

# Understanding Intraday Oil Price Dynamics during the COVID-19 Pandemic: New Evidence from Oil and Stock Investor Sentiments

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The global consumption of liquid fuels fell by 15.4% during the second quarter of 2020 owing to the coronavirus disease 2019 (COVID-19) pandemic. Nearly 100 million barrels per day were extracted from Saudi Arabia and Russia during this period, initiating a price war. Oil producers were encouraged to store excess barrels rather than sell them in the spot market after a super-contango was observed in the oil price structure, which created an excess oil supply against limited storage capacity. The economic situation, combined with the disease outbreak, particularly impacted oil investors through fear, resulting in an appalling situation for the oil industry. On April 20, 2020, the oil futures contract expiring in May was traded for  $-\$37.63$ . Our study aimed to understand the oil price dynamics from a behavioral perspective based on social media and news coming from both oil and conventional stock markets, which is the study's primary contribution.

Our study aims to examine the effects of investor sentiment related to oil and stock markets on extreme movement in oil price dynamics during the early COVID-19 period. This study is novel in that it distinguishes between oil investor sentiment and stock investor sentiment and their effects on oil price movements. Moreover, in contrast to prior literature that used different investor sentiment proxies and principal component analysis to construct investor sentiment data, we used an intraday sentiment proxy extracted from news and social media. We obtained this measure through a proprietary Thomson Reuters dataset (the TRMI sentiment index) that has not been used previously to study its relationship with oil returns and volatility. Finally, we aimed to assess investor sentiment's predictive value for oil market risk. We examined oil price dynamics' relationship with stock market investor sentiment data from three developed economies that suffered the most during the pandemic, the US, China, and the Euro-zone (April 2019 through May 2020). Since this period was characterized by high anxiety levels, emotional reactions to deaths, pessimism and high uncertainty, and positive reactions to news of vaccinations, etc., we employed a nonlinear two-part framework. The first part was based on Shi et al.'s (2018) time-varying Granger causality tests and detrended cross-correlation methods built on the variational mode decomposition (VMD) framework to evaluate dynamic long memory interaction under investor heterogeneity; we used these methods to examine time-varying causality, multi-scale long memory, and time-varying cross-correlation between WTI oil futures and stock market investor sentiment. The second part used an augmented stock market investor sentiment MAT-HAR model (moving average threshold heterogeneous autoregressive; see Motegi et al., 2019) to predict intraday oil volatility.

The contribution of this research to the literature is two-fold. First, to the best of our knowledge, this is the first study to examine intraday oil price dynamics using both oil and stock investor sentiments and assess their predictive value for intraday oil volatility. Second, we employed a

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dataset that incorporated both the COVID-19 outbreak and the oil price collapse. We tested whether the causality direction remained unchanged from oil returns to stock market investor sentiment, as discussed in the existing literature. Furthermore, we showed that, in the context of the pandemic, the causality direction was from oil and stock market investor sentiment to oil returns, and the causality was time-varying. One explanation for this is that the global lockdown plunged the industry, especially air transport and the oil sector, into inactivity. Consequently, a lack of trust and high uncertainty invaded stock market investor sentiment with suddenly reduced oil and oil-based product consumption, resulting in the oil price collapse.