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Exchange rate effect on carbon credit price via energy markets

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A B S T R A C T

This paper examines the impact of currency exchange rates on the carbon market. We scrutinize this effect through the European Union Emission Trading Scheme (EU-ETS), which primarily uses two substitutable fossil energy inputs for the generation of electricity: coal and natural gas. The European coal market is directly driven by global coal markets that are denominated in USD, whereas, natural gas is mainly imported from Russia and is denominated in Euros. The impulse response functions of a Structural Vector Autoregression (SVAR) model demonstrate that a shock in the Euro/USD exchange rate can be transmitted through the channel of energy substitution between coal and natural gas, and influence on the carbon credit market.

1. Introduction

This paper discusses the role of exchange rates in determining carbon credit prices through energy markets. The link between currency markets and the EU-ETS allowance market is facilitated primarily through the EU's electric power generating industry, which uses around 60% of total EU-ETS allowances. We posit that exchange rates could indirectly affect the EU-ETS market through a substitution effect or a demand effect. The demand effect could be present because a weak domestic currency spurs export demand and therefore demand for emissions. The substitution effect arises when clean and dirty energy inputs are denominated in different currencies. EU electricity producers primarily use two

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substitutable fossil energy inputs to generate electricity: coal and natural gas.[2] Firms can substitute between coal and natural gas easily, depending on relative prices of the fuels and demand for electricity (Delarue et al., 2008). Substitution affects GHG emissions, and thereby affects demand for EU-ETS allowances, because burning coal generates almost twice as much GHG emissions as burning natural gas to produce the same amount of energy. Since the EU-ETS was introduced, electricity producers select coal or natural gas based on the cost of using each fuel plus the cost of buying EU-ETS allowances (McGuinness and Ellerman, 2008; Alberola et al., 2008). Koenig (2011) shows how switching between fuels with different carbon intensities affects daily carbon prices, and conversely, Bunn and Fezzi (2007) show that daily carbon prices affect the energy substitution activities of electricity producers.

However, the relationship among exchange rate, energy, and carbon markets has received little attention in academic papers and industrial reports. This is true even though it is understood that exchange rates impact global energy prices and trade flows, and that energy prices are important in carbon credit price determination (Akram, 2009). To date, most studies of the European Union Emission Trading Scheme (EU-ETS) carbon allowance market discuss how supply and demand are affected by various factors such as temperature, emission cap policy, other energy markets, and market regulations (Chevallier, 2009). The studies of Chevallier (2009, 2011a,b,c) are the exceptions, and these consider macro factors like bond markets, equity markets, and business cycles to understand the EU-ETS allowance market using time-series models. Chevallier (2011c) does not find a significant effect of currency exchange rates on the carbon market. However, his study utilized daily data and this may have been too short an interval to identify the specific effect we consider. Additionally, there were 115 variables in Chevallier's factor augmented vector autoregression model, and the mechanism we identify in this paper easily could have been confounded by other effects in such a large model. In this paper we develop a conceptual model to describe the mechanism by which exchange rates can impact EU-ETS allowance prices, and we use weekly data on coal, natural gas, Euro-USD exchange rates, and Euro-Swiss Franc exchange rates to empirically test for evidence of the predicted effects between the currency, energy, and carbon markets in a Structural Vector Autoregression Model. We detect a statistically significant effect of exchange rates on EU-ETS allowance prices.

Our paper contributes to the growing body of literature on carbon credit price determination by showing that when clean and dirty fuels are denominated in different currencies, carbon credit markets are susceptible to exchange rate risk. The European coal market is directly driven by global coal markets that are denominated in U.S. Dollars (USD), whereas the natural gas market is denominated in Euros (Polański and Winkler, 2008; Timera Energy, 2011). Therefore, asymmetric exposure to exchange rate risk in the two energy inputs should change the Euro denominated price spread between coal and natural gas. Since exchange rate risk influences the relative prices of coal and natural gas, substitution between these clean and dirty inputs affects the price of carbon. For example, if the Euro depreciates against the USD, ceteris paribus, this increases the price of coal relative to the price of natural gas in Euros. This causes energy substitution away from coal and toward natural gas, thereby lowering GHG emissions; hence, carbon credit prices will fall due to reduced demand for emission allowances. We verify that this effect is present in the EU-ETS allowance market.

Policy makers should be aware of exchange rate effects on the EU-ETS allowance market when setting monetary policy. Taking actions that would support or depress the domestic currency will have unintended consequences in the EU-ETS allowance market and on GHG emissions. Further, this paper highlights the need for major players in the EU-ETS market to hedge their exchange rate risk, rather than exposing themselves to unexpected movements in currencies that could adversely impact the value of their EU-ETS allowance holdings.

2. Conceptual framework

Relative energy prices are known to be the most important determinant of clean or dirty input use (Alberola et al., 2008). In the European power generation industry, natural gas and coal are the

[2] According to the EU energy report (2009), 29.4% of electricity was generated from coal, and 22.6% was generated from natural gas in 2007 (27.8% from nuclear, 15.6% from renewable, and 3.3% from oil).