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# Exploring relationship between crude oil price volatility and stock indices movement using wavelet analysis: evidence from India and China

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## Abstract

**Purpose** – This study aims to explore the linkage between fluctuations in the global crude oil price and equity market in fast emerging economies of India and China.

**Design/methodology/approach** – The present research uses wavelet decomposition and maximal overlap discrete wavelet transform (MODWT), which decompose the time series into various frequencies of short, medium and long-term nature. The paper further uses continuous and cross wavelet transform to analyze the variance among the variables and wavelet coherence analysis and wavelet-based Granger causality analysis to examine the direction of causality between the variables.

**Findings** – The continuous wavelet transform indicates strong variance in WTIR (return series of West Texas Instrument crude oil price) in short, medium and long run at various time periods. The variance in CNX Nifty is observed in the short and medium run at various time periods. The Chinese stock index, i.e. SCIR, experiences very little variance in short run and significant variance in the long and medium run. The causality between the changes in crude oil price and CNX Nifty is insignificant and there exists a bi-directional causality between global crude oil price fluctuations and the Chinese equity market.

**Originality/value** – To the best of the authors' knowledge, very limited work has been done where the researchers have analyzed the linkage between the equity market and crude oil price fluctuations under the framework of discrete wavelet transform, which overlooks the bottleneck of non-stationarity nature of the time series. To bridge this gap, the present research uses wavelet decomposition and MODWT, which decompose the time series into various frequencies of short, medium and long-term nature.

**Keywords** MODWT, Crude oil price, CNX Nifty, Continuous wavelet transform, Shanghai Composite Index, Wavelet-based Granger causality analysis

**Paper type** Research paper



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