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Navigating Economic Swings: Asymmetric Effects of Crude Oil Volatility

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Abstract

The Oil Price Volatility Index (OPVI) is the best indication of how unpredictable oil prices are. In this research, we concentrate on the volatility index for oil prices to assess the effect of crude oil price volatility on aggregate and market returns across a variety of economic sectors. Since quantile regression modeling (QRM) enables a more complete examination across various market circumstances, it is utilized to pinpoint the issue and research topic. Meanwhile, the asymmetric effects of ambiguous shockwaves are examined using the positive (+) and negative (-) variations of the crude oil price volatility index (OPVI). Although this reform was the most significant step in reducing government control of India's domestic crude oil pricing, the study also examines whether or not the 2012 change enhanced the OPVI stock link. The findings of this paper demonstrate that changes in the OPVI are consistent with the significant negative effects of falling oil prices on overall and individual economic sector stock returns. For these effects to occur, positive shockwaves in the crude oil price volatility index are more crucial than negative shockwaves. Additionally, following the 2012 reform, the positive shocks to the crude oil price volatility index had less of an impact on the returns on Indian stocks. The crude price oil volatility index is a valuable instrument for anticipating market volatility and enhancing investment outcomes, according to the study's conclusions.

Keywords: Uncertainty Market return Volatility and oil reform.

Introduction

Since countries' reliance on crude oil increases significantly as their economies expand and urbanize, it is often considered the bedrock of all global economies. The price of crude oil has a major impact on the development of any economy. A company's cash flow may be affected by changes in the price of crude oil since it is a major input utilized in production and spent subsequently (Umar et al., 2023a). Foreign investors are attracted to the availability of crude oil in a country with an abundance of it because of the cheap cost and ease of access (Liu et al., 2021a). Changes in the price of crude oil have a considerable effect on stock market returns. Youssef, M., and Mokni's businesses might see reduced future cash flows and discount factors (Valadkhani et al., 2021) if the price of crude oil continues to climb. According to Cheng, S., (Liu et al., 2021b) the crude oil price has a strong positive impact on the stock market index of a developed country, whereas the exchange rate and inflation have a substantial negative influence. According to Jain, A., and Biswal, P.C., rising crude oil prices have a sizeable positive effect on stock market returns, whereas falling crude oil prices have a sizeable negative effect on stock returns in developing nations (Umar et al., 2023b). According to (Dutta & Dutta, 2022), there must be a co-integration between the price of crude oil and the stock returns of stock exchanges in key economies throughout the world. Stock returns may be significantly and temporally affected by the uncertainty of crude oil prices, as reported by(Hu et al., 2020). According to Bouri, E., Jain, A., Biswal, PC, and Roubaud, D., crude oil prices and manufacturing production may have an impact on returns on the Indian stock market (Jiang et al., 2021) says. Oil price uncertainty may postpone or convert significant conclusions on consumption, investment patterns, production, and other features and issues due to the article on the trading holdings and financial assets of crude oil. Economic and financial structures, as well as stock returns, have been affected by the volatile crude oil market (Wang et al., 2023). According to (Bugshan et al., 2023a), the capabilities of emerging nations may be more impacted by the uncertainty of the crude oil price due to their less established financial systems and investors. Therefore, from a perspective of ambiguity, it is critical to expand studies of the connections between the oil market and stock returns.

Thus, the most in-depth inquiry into crude oil price uncertainty rests on the E-GARCH method or complete volatility index model. In contrast, this index does not reveal how oil prices will be set in the future since it is based on previous oil price data or time-series data. The Chicago Board Options Exchange (i.e. CBOE) created the crude oil price volatility index (OPVI) to track the volatility of crude oil prices in the United States. The OPVI is based on the volatility index methodology used by the CBOE for options on crude oil funds. More than one article on the oil price index has been published by the CBOE. The implicit volatility index model is comprehended based on historical data from the oil price market and investors' predictions for future circumstances in the crude oil market. Therefore, it is currently considered to have a straighter and better degree of crude oil price ambiguity than the ambiguity measured by historical price, offering a new angle from which to study oil price fluctuations (Bugshan et al., 2023b). Now that futures and options on the volatility of crude oil prices are available, investors who are unsettled by the shockwaves of uncertainty in the oil market may boost their chances of earning more money by looking at the new volatility variations.

Only a small amount of study has looked at how the oil price volatility index model affects stock market performance, say (Sreenu, 2022) Of particular note, S. Ghosh is not alone in this regard. (Albaity et al., 2023) the impact of the crude oil price volatility index on the Indian stock market has not been the subject of a large number of academic investigations. Another limitation is that the potential for the effects of the oil price volatility index on the stock market to vary with market circumstances has been given little attention in the existing literature. The quantile technique is considered an important method for tackling this difficult issue since it provides a way to list the numerous possible distributions of the independent variables. Some studies have utilized the quantile method to look at how changes in crude oil prices affect the stock market. (Mezghani et al., 2021) found that the impact of crude oil price shocks on stocks varied depending on the prevailing market circumstances.

As a result, demonstrating the effect of the crude oil price volatility index on market returns would be an intriguing exercise. Furthermore, the available research study does not account for the asymmetric influence of the oil price volatility index on stock returns. There has been some complexity in the link between oil prices and stock market performance. Researchers (Jiang et al., 2021) stock market performance may be impacted by sudden changes in the price of crude oil. Their study report covered a lot of ground since they wanted to assess the varied impacts of crude oil market volatility on the stock market. (Lean et al., 2023) claims that the most striking relationships are the ones between the price of crude oil and stock market performance. Companies that rely on oil as a production input may have varying reactions to the definite and unpredictable variations in cash receipt management caused by the stock market. Divergent investors' reactions to the known and unknown nature of oil market shocks may further accentuate the market's asymmetry.

It has taken a long time for the immensely complicated process behind the price of crude oil to accumulate. As a result, there is a cap on how much the price of domestic crude oil may rise or fall. Therefore, according to Jain, A., the effect of the fluctuating price of crude oil on India's actual economy is minimal. (Wang et al., 2023) India has lately given serious consideration to the changeover of its high-tech stock market-linked oil price instrument. The recent revision in India's crude oil pricing structure in 2012 is considered a watershed moment in the country's history of such transformation. The Indian government's national oil price regulator was considerably de-bureaucratized after this change. Now more than ever, it is essential to evaluate how the crude oil reform would affect the ties between the Indian market and the volatility of oil prices. (Sadiq et al., 2022) shown that the 2012 reform exaggerated the correlation between the state of the Indian stock market and oil prices. This approach does not include the asymmetry of oil price fluctuations or the impact of stock market volatility. Using this skeleton, the study defends the 2012 crude oil reform and establishes whether or not the 2012 market reform substantially altered the connection between the crude oil price index.

This study examines the heterogeneous impacts of crude oil price volatility (as measured by the crude oil price volatility index) on Indian market returns over a spectrum of market environments. The following aspects of the economy pique its interest. For example, there is a dearth of literature that examines the connections between crude oil price predictability and Indian market performance from the viewpoint of the indirect crude oil price volatility index. Thus, the heterogeneity of stock market return distributions and the heterogeneity of crude oil price index shocks have been ignored in prior research examining the correlation between these two variables. The study addresses these shortcomings by using a quantile technique to decompose deviations into changes in the positive and negative crude oil price volatility index. Finally, following the stock market reform, further research is needed to determine how the refined crude oil pricing mechanism in India has affected the correlation between crude oil and equities. This article mainly examines the effect of the Indian crude oil reform of 2012 on the correlations between price fluctuations in crude oil and changes in the value of the Indian stock market. The remaining study is organized in a shadow-based fashion. In this section, we will provide a summary of the literature review. Parts 3 and 4 cover the

research strategies and data accessibility. After presenting the empirical results, the repercussions on the economy are discussed. In the last part, we may draw some conclusions and consider the policy implications.

2. Research methodology

The study examines the impact of various market circumstances on the Indian stock market as well as the varied effects of the market's erratic fluctuations in the price of crude oil. Beginning with the following, empirical calculations incorporating possible impacts of control variables:

$$sr_t = \gamma + \alpha_1 OPVI_t + \alpha_2 IRC_t + \alpha_3 ERC_t + \alpha_4 sr_{t-1} + \mu_t \quad (1)$$

In (1), OPVIt denotes the OPVI swing at time t, and srt stands for the returns from the Indian market at that time. Relationships between the price of crude oil and stock market returns are commonly researched, therefore the study may be applied to situations where macroeconomic variables are managed. Authors: (Cui et al., 2023). That's why you can get the relevant interest and exchange rate shifts in equation (1). To factor in the impact of prior data on macroeconomic variables, a lagged return (denoted srt1) is also included in the analysis.

Increases and decreases in crude oil price unpredictability strain stock market returns, which is not accounted for by equation (1), which assumes that the consequences of oil price volatility index shockwaves on India's stock market returns are proportional. To back up this restriction, we may write the following change equation (1):

$$sr_t = \gamma + \alpha_{21} OPVI_t^+ + \alpha_{22} OPVI_t^- + \alpha_2 IRC_t + \alpha_3 ERC_t + \alpha_4 sr_{t=1} + \mu_t \quad (2)$$

This, correspondingly, has the greatest (OPVI + t, 0) and lowest (OPVI - t, 0) values.

OPVI+t = OPVI(t, 0), and OPVI(t, -1) = OPVI(t, -1) are calculated using equation (2). Last but not least, after making the following adjustments to equation (2), we may determine if the 2012 Indian crude oil reforms had a noticeable impact on the correlations between OPVI fluctuations and stock market performance.

$$sr_t = \gamma + \alpha_{21} OPVI_t^+ + \alpha_{22} OPVI_t^- + \alpha_{21} OPVI_t^+ Dum_t + \alpha_{22} OPVI_t^- Dum_t + \alpha_2 IRC_t + \alpha_3 ERC_t + \alpha_4 sr_{t=1} + \mu_t \quad (3)$$

According to equation (3), the DUMt denotes a dummy variable value of 1 if the time series data have been considered within the inquiry period. Looking at equations 1 through 3 is all that can be done to anticipate the typical characteristics of OPVI price changes on the Indian stock market. Typically, the market will respond to different market circumstances throughout time. As a result, policymakers and investors are keen to get a comprehensive understanding of the interplay between crude oil price volatility and stock market returns across a range of market situations. To solve this problem, (Chien et al., 2022) presented a quantile regression model that allows for the examination of the influence of independent variables on dependently selected distributions. The quantile regression method, which is related to OLS (ordinary least squares) regression, may provide more accurate findings since it is less sensitive to statistical data and the impact of heterogeneity on the dependent variable.

3. Data availability

The data for this study are analyzed on a daily basis. The study sample spans the years 2010–2023, which correspond to the years in which the crude oil price volatility index (OPVI) is published. Data from the CMIE report database, the CBOP, and the Indian VXI stock prices all corroborate the OPVI findings. The article selects one compound index and 10 sectoral indexes to provide a comprehensive analysis of the Indian stock market. Selecting these 10 sector stocks will help mitigate the effect of the crude oil price drop on the broader market. In general, investors look for a wide range of qualities in the firms they back. Investors may devise more effective selection techniques for stocks and companies by considering the diversity across industries

Table 1: Descriptivve Analysis of Varaiables

s	Variable	Mean	S. D	Skew.	Kurt	ADF	PP
	ISMCI	−1.765	0.876	−1.987	4.876	−24.7658**	−29.0876**
	GOLD	−0.080 4	1.659 2	−0.5488	5.7488 *	−37.87657*	−38.9876**

IT	−0.0273	1.3548	−0.1857	4.6627	−34.0327**	−39.0896**
STOCK	−0.0016	2.0568	−0.6446	4.7056	−35.2465**	−37.4951**
FMCG	0.08678	1.8675	−0.9765	5.6543	−35.9786**	−36.5765**
MTI	0.0765	1.8765	−0.8796	5.0876	−29.8765**	−36.8675**
HCS	0.5464	2.0654	−0.7987	5.9873	−39.7658**	−43.0679**
Pharma	0.0675	1.3765	−0.765	5.9876	−33.0765**	−39.45332**
ENE	0.567	2.6547	−0.9776	6.6735	−41.8781**	−42.9879**
CMD	0.7654	1.8765	−0.9876	4.9876	−38.9647**	−37.5489**
TMC	0.8765	2.6579	−0.7218	4.7557	−41.8743**	−47.3217**
OPVI	−0.0726	0.0889	−0.8969	5.1987	−42.6759**	−40.6754**
IRC	−0.7617	3.657	0.5679	8.2678	−26.4567**	−46.5698**
ERC	0.5687	0.7943	−12.6789	328.456	−7.567**	−48.76561**

In this context, the acronyms ISMCI, GOLD, ITS, STOCK, and FMCG stand for the Indian Stock Market Composite Index, the Automobile Industry, the Information Technology Sector, the Financial Services Industry, and the Fast-Moving Consumer Goods Market, respectively. Industries that are impacted by changes in interest and exchange rates include CMD (Consumer Durables), TMS (Telecommunication Services), COPV (Crude Oil Price Volatility Index), and ERC (Exchange Rate Changes). The sample spans the months of March 2010 through March 2020. "**" indicates a significance level of 5%.

In contrast, kurtosis measures how tally a collection of non-normally distributed data's frequency distributions are. Although Ordinary Least Squares (OLS) regression is often employed for this purpose, this might lead to erroneous estimations since it implies the error component has a normal distribution. However, the QRM (quantile regression method) may assist to address this weakness if a more thorough explanation is included. The ADF and PP (Augmented Dickey-Fuller and Phillips-Perron) tests are used to examine the order of integration. The unit root order of the series is the null hypothesis (Ho), which is compared to the alternative (Sy), in the ADF and PP tests for stationarity. The ADF and PP tests' findings, which demonstrate that all variables are stable at a 5% level of significance, support this claim. The data that show the model's quality are shown in Table 1. For ERC data, a little kurtosis deviation indicates that the sample distribution is not normal. The excess kurtosis (ERC) statistics for each series of FX fluctuations also show it. Kurtosis is only helpful when combined with the standard deviation. Think about an investment that has a low overall standard deviation and a high kurtosis.

This depicts the behavior of the oil price volatility index (OPVX) throughout the course of the whole sample period. The oil price volatility index (OPVX) shows many significant peaks. The biggest spear is thought to be the financial crisis of 2008–2009. The oil price volatility index rose to a new all-time high during the financial crisis. In June 2012, the oil price volatility index also depicts a huge spear. The external factors, which also had an impact on the rise in the price of crude oil, tempered stock market advances. The potential of US and European market debt default is to blame

for the sharp increase in oil price uncertainty in India. The solution to this conundrum may lie in the overproduction of oil. In summary, the large changes in the oil price volatility index show that the Indian crude oil market is unstable.

4. Empirical analysis

Implications of a fluctuating volatility index for crude oil prices under various market scenarios: Using the QRM, this paper's authors begin by studying the impact of OPVI shifts on stock returns. Ordinary least squares regression estimates are shown in this study using equation (1) for ease of comparison. When examining the average effects of the independent factors on the values of the dependent variables, (Bugshan et al., 2023a) recommend using OLS (ordinary least squares) regression. According to the value 1 in column 10 of Table 2, the study finds that fluctuations in the oil price volatility index have a negative effect on overall and stock market returns in the study's selected sectors. These findings prove that decreased average stock returns may be attributed to increased market uncertainty for crude oil in India. Two primary causes have been identified for this problem. Crude oil is used in a wide variety of industrial processes, but its price volatility has a detrimental effect on real estate investments, which in turn reduces stock returns. However, with the development of the crude oil futures market and the refinement of oil derivatives, the crude oil market has become an integral part of the Indian financial system. When combined with OLS regression, the quantile regression model (QRM) provides an even more flexible and comprehensive representation for studying the impact of changes in the price of crude oil on the returns on the Indian stock market over a wide range of market situations. Using equation (3), the article has shifted its focus to the QRM (quantile regression method). Columns 2–7 of Table (2) provide the findings. Table 3 shows the estimated effects of OPVI changes on the returns of the Indian stock market at various quantiles. The estimates reveal that changes in the OPVI have a negative effect on stock market returns at the low quantiles of 0.15, 0.35, and 0.50.

Table 2. Estimation of outcomes for the OPVI Fluctuations.

	Variables		0.157	0.398	0.57	0.758	0.958	OLS
I	ISMC	α1	−0.8735***	−1.698***	−0.655***	−0.4588**	−0.675**	−0.6525
		α2	0.0076	0.6885	0.678	0.0987	0.645	−0.5692
		α3	−0.6668***	−0.8762**	0.6875**	0.9875**	0.875***	0.0348
	GOLD	α1	−0.1876***	−0.56878***	−0.4532***	0.08765	0.0766	−0.0876***
		α2	0.543	0.0987	04456	−0.3659***	−0.5687***	−0.5678
		α3	−1.5983***	−1.7148**	−0.6543**	−0.6543	−0.456	−0.6543***
	IT	α1	−0.3654***	0.0765	0.765	−0.876**	−0.032*	0.0019
		α2	0.0168	−0.0358**	−0.012**	−0.0199	0.001	−0.0249***
		α3	−2.7418***	−0.0588**	−0.071	−0.0979	−0.201**	−0.0299
	STOCK	α1	−0.1288***	−1.7568**	−0.437**	−0.4185**	0.157	−0.8849***
		α2	0.0328	0.0586*	0.025	−0.0149	0	0.0279
		α3	−1.3648***	−0.0483**	−0.016**	−0.0098	−0.019	−0.0378***

		α_1	−0.4372**	0.019	−0.046**	−0.3178	−0.332**	−0.0999				
FMCG		α_2	−0.0827	−0.6397	−0.552	−0.2799	−0.253	−0.5784**				
		α_3	−1.3647	0.1094**	0.231***	0.0028	−0.004	0.0685**				
		α_1	−0.0296***	−0.0596**	−0.032**	0.0019	−0.011	−0.0293***				
	MTI	α_2	−0.0159	0.0629	−0.046**	−0.4139***	−0.557**	−0.2219*				
		α_3	−1.2169	−0.2608	−0.216	−0.1428	−0.318	−0.4128*				
		α_1	−0.1492***	0.3581**	0.217***	−0.0128	−0.018	0.0839**				
	HCS	α_2	−0.0139	−0.0084**	−0.032	−0.0078	−0.032	−0.0148***				
		α_3	−1.2587*	0.018	−0.046**	−0.3771**	−0.293**	−0.0687				
		α_1	−0.6318**	−0.0481	−0.157	−0.4377	−0.334	−0.3469*				
Pharma		α_2	−0.0108	0.2186**	0.201**	0.0026	0.01	0.0438**				
		α_3	−1.0718	−0.0286**	−0.019**	−0.0067	−0.018	−0.0297***				
		α_1	−0.2941***	0.348	−0.215**	−0.4389***	−0.532**	−0.1392**				
	ENE	α_2	0.0087	0.418	−0.324	−0.2288	−0.343	−0.3519				
		α_3	−0.3879***	0.5118**	0.063***	−0.0018	−0.037	0.0379**				
		α_1	−0.3291***	−0.0158**	−0.071**	−0.0039	−0.021	−0.0139***				
	CMD	α_2	−0.1429	0.0538	−0.142**	−0.2691***	−0.610**	−0.0497***				
		α_3	−1.4297*	−0.3147	−0.137	−0.5438*	−0.732**	−0.3429*				
		α_1	−0.3049***	0.0172**	0.051***	0.0168	0.017	0.0638**				
	TMC	α_2	−0.0497***	−0.0375**	−0.014**	−0.0039	0.009	−0.0279***				
		α_3	−1.4789***	0.0257	0.046***	−0.4882***	−0.578	0.0129				

The first source is the OPVI fluctuation coefficient, which is 1. Coefficients 2 and 3's values represent, respectively, how sensitive stock market returns are to changes in interest rates and exchange rates. The symbols "*", "**", and "***", respectively, denote the significance at the 10%, 5%, and 1% levels.

Table 3. The outcomes of the estimation for the positive and negative impact on the OPVI fluctuation movement.

	Variables		0.152	0.307	0.508	0.759	0.985	OLS
GOLD		A_{21}	−0.2451**	−0.0481	−0.0277	−0.0257	0.0189	−0.0283**
		A_{22}	−0.0325	0.0238	−0.0116	0.0054	0.0458	−0.0159
		$H_0: \alpha_{21} = \alpha_{22}$	−1.5778**	−0.8277*	−0.3165	−0.3786	−0.1068	--0.7558**
	IT	α_{21}	−0.0683**	−0.0466***	−0.0269**	−0.0632***	−0.0828	−0.0493**
		α_{22}	0.0139	−0.0176	−0.0096	−0.0466	−0.0247	−0.0198
		$H_0: \alpha_{21} = \alpha_{22}$	−2.1457**	−1.1539	−0.4785	−0.6276	0.0882	−0.7039**
STOCK		α_{21}	−0.0637**	−0.0931**	−0.0862**	−0.0256	−0.0845	−0.1647**
		α_{22}	−0.0265	−0.0294	0.0155	−0.0356	−0.0272	−0.0208
		$H_0: \alpha_{21} = \alpha_{22}$	−1.2567	−0.7359	−1.1615	0.2436	−0.1904	−1.2869
FMCG		α_{21}	−0.0718**	−0.0419	−0.0146**	0.0247	0.0339	−0.0683**
		α_{22}	−0.0175*	0.0189	0.0144	−0.0617	−0.0278	−0.0619
		$H_0: \alpha_{21} = \alpha_{22}$	−1.6207*	−1.1636	−0.5234	0.5747	0.2773	−0.3787
	MTI	α_{21}	−0.0267	−0.0425	0.0144	−0.0537	−0.0804	−0.0675**
		α_{22}	−0.0159	−0.0254	−0.0125	0.0488	−0.0082	−0.0619
		$H_0: \alpha_{21} = \alpha_{22}$	−0.8309	−0.2473	0.4315	−0.6248	0.0957	−0.3609
	HCS	α_{21}	−0.0970**	−0.0073	−0.0058**	−0.0748	−0.0820	−0.1450**
		α_{22}	−0.0295**	−0.0262	0.0137	−0.0378	−0.0873	−0.1267

		$H_0: \alpha_{21} = \alpha_{22}$	−1.5729*	−0.1643	−0.5207*	0.5648	0.0972	−1.1869
Pharma		α_{21}	−0.0918**	−0.0855**	−0.0107	0.0588	0.0086	−0.1063**
		α_{22}	−0.0199**	0.0176	−0.0058	−0.0309	−0.0682	−0.1297
		$H_0: \alpha_{21} = \alpha_{22}$	−1.5269	−0.5277	−0.0218	0.3519	0.6906	−0.7248
ENE		α_{21}	−0.0498**	−0.0587*	−0.0368	−0.0259	−0.0834	−0.1478**
		α_{22}	0.0909	0.0129	0.0319	0.0391*	0.0408	0.0546
		$H_0: \alpha_{21} = \alpha_{22}$	−1.6939*	−1.6149*	−0.7519	−1.0193	−0.3878	−2.0817**
CMD		α_{21}	−0.0498**	−0.0378	−0.0492*	0.0579	−0.0078	−0.1684**
		α_{22}	−0.0369**	−0.0037	0.0939	−0.0419	−0.0910	−0.0766
		$H_0: \alpha_{21} = \alpha_{22}$	−1.6938*	−1.0386	−1.0789**	0.6038	0.0198	−1.2637
TMC		α_{21}	−0.0799**	−0.0554**	−0.2086	0.0297	0.1038	−0.02997***
		α_{22}	−0.02495***	−0.0185	−0.02798	−0.03067	−0.09573	−0.01796
		$H_0: \alpha_{21} = \alpha_{22}$	−1.42585*	−0.3085	−0.08948	0.31675	0.88178	−0.41937

While negative OPVI changes have a value of, positive OPVI shockwaves have a coefficient of. We adopt the H0 (null hypothesis) of the analyzed limits on statistical parameters, which is that 21 = 22, to ascertain if OPVI movements have asymmetric effects on the Indian stock market. Significant amounts are shown by the symbols "*", "**", and "***" at 10%, 5%, and 1%, respectively.

Table 4. Quantile regression slope testing equality of means/Medians (independent samples) for positive and negative impact on OPVI fluctuation movement.

Variables		0.153	0.957	Q. R	0.158	0.9586
GOLD	α_{21}	−3.0761***	−1.4896**	α_{22}	0.8767	−0.1763
IT	α_{21}	−4.2654***	−1.6475***	α_{22}	0.4328	0.2564
STOCK	α_{21}	−2.6754***	−2.0876***	α_{22}	0.9876	1.86765

FMCG	α_{21}	−1.8654**	−1.8765**	α_{22}	−0.8764	0.6547
MTI	α_{21}	−2.8798***	−1.0872***	α_{22}	−432	0.2141
HCS	α_{21}	−2.9654***	−2.08657***	α_{22}	−0.5643	0.5431
Pharma	α_{21}	−1.5983**	−1.8767**	α_{22}	0.7659	0.3185
ENE	α_{21}	−3.3479***	−1.76544***	α_{22}	0.3459	−1.07973
CMD	α_{21}	−4.7641***	−2.8767***	α_{22}	−0.5437	−0.234
TMC	α_{21}	−3.8766***	−2.4540***	α_{22}	−1.3423**	0.6575

Source: $\alpha_{21}$and α_{22} are the coefficients of the positive impact on OPVI changes and the negative impact on OPVI changes, correspondingly. "*" and "**" indicate the significance at the 10% level and the 5% level, individually.

Quantile regression technique slope testing equality of means/medians (independent samples) is carried out to ascertain if the estimated coefficients of the positive OPVI fluctuations (estimated coefficients of 11) and the negative OPVI fluctuations (estimated coefficients of 12) are heterogeneous diagonally QRM. Table (4) shows that the coefficient value at the quantile regression of 0.50 differs significantly between the quantile regression model of 0.50 and the quantile regression of 0.95, indicating that the positive OPVI fluctuations have heterogeneous features in Indian stock market returns throughout QRM. Quantile regression approach slope OPVI changes of the coefficient 11 basically reject the H0 across quantile regression values. The results show that the dispersed difference has to be considered when assessing the connections between the asymmetric OPVI and equities from different industries.

6. Conclusion and policy implications

The crude oil price volatility index is the best gauge of market uncertainty. Thus, a new viewpoint illuminates the monetary and economic significance brought on by the volatility of crude oil prices. Here, we use the OPVI to investigate oil price volatility and its relationship to the Indian market. This study first analyzes the conditional asymmetry between the OPVI and returns on the Indian stock market by using a quantile regression model and factoring in the consequences of the uncertainty surrounding the price of crude oil. Since this change significantly weakens the local oil price regulator, this research looks at the effects of the 2012 and 2013 adjustments to India's pricing instrument on the relationships between OPVI swings and Indian stock market returns. The empirical results indicate that uncertainty fluctuations in the crude oil market primarily harm the returns on Indian stocks during underperforming periods, and that these effects are most pronounced at the lowest quantiles of total and stock returns for specific industries. Furthermore, the paper finds that throughout the treatment period, positive OPVI oscillations, rather than negative OPVI changes, are mostly responsible for these undesirable consequences. The results show that shockwaves of uncertainty over the price of crude oil have an adverse asymmetrical influence on investor sentiment. The rising unpredictability of crude oil prices is a major factor impacting stock performance. Finally, empirical results reveal that the change in 2012 did not eliminate the negative associations between positive OPVI swings and poor stock market performance at the lower quantiles. Complex economic conditions, sometimes including financial crises, and the rapid financialization of the crude oil sector have all contributed to the market's expansion in recent years. Given India's reliance on foreign supplies of crude oil, policymakers and investors alike are understandably worried about the market's vulnerability to oil price shocks. Therefore, the findings of this study are significant and provide useful insights on financial risk and investment choices. The waves of instability in the crude oil market should prompt investors to return to the Indian stock market. When the market is down, an increase in uncertainty about the price of crude oil is something that the Indian government and authorities should pay special attention to. The financial risk that the increase in the price of crude oil caused may also be avoided if investors pick the volatility products tied to fluctuations in OPVI.

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