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Energy markets – Who are the influencers?

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ABSTRACT

The energy markets have recently undergone important transformations (e.g. deregulation, technological progress, renewable energy deployment and changing energy consumer behaviour) and witnessed a variety of crisis periods, affecting the relationships among energy commodities and their interactions with clean energy indices. This has implications for price discovery, asset allocation and risk management, which requires in-depth analysis to uncover and identify which energy indices (or forms of energy) lead others or are the most influential, while accounting for asymmetry and non-linearity characteristics. To uncover the complex structure of the relationship across the returns of seven different energy commodities and two clean energy stock indices, we apply Granger causality and transfer entropy in both static and dynamic approaches. The results from the Granger causality analysis identify the influence of the other energy products on natural gas, whereas the transfer entropy analysis reveals the importance of WTI oil and the influence of clean energy indices. Diesel is the most influenced energy commodity. A rolling windows analysis confirms those findings and shows evidence of a time-variation that reflects the impacts of crisis periods, especially the pandemic, on the dynamics of relationships.

1. Introduction

The energy markets have undergone important changes and transformations over the past decades arising from the emergence of challenging factors and market developments such as market deregulation, technological advances, the shale gas revolution [1] and renewable energy deployment. Such transformations influence investors' sentiment, market returns and conditions, especially if they are combined with occasional shocks and crisis periods (e.g., the 2007–2008 global financial crisis; the oil price war between Saudi Arabia and Russia in 2014–2015; and the COVID-19 pandemic[1]), and this can disrupt the dynamics of spillovers in the energy markets and make it more complex. They are important for the nature of the return spillovers as well as the individual role of each energy commodity within the structure of return spillovers [2] and have important implications for price discovery, asset allocation and risk management. Previous studies have indicated that through the channels of the financial system, it is possible for information shocks associated with either the demand or supply side to be transmitted to various energy commodities, leading to a distortion and complexity in the network of the relationships among energy commodities (see, for example, [2–4]. In fact, it is often difficult for one energy commodity to resist the shock spillover faced by another energy commodity; this is accentuated by the fact that market participants consider various energy commodities as alternative investment choices [5]. In this regard, the academic literature points to the competitive substitution relationship between fossil energy and clean energy [6], with the argument that higher prices of fossil energy make investments in clean energy more appealing which leads to an increase in the price of energy stocks [7]. However, a competitive substitution relationship has been refuted, suggesting the significance of a decoupling hypothesis [8,9] based on the rationale that crude oil and clean energy assets compete in different markets (i.e., crude oil is used to produce transportation fuel whereas clean energy is

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[1] During the March 2020 outbreak peak, WTI oil prices declined to negative territories for the first time.

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