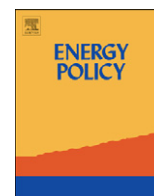




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# Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade <sup>☆</sup>

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## ABSTRACT

This article extends the understanding of oil–stock market relationships over the last turbulent decade. Unlike previous empirical investigations, which have largely focused on broad-based market indices (national and/or regional indices), we examine short-term linkages in the aggregate as well as sector by sector levels in Europe using different econometric techniques. Our main findings suggest that the reactions of stock returns to oil price changes differ greatly depending on the activity sector. In the out-of-sample analysis we show that introducing oil asset into a diversified portfolio of stocks allows to significantly improve its risk–return characteristics.

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## 1. Introduction

Understanding the dynamics of stock returns is an issue of ongoing research in financial market literature. In particular, identifying the factors that drive stock market returns is of utmost relevance and importance to investors and policy makers. Although an abundance of theoretical and empirical works focused on asset pricing, there is no consensus about both the nature and number of factors of stock returns. Furthermore, as oil price has changed with sequences of very large increases and decreases over recent years, it is now quite opportune to augment the existing research on its impacts on stock market returns. Various transmission channels exist through which oil price fluctuations may affect stock returns. Indeed, the value of stock in theory equals discounted sum of expected future cash-flows. These discounted cash-flows reflect economic conditions (e.g., inflation, interest rates, production costs, income, economic growth, and investor and consumer confidence) and macroeconomic events that are likely to be influenced by oil shocks. Accordingly, oil price changes may impact stock returns.

In the literature, there has been a large volume of works on the linkages between oil prices and economic variables. The majority of these studies have shown significant effects of oil price fluctuations on economic activity for several developed and emerging countries (Hamilton, 2003; Cunado and Perez de Garcia,

2005; Balaz and Londarev, 2006; Lardic and Mignon, 2008; Gronwald, 2008; Cologni and Manera, 2008; Kilian, 2008). By contrast, there have been relatively a few attempts to study the dynamic relationship between oil price variations and stock markets.

The pioneering paper by Jones and Kaul (1996) tests the reaction of stock returns in four developed markets (Canada, Japan, the UK, and the US) to oil price fluctuations on the basis of the standard cash-flow dividend valuation model. They find that for the US and Canada stock market reaction can be accounted for entirely by the impact of oil shocks on cash flows. The results for Japan and the UK were nevertheless inconclusive. Using an unrestricted vector autoregressive (VAR) model, Huang et al. (1996) find no evidence of a relationship between oil prices and the S&P500 market index. Inversely, Sadorsky (1999) also applies an unrestricted VAR model with GARCH effects to American monthly data and shows a significant relationship between oil price changes and US aggregate stock returns. Park and Ratti (2008) show that oil price increases have a negative impact on stock returns in the US and twelve European countries, whereas stock markets in Norway, an oil-exporting country, respond positively to rises of oil price. In a more recent study, Apergis and Miller (2009) also examine whether structural oil-market shocks affect stock returns in eight developed countries, and document no significant responses of international stock market returns to oil price shocks.

Very few studies have looked at the impact of oil price changes on the stocks of individual sectors. In addition, most of these studies are country-specific and therefore do not provide a global perspective. For instance, Sadorsky (2001) and Boyer and Filion (2007) show that oil price increases lead to higher stock returns of Canadian oil and gas companies. El-Sharif et al. (2005) reach the

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same conclusion when analyzing oil and gas returns in the UK. However, the authors note that non-oil and gas sectors are weakly linked to oil price changes. More recently, Nandha and Faff (2008) study the short-term link between oil prices and thirty-five Datastream global industries and report that oil price rises have a negative impact on all, but not the oil and gas industries. Finally, Nandha and Brooks (2009) look into the reaction of the transport sector to oil prices in thirty-eight countries and find that, in developed economies, oil prices have some influence on the returns of the sector under consideration. There is however no evidence of a significant role for oil price changes in Asian and Latin American countries. Taken together, the results from the available works on the relationships between oil price changes and sector stock returns are inconclusive and differ from country to country.

The current article extends the understanding of the relationship between oil price changes and stock returns at the disaggregated sector level in Europe by investigating their short-term linkages over the last turbulent decade using different econometric techniques. Over this decade of globally increasing oil prices, the responses of stock markets to oil price changes are ambiguous. Indeed, on the one hand increases in oil prices translate into higher transportation, production, and heating costs, which can put a drag on corporate earnings. Rising oil prices can also stir up concerns about inflation and curtail consumers' discretionary spending. On the other hand, investors can also associate increasing oil prices with a booming economy. Thus, higher oil prices could reflect stronger business performance.

It is equally important to note that studying the short-term effects of oil price fluctuations at sector level instead of aggregate market level is important for several reasons. First, any market-wide consequence may hide the performance, not necessarily uniform, of various economic sectors. Further, sector sensitivities to changes in oil price can be asymmetric to the extent that some sectors may be more severely affected by these changes than the others. The degree to which a sector is more or less sensitive to oil depend upon whether oil serves as its input or output, its exposure to the indirect oil effects, its degree of competition and concentration, and its capacity to absorb and transfer oil price risk to its consumers. Second, the industrial base varies from one European market to another. Large and mature markets such as France and Germany are more diversified, whereas small markets such as Switzerland usually concentrate on a few industries. Thus, the results of studies based on national stock market indices such as Park and Ratti (2008) and Apergis and Miller (2009) should be considered with precaution. An important and interesting issue then consists of examining how different sector market indices rather than national market indices react to oil price fluctuations. Finally, indentifying the heterogeneity of sector sensitivities to oil has important implications for portfolio risk management since some sectors may still provide a meaningful channel for international diversification during large swings in oil prices.

The rest of the paper is organized as follows. Section 2 presents the data and some preliminary analysis. Section 3 reports and discusses the empirical results. Section 4 focuses on some out-of-sample forecasting evaluations and portfolio implications of empirical results. Summary and conclusions are provided in Section 5.

## 2. Data and preliminary analysis

We investigate the relationships between oil prices and stock returns in Europe from a sector perspective. Our sample data include the Dow Jones (DJ) Stoxx 600 and twelve European sector

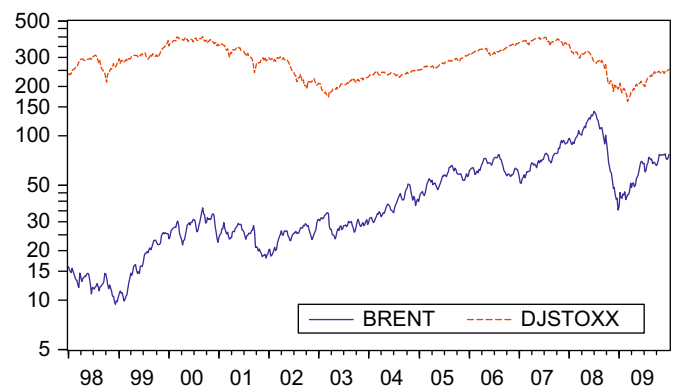


Fig. 1. European market index (DJ Stoxx 600) and crude oil price (Brent).

indices, namely *Automobile and Parts*, *Financials*, *Food and Beverages*, *Oil and Gas*, *Health Care*, *Industrials*, *Basic Materials*, *Personal and Household Goods*, *Consumer Services*, *Technology*, *Telecommunications* and *Utilities*. We collect stock market data from Datastream database.

Introduced in 1998, the Dow Jones Stoxx 600 sector indices aim to represent the largest European companies in each of the most important industries and currently cover Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. The sector indices offer an alternative view of the performance of the European stock markets. The main industries are *Automobile and Parts* (automobiles, auto parts and tires), *Financials* (banks, insurance, reinsurance, real estate and financial services), *Food and Beverages* (beverages and food producers), *Oil and Gas* (oil and gas producers, oil equipment, and services, distribution and alternative energy), *Health Care* (health care equipment and services and pharmaceuticals and biotechnology), *Industrials* (construction and materials and industrial goods and services), *Basic Materials* (chemicals and basic resources), *Personal and Household Goods* (household goods, home construction, leisure goods and personal goods and tobacco), *Consumer Services* (retail, media, travel and leisure), *Technology* (software and computer services and technology hardware and equipment), *Telecommunications* (fixed line and mobile telecommunications), and *Utilities* (electricity, gas, water and multi-utilities). Each sector index represents a capitalization-weighted portfolio of the largest European companies in this sector.

We think that weekly data may better capture the interaction of oil and stock price changes than daily or monthly data. On the one hand, the use of weekly data in the analysis instead of daily data significantly reduces any potential biases that may arise such as the bid-ask effect, non-synchronous trading days, etc. On the other hand, the monthly data may have some bearing on asymmetry in responses of stock returns to oil price shocks. In this schema of thing, we make use of weekly stock market sector indices over the period from January 01, 1998 to November 13, 2008, and examine their sensitivity to the recent oil price boom after the 1997 Asian financial crisis.<sup>2</sup> Over this sample period, the relationship between oil prices and stock markets was ambiguous as shown in Fig. 1. Increases in oil prices were, at the same time, indicative of higher production costs and inflation pressure, and synonyms of higher expected economic growth and higher levels of consumer and investor confidence. Notice that weekly data running from November 20, 2008 to December 31, 2009 will be

<sup>2</sup> It should be noted that both daily and monthly data as well as longer sample period are employed to subsequently check the robustness of our results.

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