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News sentiment and jumps in energy spot and futures markets☆

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ABSTRACT

How often do price discontinuities occur on spot and futures energy markets? What are their core characteristics in terms of incidence, size, and direction? Are price discontinuities in energy commodities related to large swings in market sentiment? Our study answers these questions by investigating the jump incidence of daily energy spot and nearest month futures returns for crude oil, natural gas, gasoline, heating oil and propane using formal nonparametric jump detection procedure for the period January 2003 to May 2013. This study proposes a proxy for aggregate and individual energy market sentiment reflecting the dynamics of news associated with the energy sector and a variety of distinct energy markets. Our analysis demonstrates that the greatest frequency of jumps occurred in spot markets as well as in crude oil and natural gas sentiment indices. The study identifies several types of co-jumps: between spot and futures pairs of energy commodities; across energy commodities; and between energy markets and relevant sentiment indices. Regarding the latter, the study discovers a statistically and practically significant dependency of jumps in corresponding energy commodity prices from the crude oil and aggregate sentiment indices introduced in this study.

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1. Introduction

Energy commodities play a critical role in the international commodity trade and trade in the derivatives market (Christoffersen et al., 2012). Because these commodities are among the key inputs contributing to the world economy, changes in energy prices are likely to spill over to other commodities and macroeconomic variables thereby affecting current and future consumption, production and investment decisions. In the last decade, commodity markets including energy underwent a number of structural and technological changes, which resulted in higher interconnection between markets, an expansion of quantitative trading, and subsequently, lead to increased market volatility: “many commodity prices have experienced roller-coaster rides since the mid-2000s” (Filimonov et al., 2014, p. 175).

The prices of many financial assets and commodities are known to exhibit individual and simultaneous discontinuities, or so-called, jumps and cojumps respectively (Lahaye et al., 2011; Dungey and Hvozdyk, 2012; Dumitru and Urga, 2012; Chevallier and Ielpo, 2014). Since jumps and cojumps in asset prices affect how economic agents make asset allocation and hedging decisions,

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understanding the dynamics of the extreme movements in commodity prices is critical for risk control, derivative pricing, and trading (Bormetti et al., 2015; Wilmot and Mason, 2013). From modelling perspective, the existence of jumps in energy prices suggests that assumption of normal distribution of log-returns which is typically used in the literature may not hold. The presence of jumps also implies that diffusion models are misspecified statistically (Lee and Cheng, 2007). The possibility of jumps may explain fat tails in many energy price returns.

The finance literature on asset pricing links the volatility of financial instruments to the rate of information flow that is received by the market (Ross, 2004; Andersen, 1996; Maheu and McCurdy, 2004). Empirical evidence shows that large abrupt swings in prices over a short time period are a relatively common but hard to predict events in energy markets (Lee and Cheng, 2007; Meade, 2010; Larsson and Nossman, 2011; Liu and Tu, 2012). Although such events are rare (the number of jumps per year is lower than the number of trading days per year), they can change the direction of the market in the short run (Postali and Picchetti, 2006; Lee and Cheng, 2007; Chevallier and Ielpo, 2014).

A number of recent studies have empirically demonstrated that trading on financial and commodity markets is strongly influenced by company-specific, macroeconomic or political news (Groß-Klußmann and Hautsch, 2011; Lahaye et al., 2011). Among other factors, these news items might shape sentiment, or beliefs of market participants about the state of the market (Baker and Wurgler, 2007; Tetlock, 2007). Another factor which influences on the response of the market participants is market incompleteness (Staum, 2007; Crès et al., 2015) which limits their ability to hedge risks. As a result, this affects their decisions to buy or sell assets exposed to those risks and magnifies price changes, potentially leading to major price discontinuities, or jumps.

How often do price discontinuities occur on spot and futures energy markets? What are their core characteristics in terms of incidence, size, and direction? Are price discontinuities in energy commodities related to large swings in market sentiment? These are the questions our study addresses.

The empirical evidence on price discontinuities in energy markets is still scarce. Current literature offers four major explanations for the occurrence of such jumps (Hanousek et al., 2014). *First*, jumps can potentially arise subsequent to news surprises including news about natural disasters, changes in the geopolitical situation, the actions of major players on energy markets, macroeconomic news announcements, and other events (Kang et al., 2011). *Second*, jumps can be caused by a lack of liquidity in the market and, hence, reflect an imbalanced market micro-structure (Joulin et al., 2008; Hanousek et al., 2014). *Third*, market participants can create a jump through their behavior (Shiller, 2005). *Fourth*, as noted by Taleb (2007) and Hanousek et al. (2014), jumps in asset prices can be caused by the complex interactions in economic systems and thus serve as manifestation of Black swans.

In this study, we contribute to the first strand of literature (i.e. news cause jumps) by expanding the focus from a particular type of news, such as macroeconomic news releases (e.g. Elder et al., 2013; Wilmot and Mason, 2013), to a wider set of news announcements relevant to a particular market. We include in our analysis the news items that may not only send the signal about current macroeconomic fundamentals, but also affect market expectations of future fundamentals. As part of our contribution, we have constructed and tested a measure of news sentiment, which is based on the real-time news items gathered by the text processing engine.

The difficulty in studying the impact of sentiment on energy commodities lies not only in finding an appropriate proxy for the sentiment but the lack of theoretical understanding on the relationship between sentiment and energy markets. Baker and Wurgler (2006, p. 1645) argued that “classical finance theory leaves no role for investor sentiment.” But what is sentiment? The first notion of investor sentiment as ‘animal spirits’ is attributed to Keynes (1936), in Fong (2014), who argued that a large number of sentiment-driven trades can cause prices deviate from their fundamental values. Sentiment can also be defined as changes in investor moods (Edmans et al., 2007), as well as the level of consumer confidence (Schmeling, 2009; Fisher and Statman, 2003), among other definitions. Early studies (Sanders et al., 2003; Sanders et al., 2004) investigated commercial sentiment indices such as the Commitment of Traders Reports and the Consensus Bullish Sentiment Index. The drawback of this approach is the low frequency of data, as it takes time for the producing agency to record, update, and post the sentiment data. The study of energy futures by Sanders et al. (2003) showed that for heating oil, crude oil and gasoline commercial sentiment indices were very volatile and highly correlated. In the analysis of causal relationships between investor positions and price movements for crude oil, gasoline, heating oil and natural gas from 1992 to 1999, Sanders et al. (2004) concluded that investor commitments do not cause movements in prices.

Alternative measures of sentiment are proposed by Choi (2010) and Kelly and Ahmad (2012) who created more complex sentiment indices based on the analysis of traders' positions and text mining. While Choi (2010) concluded that sentiment is not useful in predicting future movements in the New York Mercantile Exchange (NYMEX) energy futures market, Kelly and Ahmad (2012) found that sentiment was important in affecting crude oil prices. More recently, Deeney et al. (2015) proposed a measure of sentiment for West Texas Intermediate (WTI) and Brent crude oil futures based on stock indices, exchange rates, financial costs, crude inventory levels, supply proxies, and economic activity of the Organization of Petroleum Exporting Countries. They found that sentiment does affect futures prices for crude oil.

Our measure of sentiment or beliefs of investors and lay public about the current state of the market is in line with the prominent literature on market contagion, panic and asset bubbles (Kindleberger, 1978; Shiller, 2005) and expands the view that news do affect investor sentiment (Tetlock, 2007; Mian and Sankaraguruswamy, 2012). Mian and Sankaraguruswamy (2012) have shown that market-wide sentiment will affect investor's response to bad and good news in different ways. For example, with overly positive sentiment, investors are likely to be too optimistic which causes them to overreact to good news such as good earning news. Studying the relationship between sentiment and jumps is important because trading on sentiment can generate excess volatility, which could potentially lead to jumps in thin markets (Dumas et al., 2009; Seo and Kim, 2015). Due to the sentiment fluctuations, certain traders behave in an overconfident manner, giving too much credence to public information (Darrat et al., 2007). This results in higher levels of realized market volatility and leads to a problem of systematic market mispricing (Brown and Cliff, 2005; Lawrence et al., 2007; Shahzad et al., 2014).

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