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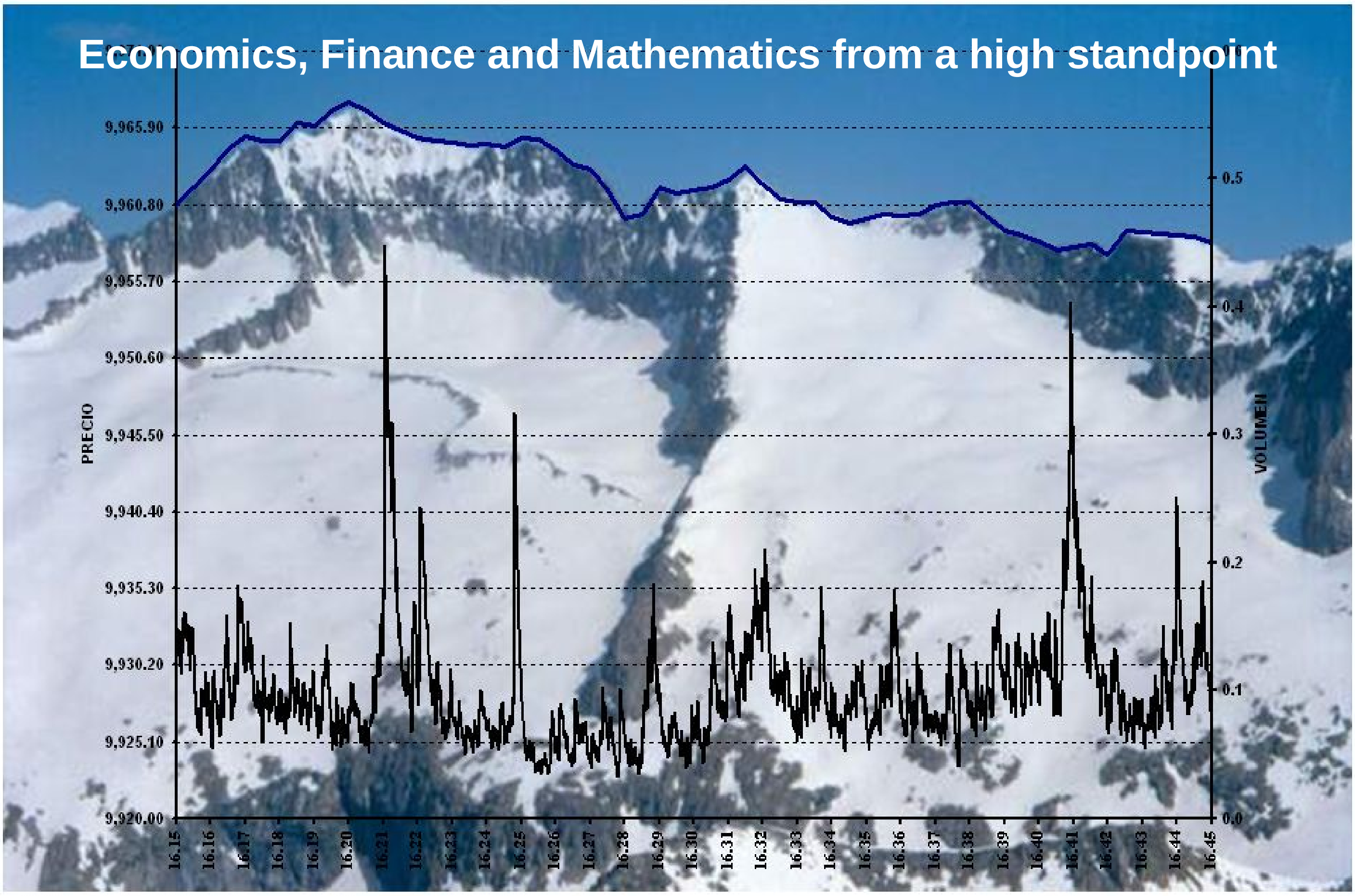

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OIL PRICE EXPOSURE OF SPANISH EQUITY SECTORS

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Abstract.

This study examines the sensitivity of Spanish industry equity returns to oil price fluctuations over the period 1993-2010. Special attention is paid to the possible presence of endogenously determined structural changes through the test for multiple structural breaks developed by Bai and Perron (1998, 2003). The key results are as follows. First, the relationship between oil prices and stock prices has undergone drastic changes in recent years for most industries. Second, the degree of oil price exposure of Spanish industries is rather limited, although substantial differences across industries and over time are found. Thus, the oil price sensitivity is very weak and mostly negative in the 1990s. In contrast, a predominantly positive sensitivity is found since the early 2000s, indicating that both oil and stock markets have moved together in recent years following expectations regarding future economic activity.

Keywords: oil price, stock market, multiple structural breaks, industry equity returns

JEL classification: C22, G12, Q43

1. Introduction

Nowadays, it is widely accepted that crude oil prices exert a critical influence on economic activity and, since the stock market represents a barometer of the economy, changes in oil prices are likely to play also a major role in the behavior of stock prices. On theoretical grounds, oil price fluctuations can affect stock values through two basic channels. First, movements in oil prices affect future cash flows since oil is a key input in the production of many goods and services. Higher oil prices increase production costs of firms, dampening expected corporate earnings and hence stock prices. Second, oil price variations are also likely to impact discount rates. Rising oil prices are often indicative of higher expected inflation and central banks usually respond to inflationary pressures by raising interest rates, with the subsequent negative impact on stock prices via the discount rate. Accordingly, the effect of increasing oil prices on the stock markets of net oil-importing countries should be negative. In contrast, rising oil prices are expected to have a positive influence on the stock markets of net oil-exporting countries through higher income and wealth effect. So far, however, the empirical evidence on the reaction of stock markets to oil price changes is still inconclusive.

The bulk of the literature has typically assumed that the relationship between oil prices and stock prices remains stable over time. Nevertheless, it does not seem unreasonable to think that this link may have undergone significant changes over the past years. A number of factors such as the existence of stock market and/or oil price bubbles, higher energy efficiency and technological improvements, episodes of considerable geopolitical instability, increasing hedging activity of firms or the recent global financial crisis may be behind the complex nature of the connection between oil prices and stock markets.

The primary purpose of this research is to gain a better understanding of the impact of oil price fluctuations on Spanish individual industries by taking into account the possible presence of endogenously determined structural breaks. Any estimation that neglects the possibility of structural changes may lead to unreliable inference about the relationship between oil prices and stock prices and hence to erroneous decisions in energy risk management or asset allocation. The present study contributes to the extant literature in two ways. First, to the best of the authors' knowledge, this is one of the first papers that examine the stability of the linkage between oil prices and equity markets using the test for multiple structural breaks at unknown dates developed by Bai and Perron (1998, 2003). Second, this work is also unique in the sense that no previous investigation has specifically addressed the oil price sensitivity of Spanish corporations at the market or sector level. Spain is one of the countries of the European Union with a higher level of energy dependence, only behind Ireland, Italy and Portugal. In 2010 the percentage of energy consumed imported from abroad was 74 percent according to data from the Spanish Ministry of Industry, Tourism and Commerce. Moreover, oil is by far the most important energy source in Spain, accounting for about 48.4 percent of total energy consumption in 2009 according to Eurostat data. Therefore, Spain offers an ideal setting to study the influence of crude oil price movements on the stock market of a net oil-importing country with an economy highly vulnerable to oil price shocks.

This paper yields some interesting results. Firstly, the relationship between oil prices and stock prices has experienced dramatic changes for most of the Spanish industries. This changing nature may be explained by several major events including the Asian economic crisis of 1998, the oil price bubble from mid-2003 until mid-2008, and the global financial crisis of 2008, with a particularly severe impact on Spain by causing the collapse of the housing market, the major driver of the Spanish economy in recent years. Secondly, the sensitivity of the Spanish stock market at the industry level to oil price fluctuations seems to be on average rather limited, although remarkable differences across industries and over time are observed. Thus, the oil price exposure is very weak and generally negative in the 1990s, probably as a result of the greater stability of oil prices during this period. Instead, the link between oil prices and stock prices is predominantly positive since the early 2000s, suggesting that both oil and stock markets have moved together in recent years following expectations regarding future economic activity. A correct understanding of whether oil price changes represent a systematic risk factor at the industry level is fundamental to make accurate investment and corporate management decisions and for risk management purposes.

The rest of the paper is organized as follows. Section 2 provides a brief review of the relevant literature on the linkage between oil price and stock markets. Section 3 presents the data used and Section 4 describes the empirical methodology. Section 5 reports the major empirical findings. Finally, Section 6 contains some concluding remarks.

2. Literature review

Given the fundamental role played by oil in global economic growth, a vast volume of empirical studies have tried to shed light on the effects of crude oil price shocks on the real economy since the first oil crises of the 1970s (e.g., Hamilton, 1983; Cuñado and Pérez de Gracia, 2003 and 2005; Jiménez-Rodríguez and Sánchez, 2005). It is broadly recognized that oil price hikes had a significant negative influence on economic activity of net oil-importing developed and emerging countries during the 1970s, even to be a cause of economic recession. Nonetheless, the impact of oil price shocks on the macroeconomy has diminished since the mid-1980s, although during the 2000s the effect of oil shocks seems to have recovered some of its previous importance (Gómez-Loscos et al., 2011, 2012).

The body of literature on the relationship between oil prices and stock markets appears as a natural extension of the above studies and it has become a very active area of research in recent years. Jones and Kaul (1996) is one of the pioneering papers in this field. Using a standard cash-flow dividend valuation model, they find that changes in oil prices have a detrimental effect on four developed equity markets (Canada, the UK, Japan and the US) during the post-Second World War period. Subsequent works have continued this line of investigation considering different stock markets and time periods and employing a variety of methodologies. For instance, Huang et al. (1996), Sadorsky (1999), Cong et al. (2008) and Park and Ratti (2008), among others, use a vector autoregressive (VAR) approach to assess the influence of oil price risk on stock market returns. Other authors, including Maghyereh and Al-Kandari (2007), Filis (2010), Zhu et al. (2011) and Arouri and Rault (2012), apply cointegration techniques. In turn, Papapetrou (2001), Hammoudeh and Li (2005), Miller and Ratti (2009) and Masih et al.

(2011), among others, utilize vector error correction models (VECM). A number of recent papers such as Arouri and Nguyen (2010), Filis et al. (2011), Lee and Chiou (2011), and Jammazi (2012) use GARCH-type models. Moreover, it is worth noting that most of these studies are based on aggregate market data of individual countries, mainly the US, economic areas, special groups of countries or even the world.

A key result from this literature is that there is no general consensus on the magnitude and sign of the linkage between oil price and stock prices. For example, some studies such as Sadorsky (1999), Papapetrou, (2001), Park and Ratti (2008), and Jammazi and Aloui (2010) support the existence of a significant negative influence of oil price movements on stock returns. In contrast, a handful of recent empirical papers such as Chen (2010), Mohanty et al. (2011), Zhu et al. (2011) and Arouri and Rault (2012) report evidence in favor of a positive response of stock markets to oil price fluctuations. Other authors such as Chen et al. (1986), Huang et al. (1996), Cong et al. (2008) and Apergis and Miller (2009) fail to detect a significant connection between oil price movements and stock returns. A last series of studies establish that the direction of the impact of oil price changes on equity prices is dependent on two basic factors. Firstly, it depends on whether a country is a net importer or exporter of oil (Sadorsky, 1999; Basher and Sadorsky, 2006; Park and Ratti, 2008; Filis et al., 2011). Thus, an adverse effect of oil price changes on stock market returns is usually found for oil-importing countries and a positive impact for oil-exporting countries. Secondly, the response of stock returns may also differ depending on the origin of oil price shocks (Kilian, 2009; Kilian and Park, 2009; Filis et al., 2011; Mohanty and Nandha, 2011). Accordingly, precautionary demand-side oil price shocks that reflect uncertainty about the availability of future oil supply generally have a negative effect on stock prices. However, supply-side shocks, where rising oil prices indicate the reduced availability of crude oil, do not seem significantly to affect the link between oil and stock prices. Additionally, stock returns tend to react positively to aggregate demand-side oil price shocks driven by global economic expansion. This is because corporate profit margins may increase with a global economic boom despite cost pressures arising from higher energy prices.

Far fewer studies have addressed the issue of the impact of oil price variations on stock markets using industry-level data (e.g., Nandha and Faff, 2008; Arouri and Nguyen, 2010; Elyasiani et al., 2011; Arouri, 2011, 2012). Overall, it is shown that the oil price exposure vary considerably across industries and from country to country. Indeed, industries where oil is an essential input such as Basic Resources, Airlines or Transportation tend to have a negative sensitivity to oil price increases. Conversely, industries that derive considerable revenue from oil and oil-related products such as Oil and Gas are likely to have a positive sensitivity to oil prices. This positive link is corroborated by a large body of work examining the effect of oil price fluctuations on the equity returns of oil and gas companies (Sadorsky, 2001; El-Sharif et al., 2005; Boyer and Filion, 2007; Mohanty and Nandha, 2011).

Furthermore, a number of recent studies have put special emphasis on the changing nature over time of the relationship between oil prices and stock markets (McSweeney and Worthington, 2008; Mohanty et al., 2010; Jammazi and Aloui, 2010). Taken together, these papers show that the oil price sensitivity of stock prices does not remain stable over time. Nevertheless, there are only a few papers that investigate the connection between oil price and stock markets from a structural change perspective

(Miller and Ratti, 2009; Lee and Zeng, 2011; Lee et al., 2012) in order to avoid possible biases in the results if structural changes are ignored. In general, these studies support the existence of significant structural changes in the link between oil and stock markets. Regarding the Spanish case, it is possible to find several works investigating issues related to the impact of oil price shocks on a variety of economic variables (Camarero and Tamarit, 2002; De Miguel et al., 2009; Alvarez et al., 2011; Gómez-Loscos et al., 2011). To date, however, there is no study that specifically addresses the effect of oil price changes on the Spanish stock market at the aggregate or industry level. In fact, only some authors that analyze the linkage between oil price and stock markets considering a large sample of countries include Spain, although without paying attention to the unique characteristics of the Spanish economy (Driesprong et al., 2008; Park and Ratti, 2008; Arouri, 2012; Arouri et al., 2012).

3. Data description

The degree of oil price exposure of Spanish corporations is examined at the industry level over the period January 1993 to December 2010, a time interval in which oil has experienced considerable price variations and high volatility within a general upward trend. The stock data used consist of stock prices of 235 firms traded on the Madrid Stock Exchange. Value-weighted industry returns are calculated by grouping individual firm stock return data. The 14 industries covered are: Consumer Goods, Consumer Services, Technology and Telecommunications, Real Estate, Banking, Financial Services, Utilities, Construction, Chemicals and Paper, Basic Resources, Health Care, Food and Beverages, Industrials, and Energy. The proxy for the market portfolio used is the *Indice General de la Bolsa de Madrid*, the broadest Spanish market index. Equity market data are collected from the Madrid Stock Exchange database.

The analysis on an industry basis is important for two reasons. First, a market-level analysis fails to capture the differences across industries in terms of oil price exposure. In particular, the sensitivity of an industry to oil price shocks depends on a variety of factors, including whether the industry is a net producer or net consumer of oil, its degree of dependence on oil, its ability to transfer oil price movements to consumers through changing goods prices, the extent of hedging activity, and the level of competition and concentration within the industry. Therefore, a more disaggregated analysis may enhance the understanding of the effect of oil price shocks on the Spanish stock market. Second, identifying the differential industry impact of oil price changes may have relevant implications for corporate management, asset pricing, risk management or asset allocation.

Along the lines followed by, among others, Henriques and Sadorsky (2008), Arouri et al. (2012), Fan and Xu (2011), and Mohanty et al. (2011), weekly industry equity returns are employed. The weekly returns are calculated using Wednesday closing prices in order to avoid the possible bias caused by the weekend effect. Weekly data are utilized instead of daily or monthly data for several reasons. On the one hand, weekly data are preferred to daily data because sometimes the market may take a while to interpret the effects of changes in economic variables such as oil prices on asset prices. Further, weekly data significantly reduce the problems of non-synchronous trading bias for less actively traded stocks and too much noise typically associated with higher frequency data. On the other hand, weekly data are used rather than monthly data because the former provide a number of observations large enough to yield more reliable results.

Regarding oil, the Brent crude oil spot price, quoted in US dollars per barrel and extracted from the US Energy Information Administration (EIA), is employed. The Europe Brent is the most broadly accepted benchmark in the crude oil markets and it is used to set the price for about two-thirds of the world's internationally traded crude oil contracts.

The yield on 10-year Spanish Treasury bonds is utilized to assess the interest rate sensitivity of companies. This choice has become a standard in the literature on corporate interest rate exposure (Hirtle, 1997; Elyasiani and Mansur, 1998; Oertmann et al., 2000; Faff et al., 2005). Long-term interest rates incorporate market expectations about future prospects for the economy and largely determine the cost of borrowed funds. Accordingly, long-term rates presumably will have a significant influence on investment activity and profitability of firms and, hence, on their stock market performance. Interest rate data are obtained from the Bank of Spain's database.

Market and equity industry returns and oil price changes are calculated by taking the first differences of the natural logarithm between two subsequent weekly prices. Instead, movements in interest rates are computed as the first differences in the level of interest rates between two consecutive weeks.

Table 1 presents the main descriptive statistics of the variables used in this study for the whole sample. Oil price changes have higher volatility than industry equity returns, reflecting the great instability of oil prices over the sample period. The distribution of returns is negatively skewed for the vast majority of industries, indicating that negative shocks are more common than positive for the Spanish equity market at the sector level. Further, all industry return series display significant excess kurtosis, thereby indicating leptokurtic distributions with many extreme observations. The Jarque-Bera test statistics confirm that the null hypothesis of normal distribution of the return series is rejected at the 1 percent level of significance for all industries. A similar distributional picture emerges for the oil price and interest rate change factors. The results from the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests clearly indicate that oil price and interest rate movements and market and industry equity returns are level stationary at the 1 percent level.

Insert Table 1 about here

Table 2 shows the correlation matrix between industry equity and market returns and oil price and interest rate changes for the total sample period. Correlations between equity industry returns and oil price fluctuations are on average quite weak and almost all positive. This positive co-movement suggests that oil price increases over the last twenty years have been seen as indicative of expectations of higher future economic growth and corporate earnings. Not surprisingly, the Energy sector has the strongest correlation with oil prices (22 percent), followed by the Basic Resources sector (17 percent). As expected, correlations between the Spanish stock market index and industry returns are positive and high on average. Correlations between industry equity returns and interest rate movements are also relatively low on average. Utilities, Food and Beverages and Real Estate appear as the sectors with higher correlation with changes in interest rates. Furthermore, the low correlation among the independent variables (market portfolio return, oil price changes and interest rate fluctuations) suggests that multicollinearity is not a problem.

Insert Table 2 about here

Figure 1 illustrates the evolution of Brent crude oil price (in dollars per barrel) and Spanish equity market index from January 1993 through December 2010. As seen in Figure 1, the relationship between oil price and stock market performance over the whole sample period is ambiguous. During the 1990s, the oil price was relatively stable at 20-30 dollars per barrel. However, since 1999 oil prices began to experience a steady upward trajectory. This upward movement became more rapid since 2004, driven by a conjunction of events such as geopolitical tensions in the Middle East, growing demand of crude oil mainly from China and India, active speculation in oil markets, and depreciation of the US dollar. As a result, oil prices have not returned to the cheap 30 dollars per barrel. A record peak of almost 148 dollars per barrel was reached in July 2008 and then the price of oil crude slumped to 37 dollars in December of the same year following the onset of the global financial crisis. Since the end of 2008, oil prices have gone up considerably due to signs of global economic recovery and expectations of higher oil consumption combined with tightening of oil supply. Specifically, oil prices doubled in 2009 and the rising trend in oil prices has continued in 2010 to levels above 90 dollars per barrel in late 2010.

Insert Figure 1 about here

4. Empirical methodology

Following Faff and Brailsford (1999), Sadorsky (2001), El-Sharif et al. (2005), and Boyer and Filion (2007), among others, a multifactor market model is used to investigate the relationship between oil prices and stock prices at the industry level. As noted by Sadorsky (2008), the multifactor model can be justified either from an arbitrage pricing theory or from a multi-beta CAPM perspective. The multifactor model employed in this study can be expressed as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i \Delta OIL_t + \lambda_i \Delta I_t + \varepsilon_{it} \tag{1}$$

where R_{it} denotes the return on the equity index of the ith industry in period t, R_{mt} the return on the market portfolio in period t, ΔOIL_t the change in the oil price in period t expressed in US dollars, ΔI_t the fluctuation in the interest rate in period t and ε_{it} is an random error term.

The coefficient on the market return, β_i, measures the sensitivity of the return of industry i to the market return and is, therefore, an indicator of market risk. In turn, the parameters γ_i and λ_i quantify the sensitivity of the return of industry i to oil price and interest rate fluctuations, respectively.

As in previous studies, the incorporation of a market return variable is important not only to control for macroeconomic factors that may affect stock prices, but also because it mitigates the omitted variable bias and leads to increases in the precision of the estimates. An interest rate variable is also included in the multifactor model due to two major reasons. First, prior work has highlighted the relevant role of interest rates in explaining stock price variability (Sadorsky, 2001; Boyer and Filion, 2007; Park and Ratti, 2008; Miller and Ratti, 2009). Second, it has been well documented that the Spanish equity market is particularly sensitive to interest rate movements since the great relative importance of banking, regulated and highly leveraged firms in this market (Jareño, 2008; Ferrer et al., 2010).

Given the length of the period under investigation and the significant milestones that have occurred in financial and oil markets over the last two decades, it is advisable to analyze the possible existence of structural breaks in the link between oil price changes and industry stock returns. To this end, the multiple structural break test developed by Bai and Perron (1998, 2003) is applied. This framework enables testing for multiple structural changes that occur at a priori unknown dates in a linear model and it provides an estimate of the breakpoints. Specifically, the break estimates are obtained by minimizing the sum of the squared residuals over all the possible combinations of time breaks. Moreover, the Bai and Perron's methodology allows for general forms of serial correlation and heteroskedasticity in the residuals and different moment matrices for the regressors in the different regimes.[1]

Following the modeling strategy of Bai and Perron (2003), the multifactor model in Eq. (1) can be easily reformulated to allow for multiple structural changes in the parameters. Thus, the following regression model with *m* breaks (*m+1* regimes) is estimated:

$$R_{it} = \alpha_{ij} + \beta_{ij} R_{mt} + \gamma_{ij} \Delta OIL_t + \lambda_{ij} \Delta I_t + \varepsilon_{it} \qquad \mathrm{t} = T_{\mathrm{j}\text{-}1} + 1, \ldots, T_{\mathrm{j}} \tag{2}$$

where $j=1, 2, \ldots, m+1$. The breakpoints ($T_1,\ldots,T_{\mathrm{m}}$) are explicitly treated as unknowns, with $T_0=0$ and $T_{\mathrm{m}+1}=T$ where T is the series length. All other variables are described earlier. This is a pure structural change model because all the parameters are subject to shifts.

[1] More details on this method are provided in Bai and Perron (1998, 2003).

Bai and Perron design three different tests to detect the number of breaks. First, the $supF_T(k)$ is a supF-type test of the null hypothesis of no structural breaks ($m=0$) versus an alternative containing an arbitrary number of changes k ($m=k$). Second, the double maximum tests (denoted by UDmax and WDmax) allow us to test the null of no breaks against the alternative of an unknown number of breaks subject to an upper bound M. Third, the $supF_T(l+1|l)$ test is a sequential test of the null of l breaks versus the alternative of $l+1$ breaks. In line with usual practice, a maximum of five breaks is allowed, the minimum length of each segment of the regression is restricted to be no less than 15 percent of the total number of observations and no pre-whitening is applied in the sequential test.

In order to determine the exact number of breaks, Bai and Perron (2003) recommend the following strategy. First, to use the $supF_T(k)$ and the double maximum statistics to see if at least one break exists. Second, once the presence of at least one break is established, the number of breaks can be selected with the sequential application of the $supF_T(l+1|l)$ test in combination with the Bayesian Information Criterion (BIC) and the modified Schwarz criterion (LWZ) proposed by Liu et al. (1997).

5. Empirical Results

5.1. Analysis of structural breaks

The results from the Bai and Perron tests for multiple structural breaks in the relationship between oil price changes and Spanish industry equity returns over the period 1993-2010 are summarized in Table 3. The statistical significance of the $SupF_T(k)$ tests for k between 1 and 3 and the double maximum tests (UDmax and WDmax) at the 5 percent level implies that at least one break is present in the great majority of industries. The $SupF_T$ (2|1) tests are significant for six industries, suggesting the existence of at least two breaks for these sectors. However, the $SupF_T$ (3|2) tests are not significantly different from zero with a few exceptions. The $SupF_T$ (4|3) test statistics are all insignificant, indicating that no industry appears to have more than three breaks. In addition, the last three columns of Table 3 report the number of breaks selected according to the Bai and Perron's sequential procedure and the BIC and LWZ information criteria. As can be seen, the BIC and LWZ information criteria almost always suggest a lowest number of breaks than the sequential method. As Bai and Perron (2003), using Monte Carlo experiments, showed that in general the sequential procedure works better than information criteria, the number of breaks in this study is determined by the sequential method.

The main finding from Table 3 is that there are large discrepancies across industries concerning the presence and number of breaks. For the Consumer Goods, Consumer Services and Health Care industries no breaks are identified. However, the Technology and Telecommunications, Financial Services, Basic Resources, Food and Beverages and Energy industries exhibit one break. In turn, Banking, Chemicals and Paper and Industrials are characterized by two breaks. Lastly, the number of breakpoints is three for the Real Estate, Construction and Utilities industries.

Insert Table 3 about here

Table 4 reports the break date estimates for each industry along with their 95 percent confidence intervals. Regarding the timing of the structural breaks, the breakpoints are not exactly the same for all industries, although some common patterns with a clear economic interpretation seem to emerge. The first structural break common to various sectors (Real Estate, Utilities, Construction, Chemicals and Paper, Food and Beverages, and Energy) is detected to take place between late 1998 and early 2000. This significant change in the link between oil prices and stock prices may be associated with the effects of the Asian and Russian economic crises. On the one hand, the risk of transmission of these crises to major Latin American economies led to a sharp decline in the Spanish stock market during the autumn of 1998. This was mainly due to the strategy adopted by the largest Spanish corporations since the early 1990s to expand their operations in a number of Latin American countries in search of profits and greater scale. Indeed, Spain has become the biggest foreign investor in Latin American after the United States. On the other hand, after reaching in December 1998 a record low since the early 1970s caused by the drastic fall in oil consumption of the East Asian region in the aftermath of the Asian and Russian crises, oil prices tripled between January 1999 and September 2000. This break date is very similar to that reported (September 1999) by Miller and Ratti (2009) for a set of six developed countries.

A second structural break shared by four industries (Technology and Telecommunications, Real Estate, Construction, and Chemicals and Paper) seems to have occurred sometime between late 2003 and late 2004. The presence of a break around this period may be related to the formation of an oil price bubble since the middle of 2003 caused by several factors such as booming demand for crude oil from emerging countries like China and India, rampant speculation in oil markets, and increasing geopolitical risk associated to the US invasion of Iraq.

Another structural break is identified for four industries (Real Estate, Banking, Financial Services, and Construction) between the first quarter of 2007 and the first half of 2008. This break can be attributed to the recent global financial crisis sparked by the US subprime mortgage crisis initiated in August 2007 and then turned into the worst world recession since the Great Depression of the 1930s. Further, oil prices dropped about 79 percent in five months since their record peak in July 2008 due to the weaker demand for oil resulting from the global economic downturn and the large-scale withdrawal of speculative positions from oil futures markets. In the Spanish case, the bursting of the real estate bubble since 2007 and the subsequent stock collapse of construction and real estate companies, later extended to financial firms as a result of their high exposure to real estate, may also have played a critical role in the existence of this break. It is worth noting that these last two structural breaks correspond closely to those found by Fan and Xu (2011) in their analysis of the dynamics of the international oil market over the period 2000-2009.

Insert Table 4 about here

5.2. Regression results

In light of the above evidence of structural instability, the full sample can be split into sub-samples based on the breakpoints identified by the Bai and Perron's tests. Thus, the multifactor model outlined in Eq. (2) is estimated by OLS for each of the sub-samples to check if the oil price sensitivity of Spanish industry equity returns has changed over time. The regression results for the sub-samples are presented in Table 5. Standard errors of the parameter estimates incorporate the Newey-West corrections for heteroskedasticity and autocorrelation. As shown in Table 5, the adjusted R^2 values range between 0.20 (Health Care) and 0.85 (Banking) and are reasonably high for the sectors with greater relative importance in the Spanish stock market (Technology and Telecommunications, Banking, Utilities, Construction and Energy). Hence, the model appears to fit the data relatively well. All industries exhibit a statistically significant positive exposure to the market factor at the 1 percent level regardless of the sub-period under consideration. This strong explanatory power is consistent with the traditional capital asset pricing models and confirms that the market portfolio plays a dominant role in explaining the variability of industry stock returns.

Regarding the sensitivity of industry equity returns to oil price changes, the results reveal on average a rather limited impact of oil price movements on the Spanish stock market, although there exist substantial differences across industries and over time. Thus, changes in oil prices have no significant effect on the equity returns of a large number of industries such as Consumer Goods, Consumer Services, Technology and Telecommunications, Real Estate, Financial Services, Utilities, Chemicals and Paper, and Health Care. This finding is not too surprising given that these industries are not particularly oil-intensive. Moreover, the fact that hedging activity against adverse movements in oil price using derivative instruments has become more common during recent years in the companies belonging to these sectors can also have contributed to this result. This evidence is consistent with that reported by other recent studies (Faff and Brailsford, 1999; El-Sharif et al., 2005; Arouri and Nguyen, 2010; and Scholtens and Yurtsever, 2012).

Six out of the fourteen industries have a significant oil price sensitivity at the 10 percent level in at least one of the sub-samples. In general, the impact of oil price shocks on

Spanish industries is very weak in the 1990s, possibly due to the remarkable stability of oil prices during this period. In fact, only Food and Beverages and Industrials show a significant oil price exposure, in both cases negative indicating that oil price increases have a negative effect on the stock prices of firms in these industries. However, since the early 2000s the industries significantly affected by oil price changes tend to exhibit a positive sensitivity (Construction, Basic Resources and Energy). This result suggests that in recent years oil prices and stock markets have tended to move in the same direction driven by expectations about the future course of the economy.

Looking to the results for individual industries, as expected a positive relationship, but statistically significant only from 1999, is found between oil price fluctuations and the stock returns of the Energy sector. A particularity of energy firms is that their value is driven by oil prices as their revenues are positively linked to developments in oil prices. Therefore, it is widely accepted that increases in oil prices raise stock prices of energy companies.

Although the Banking sector is not directly affected by oil, this industry shows a significant negative sensitivity to the oil price factor, although only at the 10 percent level, over the period from April 1997 to March 2008. A possible explanation for this negative association proposed by McSweeney and Worthington (2008) is related to the role played by bank stocks in investor portfolios. In general, banking stocks are perceived as relatively safe investments, so that it seems reasonable to assume that in times of oil price hikes investors sell less-risky assets (i.e. bank stocks) to buy riskier assets expected to benefit from the oil price rise (i.e. energy stocks). Thus, the sale of bank stocks drives their prices and returns down, while the prices of energy stocks are driven upwards. An alternative argument is provided by Arouri (2011), who argues that the negative oil price sensitivity of bank stocks may occur primarily through demand-side effects since oil price increases affect consumer and investor confidence and demand for financial products. A similar result is found by Faff and Brailsford (1999) and Elyasiani et al. (2011) for the Australian and US markets, respectively. Interestingly, Construction also appears as one of the industries most significantly affected by oil price changes. In fact, a significant negative relationship is observed for the sub-sample from October 1999 to November 2004, whereas a significant positive link is found since then. One likely reason behind this dramatic change in the nature of the oil price exposure is related to the recent boom and bust in the Spanish housing market. The housing boom clearly benefited construction firms and coexisted with a strong global demand for oil, especially since 2004, driving the prices of both construction stocks and oil up to record levels. Likewise, the bust of the housing bubble in Spain since the end of 2007 and the subsequent collapse of stock prices of construction companies coincided with the sharp fall of oil prices during the second half of 2008 caused by the substantial contraction in oil demand resulting from the economic recession. To sum up, construction stocks and oil have moved together over the last years, generating a positive correlation between oil prices and stock returns.

Insert Table 5 about here

In addition, as is shown in Table 5 interest rate changes seem to have a significant influence on a great number of industries. In particular, Banking, Construction, Chemicals and Paper, Basic Resources, Food and Beverages, Industrials and especially Utilities are the industries most exposed to movements in interest rates. In turn, Consumer Goods, Real Estate, Health Care and Energy appear as industries hardly subject to interest rate risk. This evidence is consistent with the notion that regulated, heavily leveraged and banking industries are the most interest rate sensitive (Sweeney and Warga, 1986; Bartram, 2002; Reilly et al., 2007). The interest rate sensitivity is predominantly negative during the 1990s, indicating that Spanish firms are on average adversely impacted by rising interest rates. However, a pattern of positive interest rate exposure seems to emerge since the early 2000s for some industries (Banking, Financial Services, Industrials, Basic Resources, Chemicals and Paper). This result suggests that the sign of the interest rate sensitivity might be closely related to the level and volatility of interest rates. Thus, in times of relatively high interest rates, such as most of the 1990s, interest rates have an inverse impact on firms' stock returns through the financing costs. In contrast, in scenarios of low and relatively stable interest rates, such as the 2000s, the correlation between interest rate changes and stock returns considerably decreases and can even be positive. In short, these findings are consistent with those of previous studies in the Spanish case (Jareño, 2008; Ferrer et al., 2010) and serve to confirm the interest rate sensitive nature of the Spanish stock market as a result of the greater relative weight of regulated, highly leveraged and financial firms in this market.

5.3. Robustness checks

Since crude oil prices are denominated in US dollars, movements in international exchange rates can be particularly relevant in the context of oil. To shed some light on this issue, the multifactor model in Eq. (1) is re-estimated replacing the oil price change variable in US dollars with an oil price change variable in euros and including the euro-dollar exchange rate changes as an additional risk factor. Thus, the augmented market model takes the following form:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i \Delta OIL(€)_t + \lambda_i \Delta I_t + \phi_i \Delta EXR_t + \varepsilon_{it} \tag{3}$$

where $\Delta OIL(€)_t$ represents the change in the oil price in period t expressed in euros and ΔEXR_t the change in the euro-dollar exchange rate. The remaining variables are as defined earlier.

The results from this robustness check are very similar to those of the main specification. As can be seen in Table 6, the evidence concerning the number and location of structural breaks and the significance and magnitude of market risk, oil price risk and interest rate risk is almost identical to that obtained with the original model. Further, the adjusted R^2 values are also virtually the same, indicating the low explanatory power of the exchange rate factor. Overall, it is found that the exchange rate risk does not exert a remarkable influence on Spanish corporations at the industry level. In particular, only Utilities, Construction, Industrials and Energy show significant sensitivity to exchange rate fluctuations during some sub-samples.

Insert Table 6 about here

6. Concluding remarks

This study investigates the oil price sensitivity of the industries of the Spanish stock market over the period from January 1993 to December 2010. The empirical methodology pays special attention to the stability of the linkage between crude oil prices and stock markets by accounting for the possibility of endogenously determined structural changes through the multiple structural break test by Bai and Perron (1998, 2003).

Results can be summarized as follows. First, the relationship between oil prices and stock prices has undergone significant changes in recent years for most Spanish industries. This changing pattern may be attributed to the influence of several key events such as the Asian economic crisis of 1998, the oil price bubble from mid-2003 until mid-2008 and the global financial crisis since September 2008, which has hit Spain especially hard. In particular, the recession following the global financial crisis led to the burst of the Spanish real estate bubble and the subsequent financial sector crisis. This evidence suggests that it would be inappropriate to examine the effect of oil price shocks under the assumption that the oil price exposure remains constant over time. Second, the impact of oil price changes on the Spanish stock market is relatively modest, although the degree of oil price exposure varies considerably across industries and over time.

Thus, oil price changes do not seem to play a significant role in explaining the stock returns of a large number of industries including Consumer Goods, Consumer Services, Technology and Telecommunications, Real Estate, Financial Services, Utilities, Chemicals and Paper, and Health Care. In contrast, Construction, Energy, Basic Resources, Food and Beverages and more weakly Banking and Industrials appear as the industries with higher exposure to oil price risk. Further, the impact of oil price shocks is very small and mainly negative in the 1990s, principally due to the greater stability of oil prices in this period. Instead, the relationship between oil prices and stock prices is mostly positive since the early 2000s, a period characterized by higher and more volatile oil prices. This means that oil and stock markets have tended to move in the same direction driven by the expectations about the future course of the economy in the periods of economic expansion (2003-2007) and financial crisis (2008-2010). In addition, interest rate fluctuations have a significant impact on a great number of industries, while exchange rate risk seems to exert a very weak influence on the Spanish stock market at the industry level.

The results in this paper may be of practical importance for investors, portfolio managers, corporate managers and policy makers in order to make optimal investment and corporate management decisions, to take advantage of possible diversification opportunities, to implement effective risk management strategies, to better understand how oil price shocks are propagated through different industries and to develop improving energy-investment and energy-consumption policies.

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Table 1. Sample descriptive statistics of industry and market returns and oil price and interest rate changes, January 1993-December 2010.

Returns and factors	Mean	Median	Min.	Max.	Std. Dev.	Skewness	Kurtosis	JB statistic	ADF statistic	PP statistic
Consumer Goods	0.0019	0.0018	-0.1851	0.1408	0.0350	-0.26**	6.03***	368.60***	-21.94***	-968.89***
Consumer Serv.	0.0012	0.0027	-0.1217	0.1181	0.0277	-0.22*	4.87***	144.00***	-20.40***	-981.04***
Technology & Telecom	0.0023	0.0030	-0.1483	0.1599	0.0381	-0.12	4.59***	101.67***	-21.18***	-1057.23***
Real Estate	0.0006	0.0004	-0.1619	0.3320	0.0318	1.06***	16.99***	7836.30***	-18.99***	-919.28***
Banking	0.0013	0.0031	-0.1936	0.1562	0.0376	-0.37**	6.42***	482.03***	-21.37***	-1059.46***
Financial Services	0.0020	0.0025	-0.1313	0.1073	0.0286	-0.26**	5.02***	171.06***	-21.28***	-952.44***
Utilities	0.0019	0.0030	-0.1577	0.1398	0.0294	-0.39***	6.02***	380.37***	-21.10***	-1031.37***
Construction	0.0018	0.0037	-0.2616	0.1072	0.0309	-0.97***	9.40***	1748.87***	-19.90***	-1028.88***
Chemicals & Paper	-0.0005	-0.0018	-0.4924	0.2315	0.0438	-2.20***	32.93***	35782.03***	-20.43***	-805.29***
Basic Resources	0.0023	0.0011	-0.3727	0.2076	0.0489	-0.54***	9.02***	1460.74***	-20.56***	-1117.86***
Health Care	0.0013	-0.0002	-0.3110	0.3422	0.0439	0.59***	15.16***	4536.78***	-17.02***	-667.76***
Food & Beverages	0.0022	0.0023	0.0944	0.1341	0.0249	0.07	5.08***	171.36***	-20.87***	-1000.75***
Industrials	0.0014	0.0028	0.2318	0.1489	0.0349	-0.69***	8.01***	1057.80***	-20.60***	-975.99***
Energy	0.0017	0.0016	0.1174	0.1806	0.0309	-0.06	5.19***	188.01***	-22.65***	-998.50***
Market Portfolio	0.0016	0.0040	0.1208	0.1188	0.0350	-0.45***	4.55***	124.17***	-21.19***	-1088.07***
Oil Price Changes	0.0019	0.0049	0.2785	-0.2034	0.0509	-0.2294*	4.70***	121.93***	-21.37***	-963.20***
Interest Rate Changes	-0.0001	-0.0001	0.0069	-0.0062	0.0014	0.237*	6.72***	552.19***	-19.75***	-1023.08***

Notes:

The table presents some descriptive statistics of the weekly industry and market returns and oil price and interest rate changes, including mean, median, standard deviation (Std. Dev.), minimum (Min.) and maximum (Max.) values, and skewness and kurtosis measures. JB denotes the statistic of the Jarque-Bera test for normality. The last two columns present the results of the Augmented Dickey- Fuller (ADF) and Phillips-Perron (PP) unit root tests, respectively. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Figure 1. Weekly Spanish Market Index and Crude Oil Price in dollars.

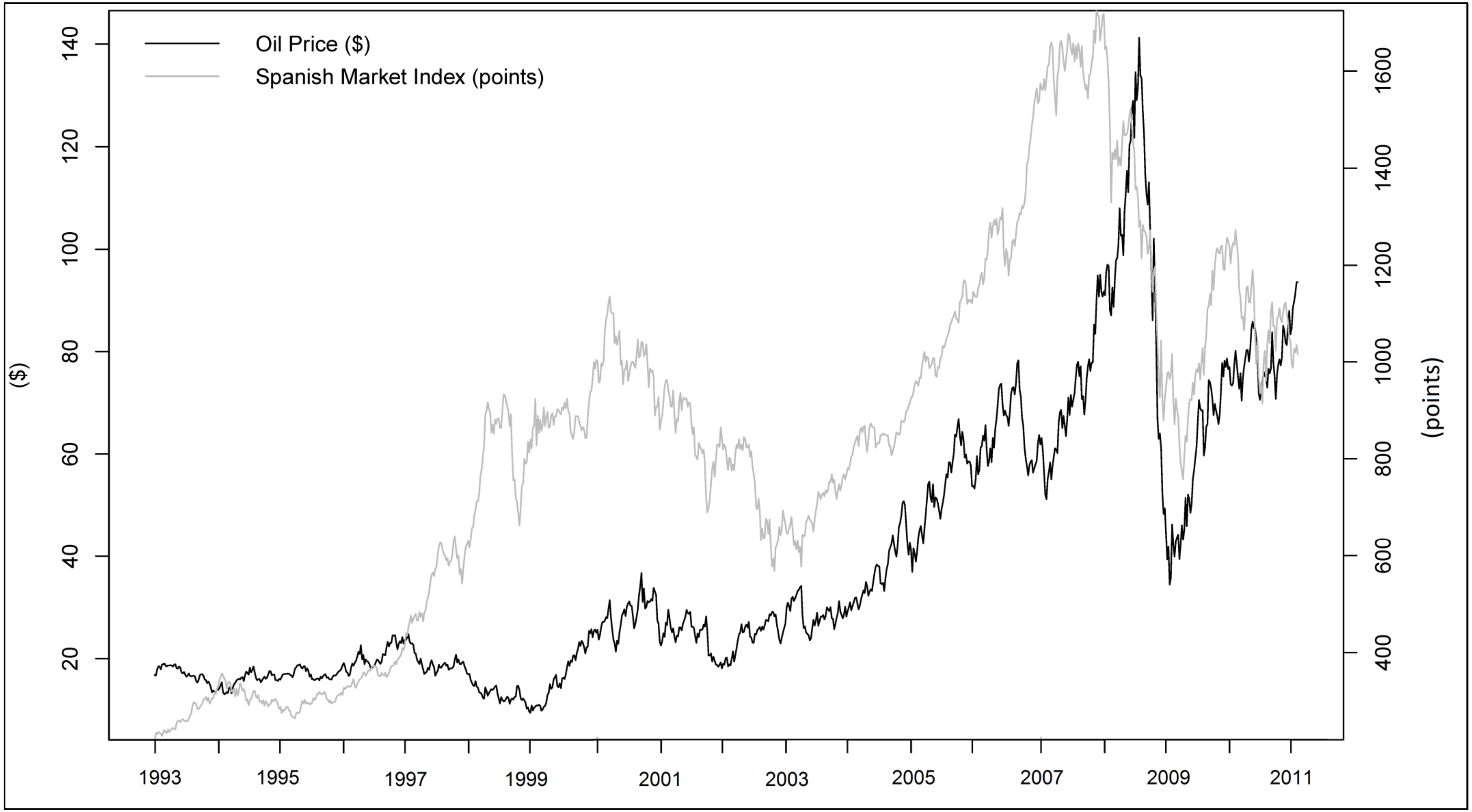

Table 2.Correlations among industry and market returns and oil price and interest rate changes, January 1993-December 2010.

Returns and factors	Interest Rate Changes	Oil Price Changes	Market Portfolio	Energy	Industrials	Food & Beverages	Health Care	Basic Resources	Chemicals & Paper	Construction	Utilities	Financial Services	Banking	Real Estate	Tech.& Telecom	Consumer Services	Consumer Goods
Consumer Goods	-0.29	0.04	0.52**	0.34**	0.42**	0.29**	0.29**	0.40**	0.30**	0.48**	0.35**	0.47**	0.47**	0.26**	0.36**	0.47**	1.00**
Consumer Serv.	-0.14**	0.08*	0.79**	0.51**	0.61**	0.42**	0.44**	0.52**	0.39**	0.65**	0.63**	0.70**	0.68**	0.38**	0.58**	1.00**	
Tech & Telecom	-0.11**	0.06	0.80**	0.49**	0.47**	0.32**	0.34**	0.41**	0.29**	0.46**	0.50**	0.51**	0.62**	0.29**	1.00**		
Real Estate	-0.18**	0.02	0.41**	0.33**	0.33**	0.34**	0.19**	0.23**	0.32**	0.42**	0.36**	0.37**	0.32**	1.00**			
Banking	-0.03	0.11**	0.91**	0.56**	0.62**	0.35**	0.41**	0.55**	0.35**	0.64**	0.61**	0.69**	1.00**				
Financial Services	-0.07*	0.09**	0.75**	0.52**	0.60**	0.39**	0.35**	0.53**	0.40**	0.67**	0.60**	1.00**					
Utilities	-0.23**	0.07*	0.75**	0.55**	0.51**	0.48**	0.39**	0.48**	0.33**	0.60**	1.00**						
Construction	-0.10**	0.10**	0.72**	0.52**	0.60**	0.42**	0.33**	0.55**	0.40**	1.00**							
Chemicals & Paper	-0.06	0.07*	0.41**	0.32**	0.39**	0.31**	0.27**	0.32**	1.00**								
Basic Resources	0.02	0.17*	0.60**	0.45**	0.54**	0.28**	0.31**	1.00**									
Health Care	0.03	0.05	0.45**	0.23**	0.38**	0.26**	1.00**										
Food & Beverages	-0.20**	-0.02	0.46**	0.37**	0.35**	1.00**											
Industrials	0.00	0.08*	0.67**	0.47**	1.00**												
Energy	-0.11**	0.22**	0.68**	1.00**													
Market Portfolio	-0.11**	0.12**	1.00**														
Oil Price Changes	0.04	1.00**															
Interest Rate Changes	1.00**																

Notes:

This table reports the correlation coefficients among the variables used in this study over the period from January 1993 to December 2010. *, ** indicate statistical significance at 5% and 1% level, respectively.

Table 3. Multiple structural breaks in the relationship between oil price changes and industry equity returns.

									Number of breaks selected		
Industries	$SupF_T(1)$	$SupF_T(2)$	$SupF_T(3)$	UD*max*	WD*max*	$SupF_T(2\|1)$	$SupF_T(3\|2)$	$SupF_T(4\|3)$	Sequential	BIC	LWZ
Consumer Goods	9.35	9.78	8.47	9.78	12.90	9.13	6.17	8.90	0	0	0
Consumer Services	6.22	6.88	9.66	9.66	12.29	9.65	10.63	10.63	0	0	0
Technology & Telecom	129.80**	87.75**	64.53**	129.80**	129.80**	16.60	19.48*	4.48	1	1	1
Real Estate	65.01**	53.48**	52.91**	65.01**	75.69**	19.88*	48.77**	13.23	3	2	0
Banking	40.56**	72.03**	51.18**	72.03**	88.05**	58.67**	11.20	17.60	2	3	0
Financial Services	19.68*	20.74**	15.90**	20.74**	25.36**	16.85	8.98	6.87	1	0	0
Utilities	60.22**	35.18**	51.27**	60.22**	72.73**	26.82**	33.88**	8.24	3	2	0
Construction	72.02**	53.60**	66.96**	72.02**	94.99**	37.08**	32.49**	6.81	3	2	1
Chemicals & Paper	19.26*	26.30**	18.89**	26.30**	32.15**	37.27**	5.44	2.40	2	0	0
Basic Resources	27.30**	23.73**	23.68**	27.30**	33.59**	14.50	9.39	9.39	1	0	0
Health Care	7.26	11.10	11.71	11.71	14.90	16.17	10.02	4.25	0	0	0
Food & Beverages	57.30**	39.91**	30.65**	57.30**	57.30**	14.50	13.96	13.96	1	1	0
Industrials	46.38**	30.93**	24.38**	46.38**	46.38**	17.37*	11.81	7.01	2	1	0
Energy	16.52**	13.90*	11.88	16.52*	29.81**	14.02	8.33	6.54	1	0	0

Notes:
This table reports the results of the procedure developed by Bai and Perron (1998, 2003) to search endogenously for structural breaks. The effective sample size is 938. A maximum of five breaks are allowed and a trimming parameter of 0.15 is used. The $SupF_T(k)$ test tests the null hypothesis of no structural breaks (k=0) versus the alternative hypothesis that there are k breaks. The double maximum test (UD*max* and WD*max*) test the null of no structural breaks against the alternative of an unknown number of breaks. The $SupF_T(l+1|l)$ is a sequential test of the null of l breaks versus the alternative of l+1 breaks. Sequential, BIC and LWZ denote the sequential procedure, Bayesian Information Criterion and Information Criterion suggested by Liu et al. (1997), respectively. *, ** indicate statistical significance at the 5% and 1% level, respectively.

Table 4. Optimal number of structural breaks, estimated break dates and confidence intervals.

Industries	Breaks	Break dates	95% Confidence Interval
Consumer Goods	0	-	-
Consumer Services	0	-	-
Technology & Telecom.	1	September 2004	[2004:02 2005:03]
Real Estate	3	December 1998	[1998:09 1999:03]
		October 2003	[2003:01 2003:12]
		February 2007	[2006:10 2007:06]
Banking	2	March 1997	[1995:11 1997:05]
		March 2008	[2007:02 2010:02]
Financial Services	1	December 2007	[2006:08 2010:04]
Utilities	3	December 1996	[1996:04 1997:04]
		September 1999	[1999:02 2000:04]
		May 2002	[2001:09 2002:09]
Construction	3	October 1999	[1998:12 2000:10]
		November 2004	[2004:09 2004:12]
		December 2007	[2007:09 2008:06]
Chemicals & Paper	2	October 1998	[1998:02 1999:10]
		August 2003	[2001:09 2004:05]
Basic Resources	1	September 2002	[1999:07 2003:07]
Health Care	0	-	-
Food & Beverages	1	April 2000	[1999:05 2000:12]
Industrials	1	February 2001	[1999:09 2001:12]
Energy	1	December 1998	[1996:03 2001:07]

Notes:
The optimal number of breaks is selected with the sequential procedure proposed by Bai and Perron (2003). Dates of the structural breaks are arranged in the order that the sequential method detects them. The last column shows the 95% confidence interval for each break date.

Table 5. Estimation results for industries and sub-samples.

Industry	Sub-samples	Breaks	Intercept	Market Portfolio	Oil	Interest Rates	Adjusted R^2
Consumer Goods	Jan. 1993- Dec. 2010	0	0.001	0.642^{***}	-0.018	0.835	0.270
Consumer Services	Jan. 1993- Dec. 2010	0	0.000	0.757^{***}	-0.009	-1.01^{**}	0.627
Technology & Telecom.	Jan. 1993- Sep. 2004	1	0.000	1.326^{***}	-0.022	1.133^{*}	0.698
	Sep. 2004- Dec. 2010		0.001	0.683^{***}	-0.018	-1.161	
Real Estate	Jan. 1993- Dec. 1998	3	0.000	0.831^{***}	-0.024	-1.454	0.264
	Dec. 1998- Oct. 2003		0.001	0.211^{***}	-0.027	-0.889	
	Oct. 2003- Feb. 2007		0.004^{*}	0.878^{***}	0.048	1.240	
	Mar. 2007- Dec. 2010		-0.010^{***}	0.253^{***}	0.006	-0.890	
Banking	Jan. 1993- Mar. 1997	2	0.000	0.810^{***}	0.037	-0.177	0.854
	Apr. 1997- Mar. 2008		0.000	1.153^{***}	-0.022^{*}	2.219^{***}	
	Mar. 2008- Dec. 2010		0.000	1.446^{***}	-0.024	0.944	
Financial Services	Jan. 1993- Dec. 2007	1	0.001	0.677^{***}	-0.016	-0.410	0.581
	Dec. 2007- Dec. 2010		0.000	0.885^{***}	0.030	1.961^{*}	
Utilities	Jan. 1993- Dec. 1996	3	0.001	1.128^{***}	-0.007	-0.279	0.633
	Dec. 1996- Sep. 2000		-0.002	0.751^{***}	-0.019	-3.439^{**}	
	Sep. 2000- May. 2002		0.000	0.302^{***}	0.019	-7.363^{***}	
	Jun. 2002- Dec. 2010		0.000	0.838^{***}	0.002	-2.773^{***}	
Construction	Jan. 1993- Oct. 1999	3	0.000	0.756^{***}	0.005	0.124	0.603
	Oct. 1999- Nov. 2004		0.002	0.452^{***}	-0.048^{**}	-3.622^{**}	
	Nov. 2004- Dec. 2007		0.000	1.507^{***}	0.089^{**}	-0.609	
	Jan. 2008- Dec. 2010		-0.002	0.946^{***}	0.063^{**}	0.221	
Chemicals & Paper	Jan. 1993- Oct. 1998	2	-0.001	0.838^{***}	0.053	-0.263	0.201
	Oct. 1998- Aug. 2003		-0.001	0.276^{***}	0.009	-2.613	
	Sep. 2003- Dec. 2010		-0.003	0.762^{***}	-0.003	5.674^{***}	
Basic Resources	Jan. 1993- Sep. 2002	1	0.001	0.780^{***}	0.011	0.192	0.405
	Sep. 2002- Dec. 2010		0.000	1.203^{***}	0.185^{***}	6.290^{***}	
Health Care	Jan. 1993- Dec. 2010	0	0.001	0.655^{***}	-0.005	-0.595	0.200
Food & Beverages	Jan. 1993- Apr. 2000	1	0.000	0.662^{***}	-0.075^{***}	-1.754^{***}	0.287
	Apr. 2000- Dec. 2010		0.002^{**}	0.256^{***}	-0.013	-0.654	
Industrials	Jan. 1993- Feb. 2001	1	0.001	0.522^{***}	-0.041^{*}	-1.095	0.483
	Mar. 2001- Dec. 2010		0.000	0.948^{***}	0.013	4.323^{***}	
Energy	Jan. 1993- Dec. 1998	1	0.000	0.835^{***}	0.012	-0.509	0.487
	Jan. 1999- Dec. 2010		0.000	0.657^{***}	0.112^{***}	-0.129	

Notes:

This table reports the OLS regression results of the multifactor model in Eq. (2) for the sub-samples based on the breakpoints identified by the test of Bai and Perron (1998, 2003). Standard errors of the estimated coefficients are corrected for autocorrelation and heteroscedasticity with the Newey-West procedure. Breaks denote the number of breaks selected by the sequential procedure of Bai and Perron at the 5% significance level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 6.Estimation results for industries and sub-samples with the augmented multifactor model.

Industry	Sob-samples	Breaks	Intercept	Market Portfolio	Oil (€)	Interest Rates	Exchange Rates	Adjusted R^2
Consumer Goods	Jan. 1993- Dec. 2010	0	0.001	0.643***	-0.016	0.855	-0.049	0.269
Consumer Services	Jan. 1993- Dec. 2010	0	0.000	0.757***	-0.011	-1.032**	-0.052	0.628
Technology & Telecom.	Jan. 1993- Sep. 2004	1	0.000	1.323***	-0.023	1.105*	0.026	0.697
	Sep. 2004- Dec. 2010		0.001	0.681***	-0.018	-1.160	-0.018	
Real Estate	Jan. 1993- Dec. 1998	3	0.000	0.828***	-0.027	-1.468	0.038	0.262
	Dec. 1998- Oct. 2003		0.001	0.215***	-0.015	-0.371	-0.140	
	Oct. 2003- Jan. 2007		0.004*	0.866***	0.051	1.542	-0.165	
	Jan. 2007- Dec. 2010		-0.010***	0.263***	0.006	-0.898	0.081	
Banking	Jan. 1993- Jan. 1997	2	0.000	0.808***	0.043	-0.266	-0.077	0.853
	Jan. 1997- Mar. 2008		0.000	1.148***	-0.023**	2.306**	0.025	
	Mar. 2008- Dec. 2010		0.000	1.450***	-0.024	0.950	0.025	
Financial Services	Jan. 1993- Dec. 2007	1	0.001	0.677***	-0.016	-0.410	-0.000	0.581
	Dec. 2007- Dec. 2010		0.000	0.862***	0.029	1.940*	-0.163	
Utilities	Jan. 1993- Dec. 1996	3	0.001	1.126***	-0.009	-0.281	0.035	0.640
	Dec. 1996- Sep. 2000		-0.001	0.815***	0.012	-2.769**	-0.636***	
	Sep. 2000- May. 2002		0.000	0.299***	0.022	-7.673***	0.005	
	May. 2002- Dec. 2010		0.000	0.843***	0.002	-2.916***	0.072	
Construction	Jan. 1993- Oct. 1999	3	0.000	0.735***	-0.003	0.079	0.181*	0.603
	Oct. 1999- Nov. 2004		0.002	0.463***	-0.050**	-3.899***	-0.021	
	Nov. 2004- Dec. 2007		0.000	1.510***	0.089**	-0.546	0.084	
	Dec. 2007- Dec. 2010		-0.002	0.936***	0.063**	0.210	-0.066	
Chemicals & Paper	Jan. 1993- Oct. 1998	2	-0.001	0.843***	0.055	-0.246	-0.050	0.199
	Oct. 1998- Aug. 2003		-0.001	0.281***	0.015	-2.328	-0.073	
	Aug. 2003- Dec. 2010		-0.003	0.781***	-0.002	5.565***	0.163	
Basic Resources	Jan. 1993- Jul. 2002	1	0.001	0.749***	-0.006	-0.188	0.191	0.405
	Jul. 2002- Dec. 2010		0.000	1.178***	0.181***	6.443***	-0.105	
Health Care	Jan. 1993- Dec. 2010	0	0.001	0.657***	-0.012	-0.858	0.177	0.201
Food & Beverages	Jan. 1993- Apr. 2000	1	0.000	0.665***	-0.073***	-1.721**	-0.017	0.286
	Apr. 2000- Dec. 2010		0.002**	0.253***	-0.013	-0.569	-0.045	
Industrials	Jan. 1993- Apr. 2001	1	0.001	0.542***	-0.030	-0.932	-0.099	0.490
	Apr. 2001- Dec. 2010		0.000	0.966***	0.013	3.628***	0.381***	
Energy	Jan. 1993- Dec. 1998	1	0.000	0.812***	-0.005	-0.590	0.219*	0.488
	Dec. 1998- Dec. 2010		0.000	0.660***	0.113***	-0.134	-0.023	

Notes:
This table reports the OLS regression results of the augmented multifactor model in Eq. (3) for the sub-samples based on the breakpoints identified by the test of Bai and Perron (1998, 2003). Standard errors of the estimated coefficients are corrected for autocorrelation and heteroscedasticity with the Newey-West procedure. Breaks denote the number of breaks selected by the sequential procedure of Bai and Perron at the 5% significance level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.