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Oil price risk in the Spanish stock market: An industry perspective

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ABSTRACT

This study examines the sensitivity of the Spanish stock market at the industry level to movements in oil prices over the period 1993–2010, paying special attention to the presence of endogenously determined structural changes in the relationship between oil price changes and industry equity returns. The empirical results show that the degree of oil price exposure of Spanish industries is rather limited, although significant differences are found across industries. The oil price sensitivity is very weak in the 1990s, a period of fairly stable and low oil prices. Instead, the link between crude oil and stock prices seems to have increased during the 2000s, becoming primarily positive. This evidence highlights the key role played by aggregate demand-side oil price shocks associated with the global real economic activity in the link between oil price fluctuations and the Spanish stock market.

1. Introduction

Nowadays, it is commonly accepted that crude oil prices exert a critical influence on the economic activity and, since the stock market acts as the barometer of the economy, oil prices are also likely to play a major role in the behavior of stock prices. Oil price shocks can affect stock prices via at least two channels. First, movements in oil prices may impact future cash flows of firms as oil is a key input in the production of many goods. Higher oil prices increase production costs of companies, dampening corporate profits and depressing stock prices (Apergis and Miller, 2009; Arouri and Nguyen, 2010; Sadorsky, 1999). Second, oil price fluctuations may also affect the discount rate used in standard equity valuation models. Rising oil prices are often indicative of inflationary pressures which central banks typically control by raising interest rates, with the subsequent negative effect on share prices via the discount rate (Huang et al., 1996; Miller and Ratti, 2009; Mohanty et al., 2011). As a result, the effect of increasing oil prices on the stock markets of net oil-importing countries should be negative. In contrast, rising oil prices should have a positive influence on the equity markets of net oil-exporting countries in the form of higher income and wealth effects.

So far, however, the empirical evidence on the response of stock markets to oil shocks is mixed. One possible explanation for this lack of conclusive results might be that the oil–stock prices link is not stable over time (Aloui et al., 2012; Broadstock et al., 2012; Filis et al., 2011). In this regard, it seems reasonable to think that this connection might have experienced dramatic changes in recent years due to factors such as the existence of stock market and/or oil price bubbles, episodes of geopolitical instability, increasing corporate hedging activity or the recent global financial crisis.

The primary purpose of this research is to examine the impact of oil price fluctuations on Spanish industries with a particular focus on the presence of endogenously determined structural changes. It is widely agreed that oil price shocks affect different industries in different ways, depending on whether the industry is a net producer or consumer of oil, its degree of dependence on oil, its ability to transfer oil price shocks to consumers or its extent of hedging activity. In addition, ignoring structural changes could lead to inaccurate inferences about the oil–stock market link.

The present study contributes to the literature on this topic in two ways. First, to the best of the authors' knowledge, this is the first time that the stability of the relationship between oil prices and equity markets is assessed using the test for multiple structural breaks developed by Bai and Perron (1998, 2003). Second, no previous paper has specifically investigated the oil price exposure of Spanish firms. Spain is one of the countries of the European Union with a higher level of energy dependence. According to the Spanish Ministry of Industry, in 2010 the percentage of consumed energy imported from abroad was 74%. Furthermore, oil is by far the main energy source in Spain (about

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48.4% of the total energy consumption in 2009). Thus, Spain offers an ideal setting to study the effect of oil price changes 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 sensitivity of the Spanish stock market to oil price movements appears to be rather limited on average, even though significant differences can be observed across industries and over time. The oil price exposure is very weak in the 1990s, although it seems stronger and of mostly positive sign in the 2000s. This finding suggests that the aggregate demand oil price shocks driven by real global economic activity, prevailing during the decade of the 2000s, appear to play a critical role in explaining the oil price–stock market nexus. Secondly, the changing nature of the link between oil and stock prices may be attributed to several important economic events including the Asian and Russian financial crises of 1998, the oil price bubble from mid-2003 until mid-2008, and the recent global financial crisis, which has had a devastating impact on the Spanish economy causing a deep recession.

The rest of the paper is organized as follows. Section 2 reviews the literature on the link between oil price and stock markets. Section 3 presents the data used and Section 4 describes the empirical methodology applied in the paper. Section 5 discusses the major empirical findings. Finally, Section 6 concludes.

2. Literature review

Given the crucial role of crude oil in world economy, a plethora of empirical studies have tried to shed light on the effects of oil price shocks on the real economy since the first oil crisis of the 1970s (Cuñado and Pérez de Gracia, 2005; Hamilton, 1983; Jiménez-Rodríguez and Sánchez, 2005). The literature on the relationship between oil prices and stock markets can be viewed as a natural extension of the above mentioned studies and it has become a prominent issue in recent years. In a pioneering paper based on a standard cash-flow dividend valuation model, Jones and Kaul (1996) find that oil price shocks had a detrimental effect on four developed equity markets (Canada, the UK, Japan and the US) during the post-World War II period. Subsequent studies have continued this line of research by focusing on different aggregate country stock indices and time periods and by applying a variety of methodologies such as linear regression, vector autoregressive (VAR) models, vector error correction model (VECM), cointegration techniques, GARCH-type models or wavelet analysis.

In general, there is no consensus on the nature of the relation between oil price and stock returns. Some studies, such as Sadorsky (1999), Park and Ratti (2008), and Miller and Ratti (2009), document a significant negative effect of oil price changes on stock returns. In contrast, a handful of recent papers, such as Zhu et al. (2011), Arouri and Rault (2012), and Li et al. (2012), report a positive response of stock markets to oil shocks. Other authors, such as Huang et al. (1996), Cong et al. (2008), and Apergis and Miller (2009), fail to detect a significant linkage. A last group of studies advocates that the sign of the oil price exposure is dependent on two main factors. Firstly, it depends on the status of the country. So, an adverse effect is expected for oil-importing countries (Arouri and Nguyen, 2010; Park and Ratti, 2008; Sadorsky, 1999), while a positive impact is typically found for oil-exporting countries (Jammazi, 2012b; Jiménez-Rodríguez and Sánchez, 2005; Nandha and Faff, 2008). Secondly, the response of stock returns may also vary according to the origin of oil price shock (Filis et al., 2011; Jammazi, 2012b; Kilian and Park, 2009). Thus, precautionary demand–side oil price shocks that reflect concerns about future oil supply shortfalls generally have a negative impact on stock markets. However, supply–side oil price shocks due to a reduction of crude oil availability do not significantly influence the linkage between the two markets. Finally, aggregate demand-side oil price shocks which correspond to unexpected changes in the demand for crude oil driven by fluctuations in the global business cycle tend to have a persistent positive effect on stock prices. This occurs because oil and stock markets react similarly to shifts in expectations regarding future economic activity.

Far fewer studies have been devoted to the impact of oil price movements on stock returns at the industry level (Arouri and Nguyen, 2010; Elyasiani et al., 2011; Nandha and Faff, 2008). On the whole, it is shown that the oil price exposure differs greatly among industries. Indeed, industries where oil is an essential input, such as Airlines or Transportation, tend to display negative sensitivity to oil price hikes. Conversely, industries that generate a large share of their revenue from oil and oil-related products such as Oil and Gas usually exhibit a positive oil price exposure (Boyer and Filion, 2007; El-Sharif et al., 2005; Ramos and Veiga, 2011).

In addition, a number of recent studies have laid special emphasis on the changing nature of the relationship between oil and stock markets (Filis et al., 2011; Jammazi, 2012a; Jammazi and Aloui, 2010). All of these papers document that the oil price exposure does not remain constant over time. Nevertheless, there are only a few works examining the oil–stock prices link from a structural change perspective (Broadstock et al., 2012; Lee and Zeng, 2011; Li et al., 2012; Miller and Ratti, 2009). This paper is, to our knowledge, the first attempt to apply the multiple structural breaks test of Bai and Perron (1998, 2003) within this framework.

As for the Spanish case, it is possible to find several studies investigating the influence of oil price on a variety of economic indicators (Alvarez et al., 2011; De Miguel et al., 2009; Gómez-Loscos et al., 2011). To date, however, no work has specifically addressed the impact of oil price shocks on the Spanish equity market. In fact, Spain is only included in some papers that analyze the oil–stock market nexus in a multi-country framework, but without paying attention to the singular nature of the Spanish equity exchange (Arouri et al., 2012; Driesprong et al., 2008; Park and Ratti, 2008).

3. Empirical methodology

Following Faff and Brailsford (1999), Boyer and Filion (2007), and Nandha and Faff (2008), among others, a multifactor market model is used to investigate the impact of oil price changes on industry stock returns. The multifactor model can be justified either from an arbitrage pricing theory (APT) or from a multi-beta capital asset pricing model (CAPM) perspective. The model employed takes the following form:

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

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

The coefficient on the market return, β_i, represents the sensitivity of the return on industry i to general market movements and is, therefore, an indicator of market risk. In turn, γ_i and λ_i measure the sensitivity of the industry's i return to oil price and interest rate changes, respectively, after controlling for market risk. The inclusion of the market portfolio return is designed to control for the macroeconomic factors that affect stock returns and are correlated with oil price changes. This approach mitigates the omitted variable bias and improves the precision of the exposure estimates.

An interest rate variable is also included in the multifactor model due to two reasons. First, prior work in the context of the oil price–equity returns link has highlighted the prominent role of interest rates in explaining stock price variability (Li et al., 2012; Miller and Ratti, 2009; Sadorsky, 1999). Second, it has been well documented that the Spanish equity market has a significant interest rate exposure due to the great relative importance of banking, regulated and highly