

Financialization of oil futures markets and futures market efficiency: a multifractal perspective

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Overview

The temporal concurrence of oil prices' record high in 2008 with the so-called financialization of oil futures markets - a considerable increase in liquidity in oil futures markets and the increasing share of non-commercial traders observed after 2002 - sparked a heated debate whether or not the latter caused the former. For many observers in the broader public this relationship seems to be obvious, resulting in calls for introducing appropriate regulations. Among academic observers, however, the view is different. The majority of empirical studies investigating this issue do not find evidence of impacts of index funds positions on oil price changes; see e.g. Irwin and Sanders (2012). In consequence, some authors are skeptical with regard to the benefits of new regulations, see e.g. Pirrong (2010) and Irwin and Sanders (2012). The key argument they invoke is that reduced liquidity would impair the functioning of crude oil futures markets.

This, in turn, would mean that crude oil futures markets efficiency must have improved after 2002. Illuminating this ascribed relationship between futures market liquidity and market efficiency is the subject of this paper. It applies a newly developed quantitative measure of financial market efficiency. This procedure allows one to study the development of market efficiency over time and, therefore, in particular how it developed before and after 2002.

Due to the non-availability of corresponding empirical techniques, the vast majority of papers which study financial market efficiency employ qualitative measures of market efficiency. These analyses, however, are restricted to testing whether or not a certain market is efficient in a certain period. Campbell et al. (1997) put forward the idea of using quantitative rather than qualitative measures of market efficiency. The benefit of these methods is that they allow for studying how efficient a certain market is in a certain period. Recent methodological advancements now make possible to walk this path. Gu et al. (2010), for instance, find evidence of weak persistence in international crude oil markets for time scales smaller than a year and strong anti-persistence otherwise. They conclude that the short term persistent behavior is attributable to "speculators" in the oil futures market. Wang and Wu (2010) focus on the impacts of the Gulf Wars and shows that the first Gulf War made a greater impact on global oil markets and that Brent was more influenced than WTI.

Methods

Fama's (1970) seminal paper distinguishes between different degrees of market efficiency. If current prices can reflect all historical publicly available information, the market is referred to as weakly efficient. If current prices can, in addition to that, also instantly respond to new information, the market is said to be efficient of semi-strong form. The strong form of market efficiency, finally, requires that prices reflect all information, including hidden or insider information. The empirical procedure applied in this paper tests for weak-form efficiency.

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At the heart of this procedure is the notion that price movements in efficient markets are non-predictable. The statistical concept this non-predictability is translated into are random walk models. The key feature of quantitative measures of market efficiency is their ability to measure the “distance” of a price process to a random walk. Two so-called multifractal models are among the extant approaches. Multifractal models are able to capture an empirical feature of many financial time series: the interrelation between returns and sampling intervals.

The first is based on Hurst exponents. Based on this measure of multifractality, inference regarding market characteristics can be made. The further away the parameter is from the value of 0.5, the less efficient is a market. Gu et al. (2010) and Wang and Wu (2010) apply this approach, initially proposed by Zunino et al. (2008).

The second approach, proposed by Sattarhoff (2011), is based on models by Muzy and Bacry (2002) and Bacry et al. (2001, 2008). It is a very parsimonious framework, with only three parameters: the intermittency coefficient, the correlation length, and the error term variance. The intermittency coefficient measures how strong the interrelation between returns and sampling intervals is and, thus, serves as measure of multifractality and market efficiency. This second approach is applied in this paper.

Contribution

Given the momentum of the public debate on financial market speculation on crude oil prices, it is of particular importance to understand whether or not price behavior is affected by “speculation”. An insufficient understanding would likely result in inappropriate regulatory measures. The existing literature studies whether or not speculation contributed to the oil price increase. This paper, distinguished therefrom, is concerned with analyzing the relationship between market liquidity and market efficiency. Understanding whether or not market efficiency is affected makes an important contribution to understanding impacts of financial speculation and, thus, also to finding appropriate regulatory measures.

Keywords: Market efficiency, Oil futures markets, Financialization, Multifractality

JEL codes: C22, Q31, G12

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