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Fuel prices impacts on stock market of metallurgical industry under the EU emissions trading system

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ABSTRACT

Metallurgical industry is among the largest industrial users of fossil fuels in the Spanish economy and it is one of the industries under the European Union emissions trading system. This study examines the long-run equilibrium relations and short-run interactions between fuels and European Union carbon emissions allowances price changes and the corporate value of Spanish iron and steel industry.

From a multifactor market model specification, a cointegrated Vector Error Correction model is employed for the period covering 1st January 2013 to 15th September 2015 to embrace the analysis. Moreover, by using a panel data econometric approach, it is tested if the relationship of European Union carbon emissions allowances and fuel prices variations with stock returns are firm-specific.

The results indicate a negative stable long-run relation between gas prices and stock market price changes of metallurgy sector and firm-specific effects. Regarding the EUA price change effect on aggregated stock market return, the VECM estimation did not find a significant long-run linkage. However, the results of EUA price change impact at firm level showed evidence for heterogeneity in this effect.

1. Introduction

The Spanish metallurgical industry, which includes metal production and processing activities, is considered as a key sector of the Spanish economy. It is a macro-sector that has 9252 companies [61], 869,025 workers and a trade surplus of 3506 million of Euros in 2014 [60].

However, this sector is characterized by a high consumption of resources to develop its activity. According to the last Energy Consumption in Spain [56], energy consumption by the extractive and manufacturing industry reaches 11,086 million euros in 2013. The metallurgical industry consumed the most energy resources, with 2185 million euros (19.7% of the total industry energy consumption). Based on the use of the different types of fuel, worth noting was the high percentage consumption of gas recorded by this sector (23% of the total energy consumption of this industry). In turn, petroleum use accounted for 11% of its total energy consumption and a very residual use of coal was observed (2%).

Moreover, the European Union (EU) has adopted a cap and trade system since 2005 (EU emissions trading system, EU ETS). Under this system, each EU country establishes the number of emission allowances (the right to emit one tonne of CO_2) of every installation yearly. This system gives price to carbon allowances as companies can purchase supplementary rights or sell their remaining rights.

Under the current Phase III of this system, the Spanish metallurgy sector involved important greenhouse gas emissions, specifically 2912.01 kt CO_2 equivalent (11% of total GHG in industrial processes, [55]. Besides, metallurgical industry requires more emission allowances that those allocated by the national government. During the period 2013–2014 of Phase III (when the rate auction allocation of allowances is increasing), Spanish iron and steel industry had a negative relative coverage of allowances allocation. In fact *Production of pig Iron and Steel* and *Production of primary aluminum* activities had a relative coverage of −10.8% and −8.1% respectively [54].

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In this context, Capital Market Theory indicates that fuel prices and carbon price could have an impact in financial variables such as stock market returns. Thus, energy fuels can influence output prices as well as costs because companies can incorporate their fuel costs in their sale offers. Therefore, fuel prices can have different effects on the companies' profitability in function of if these costs are largely passed or not on to the consumers. When the company decides to support exclusively a possible increase of fuel costs, lower investors' expectations in the company's profitability and therefore lower stock market prices will tend to be observed. Similar arguments are developed for emission trading system by conventional economic assumptions of profit maximization [53]. Thus, the final influence of fuel and EUA change prices on metallurgical firms' profitability depends on firms' intermediate costs mix but also on the pass-through of costs to consumers.

Several studies have analyzed the effect of fuel prices changes on stock market returns at country level, but few of them have analyzed both fuel and EUA prices impacts on stock market by paying attention the singular nature of each industry equity exchange. For example [41,57,47] studied the effect of EUA prices on European power stock market returns. For the Spanish case [17] analyzed those interactions in the Spanish electricity sector and quantified the existence of the differences impacts at firm-level. For the case of metallurgical industry [46], analyzed the oil price effect on stock prices in all sectors (including steel and other metals) and Elyasiani et al. [21] analyzed the impact of oil price changes on metal industry stock prices in US industries [11]. examined the impact of carbon prices on the stock returns of European carbon-intensive industries and [13] on the revenue performance of cement and iron or steel industries.

For the Spanish industrial sector, there are only two works [43]. analyzed the impact of EUA price fluctuations on Spanish stock market of industries affected by EU ETS. By using a multifactor market panel econometric model over the period 2008–2014 they found that that the effect of EUA price changes on Spanish Market returns was industry-specific. They found a small relationship between EUA price changes and stock market returns of the metallurgical industry. However, this work 1) did not address specifically on metallurgy sector characteristics and on its firms characteristic, 2) did not analyzed the fuel price change effects for the industry and 3) did not take into consideration the dynamic interactions among variables, as multifactor model specification they used presumed the direction of causality among variables.[1] Moreover [44], was the only work analyzing the impact of oil price fluctuations on Spanish stock market at sectoral level (including basic resource and industry). By using a multifactor market model over the period 1993–2010, they showed how the impact of oil prices on the Spanish stock prices vary across industries. They obtained that oil price increases involved a negative impact on stock prices of Spanish industry companies' (which in includes metallurgy activity aggregated to other industrial activities). However, this work i) considered the effect of an unique fuel price (oil), ii) did not take into account the effect of EUA price changes on stock market, iii) did not address specifically on metallurgy sector and iv) did not take into consideration the dynamic interactions among variables.

Thus, there are no works that have specifically addressed the overall impact of several fuels and EUA prices changes on the Spanish metallurgy equity market and on the stock market of each firm.

In this context, the objective of this paper is to contribute to the literature by means of a detailed analysis of the effects that involve fuel prices and EUA prices on stock prices of Spanish metallurgical industry and its firms.

In particular, this paper focuses in the following questions:

Do EU Emission Allowances and fuel price changes affect the Spanish metallurgical stock market returns? How are the direction and the intensity of those effects? Are those effects firm-specific?

In order to answer these questions, model specifications based on multifactor market model are used. The multifactor market model has been widely used to study the effect of fuel and EUA prices changes on industries stock market returns [41,57] or [47] and [44,43,17] in a Spanish context). In this paper, the multifactor market model specification is extended by considering the dynamic interactions among variables. In fact, a vector error correction model (VECM) is used.

By using that methodology, it is possible to analyze long-run equilibrium relations and short-run interactions of the aggregated metallurgical industry stock market returns with fuel and carbon emission prices changes. Moreover, by using a panel data econometric approach, it is tested if there are differences at firm-level about EUA and fuel prices impacts.

The daily sample period used in the analysis covers the current Phase III (1st January 2013–15th September 2015) of the EU ETS.

Our results indicate that fuel price changes impacts on the stock market of Spanish iron and steel industry. The VECM estimations indicate a negative long-run relation between gas prices and stock market price changes of Spanish metallurgy sector.

The panel data approach indicated that the estimated gas-price firm effects were negative for nearly all metallurgical companies. The panel data approach also found clear evidence of the positive oil-price effect at firm level. Moreover, the results of EUA price change impact at firm level showed evidence for heterogeneity in this effect.

The paper is organized as follows: Section 2 presents a literature review; Section 3 presents a brief description of the used methodology including the multifactor model specification, the Vector Error Correction Model and the extension of the multifactor model with panel data; Section 4 describes the used data and Section 5 reports the empirical findings. Finally, Section 6 contains conclusions.

2. Literature review

Several studies have analyzed the impact of fuel and carbon prices on stock returns (see Table 1). However, the existing studies do not converge to a single view as many of the findings are country specific. Moreover, results also rely on the modeling and the used econometric tool (linear regression, vector autoregressive model-VAR, vector error correction model-VECM, cointegration techniques, GARCH-type models or wavelet, among others) or the studied period, among others.

Some empirical literature shows the existence of significant linkages between fuel and stock prices. For example Sadorsky [51], used a GARCH model and obtained a significant negative effect of oil price changes on stock return in US during 1947–1996. Similarly, [40]; by applying a cointegrated vector correction model, obtained that oil prices increases affected negatively stock prices in six OCDE countries during 1971–2008. On the other hand, other studies obtained a positive response of stock markets to oil and gas shocks. By means of a multifactor model [6], obtained a positive impact of oil prices on stock prices in emerging markets in the period 1992–2005. Similarly [8], found a positive relationship between

[1] Dynamic interactions among variables may play a fundamental role: For instance [48,27] studied the effects energy prices changes on the CO_2 emission allowance prices. In the same way [36], demonstrated that fuel prices changes may be drivers of the EUA prices [7]. found that natural gas, oil prices and the switching possibilities between gas and coal for electricity generation are significant drivers of the EUA futures price.