

# Preliminary to Analyzing Market Efficiency of WTI Crude Oil Futures Market During Ukraine Crisis

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*The following is a literature review for a potential paper on analyzing the Ukraine-Russia War's effect on WTI crude oil futures market's efficiency. To be expanded.*

When the war in Ukraine began, with oil-rich Russia on one side and corn-growing Ukraine on the other side, one thing was certain: the market was not going to react well. The question is: how?

There is a large body of literature that shows markets do not do well in war environments (Chappell and Eldridge, 2000). The stock market often approaches inefficiency in war-torn regions during wartime (Schneider and Troeger, 2006). What has especially been proven to be the case is that markets pertaining to the economic strengths of countries at war are most in danger of economic turmoil. In Jiang et al., (2014), the West-Texas Intermediate (WTI) crude oil futures market is proven to be inefficient during the Gulf War (Jiang et al., 2014). Since Russia is known to be an oil-rich nation, the countless sanctions recently placed on it beg the question whether the current WTI crude oil futures market has also become inefficient, or at the very least, has reduced in efficiency. So now I ask the question: has the WTI crude oil futures market become inefficient during the invasion of Ukraine?

## I. Literature Review

### A. Weak-Form Efficiency

Before I begin my analysis of a specific instance of market efficiency, I must first clearly define what it means in practice to have a market efficiency. In general, when testing for market efficiency, we seek weak-form market efficiency. Slezak (2003) describes this term perfectly: "In risk-neutral markets, [weak-form market efficiency] implies that prices must follow a random walk" (Slezak, 2003). However, in the same paper, Slezak concludes that under the two simple assumptions that rational investors are risk-averse and the asset in question's fundamental value is risky, the theory behind the weak-form market efficiency hypothesis falls apart.

However, if we are to accept these two assumptions and collapse the weak-form efficiency market hypothesis, then no analysis would be needed to conclude market inefficiency. Furthermore, if we take an approach like Jiang et al. (2014), we leave open the possibility to find weak-form market efficiency, and also potentially a

reduction in market efficiency, both of which would be promising developments in the literature.

Furthermore, would it make sense to assume that rational investors are risk-averse? One could argue that, with the creation of platforms such as Robinhood that have expanded the power to invest to the masses, that it would make more sense to consider rational investors as a whole risk-neutral, with some risk-loving and risk-averse individual investors in there.

What about an asset's fundamental value being risky? For an asset to be risky, that would mean its fundamental value tends to be volatile. However, this is not always the case, as Baffes et al. (2015) shows by demonstrating that, while the crude oil market experiences periods of volatility, it also enjoys years-long terms of relative stability (Baffes et al., 2015). Furthermore, in a long-term sense, oil prices also are stable. Therefore, we can leave the door open to having weak-form market efficiency in our model.

### *B. WTI Crude Oil Futures Market*

Jiang et al. (2014) initially shows that, considering the time period 1983-2012 as a whole, the WTI crude oil futures market has weak-form efficiency. However, dividing into three sub-series to account for the Gulf War, market efficiency reduces by so much that market inefficiency occurs. In this paper, I hope to follow a similar method of analysis to uncover whether market efficiency has reduced, and if so, by how much.

Similarly, Tokic (2015) rounds out just how volatile and potentially inefficient the oil market can be, as it follows the 2014 oil price collapse, concluding that oil fundamentals played a strong role in this (Tokic, 2015). Tokic builds this work off of Tokic (2011), in which the inefficiencies present in the crude oil market during the 2008 Oil Bubble are analyzed (Tokic, 2011).

Important consideration through all of this is the mechanism by which inefficient markets form. Market inefficiencies come down to how accurate predicting market prices are with a set of covariates. Hamilton (2009) does just this for the crude oil market by determining what drives price changes, concluding scarcity rent (i.e., the cost of using up finite resources) could now be playing a role in price change (Hamilton, 2009). Both Hamilton (2009) and Tokic (2011) reference ideas that De Long et al. (1990) and Dufour and Engle (2000) expand upon, that which being what drives continual price deviations from an asset's fundamental value (in this instance, the asset in question is oil). The answer according to either paper is inefficient markets having either positive feedback investing (De Long et al., 1990) or a heightened presence of better-informed investors (Dufour and Engle, 2000). Positive feedback investing is one potential source of bubbles, such as the 2008 Oil Bubble, where investment interest exponentiates prices to unsustainable levels (De Long et al., 1990).

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