the standard error of these averages[7]. The sectors are ordered by the relative strength of the sector contribution.

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[5] We discuss the correlation between explanatory variables in further detail in the appendix.
[6] The standard error is determined by block bootstrapping the returns.
[7] These errors were calculated by bootstrapping the stock-level regression coefficients contributing to the average.
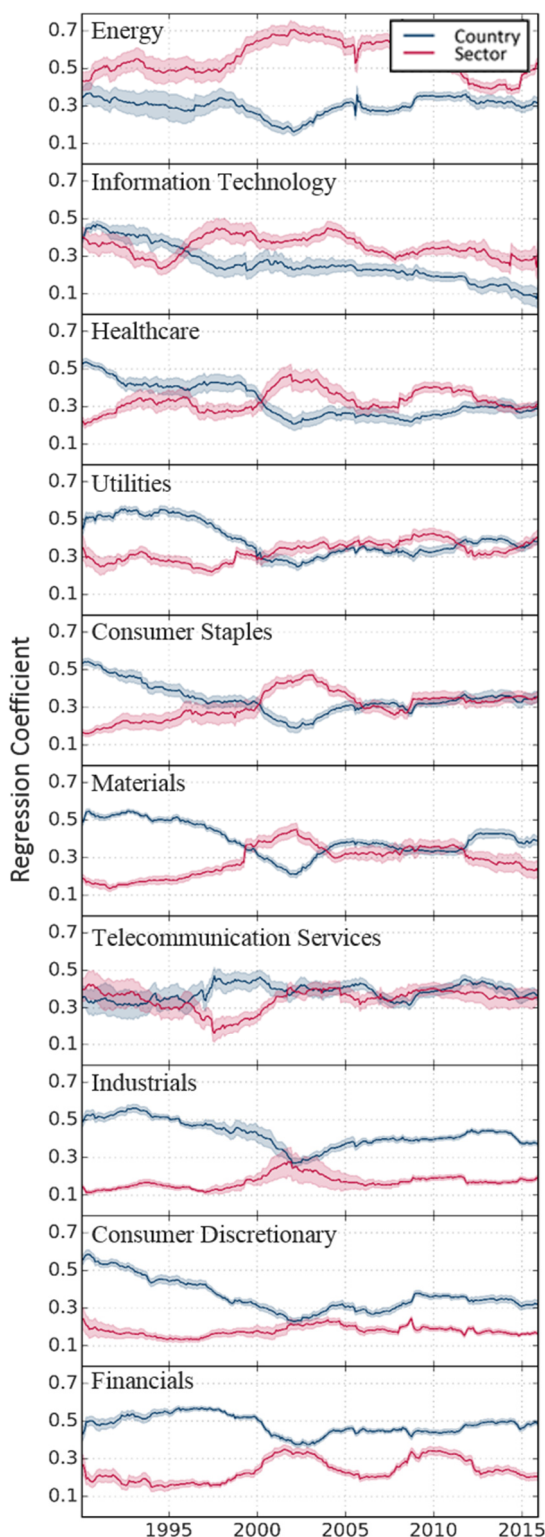
Figure 2. Market capitalisation weighted average sector (red) and country (blue) contributions towards the returns of stocks within all ten GICS sectors. The sectors have been sorted in order of relative size of the sector component.

Over the last 25 years, energy stocks have had a stronger relationship with their sector than their home country. This makes intuitive sense as companies within this sector have generally become more reliant on global resources, such as oil, and have expanded to provide energy to many different countries. Similarly, IT companies have expanded internationally and have become less correlated to their domestic marketplace.

Financial stocks however, continue to co-move more with their domestic economies. This is perhaps expected as banks, which are the largest constituent of the financials sector, are heavily influenced by government fiscal policy. Unlike the IT and energy sectors, the financials sector encompasses a wide range of industries from real estate to insurance. As a result, the financials sector index may have a lower explanatory power of individual company returns than energy or IT indices.

Like financial companies, industrials and consumer discretionary companies have had strong relationships with their home country. The remaining sectors, in general, have become less correlated to their domestic market since the early 1990s. Over recent years, these sectors have received, to a large extent, equal contribution from both the country and the sector factors.

Countries

In Figure 3, we contrast the country and sector regression coefficients for stocks within the US, Japan and Germany, which are three of the largest economies in the MSCI World index. Our results show that US stocks have become less related to the domestic marketplace over time and more related to their sector performance.

Our results regarding the US contrast with our findings for Japan. In the late 1980s and early 1990s, Japan experienced a real estate-led boom and bust. Figure 3 shows that the sector contribution was relatively large during this time but gradually weakened over the next 10 years leaving Japanese companies with a stronger relationship to their home country ever since. This
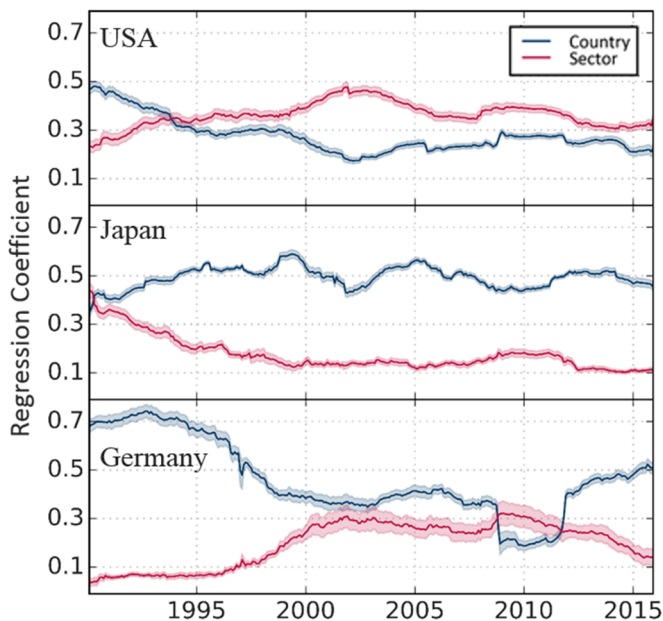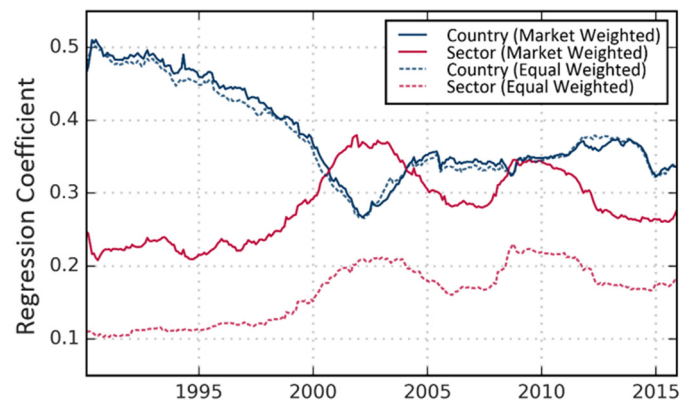
Figure 3. Market capitalisation-weighted average contributions of sector (red) and country (blue) to the returns of stocks within the US (top), Japan (middle) and Germany (bottom).

relative dominance of the domestic marketplace can be seen in other Pacific countries as well.

The results for European stocks are mixed. In the largest economies within the region (for example, Germany) the contribution of the country factor has decreased over time and the sector contribution has grown, eventually resulting in similar levels between 2000 and 2010. However, more recently, a stronger relationship between stock and country has developed.

Overall

Finally, in Figure 4, we average the sector and country contributions by market capitalisation weighting (solid lines) and equally weighting[8] (dashed lines) each constituent within the MSCI World index.

When equally weighting, we find that the relationship between stock and country has weakened, but still remains stronger than with a company's sector. This is

Figure 4. Market capitalisation-weighted (solid) and equal-weighted (dashed) average contributions of sector (red) and country (blue) to the returns of stocks globally.

also true when using market capitalisation weighting, but to a lesser extent.

During the recent crashes, we see that the sector contribution to stock returns grew. This is understandable given that the booms and busts were mainly driven by individual sectors – technology stocks in the early 2000s and financial stocks in the mid to late 2000s.

In conclusion, using the methodology presented here, we find that companies within developed markets generally have had a stronger relationship with their country than their sector. This is not always the case, however. The level of contributions for different sectors and countries can vary to a large extent. In particular, we found that IT and energy companies have historically been less correlated with their domestic marketplace and more with the performance of their sector globally.

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[8] By equally weighting the constituents, we reduce the influence of the US on our overall results. Currently, the US constitutes around 60% of the index by weight. When equal weighting, this reduces to close to 30%.

Appendix
Details on the regression

To calculate the contribution of sector and country to the returns of a stock we perform a rolling, multivariate, linear regression. For each period the regression equation is as follows:

$$\vec{r_i} = \alpha_i + \sum_c \beta_{i,c} I_{i,c} \vec{r_c} + \sum_s \beta_{i,s} I_{i,s} \vec{r_s} + \varepsilon_i$$

where $\vec{r_i}$ is the rolling 5-day return of the ith stock after the market contribution has been removed (i.e. the market-neutral stock return) over the previous three years, α_i is the excess return once country, sector and market contributions have been removed, $I_{i,c}$ and $I_{i,s}$ are dummy variables indicating whether the stock is part of country c or sector s respectively, $\vec{r_c}$ and $\vec{r_s}$ are the market-neutral returns of country c and sector s indices over the previous three years, $\beta_{i,c}$ and $\beta_{i,s}$ are the calculated regression coefficients for country c and sector s, and ε_i is the error term.

Correlation between explanatory variables

One of the main concerns with our method is that the explanatory variables may be correlated and that this may affect the results. We find that the average correlation between different sectors and countries (once the market has been removed) is typically quite low (close to 20%). Nevertheless, we have carried out our analysis in several different ways including performing partial regressions and using the methodology of Heston and Rouwenhorst (1995). In each case, we obtained similar results to those presented here.