**Original Research Article**

**Analysing the Impact of Global Market Indicators on Nifty 50: Evidence from**

**Quantile Regression**

**Abstract:**

This study inspects how selected five global market indicator such as the Dow Jones Industrial Average, WTI crude oil prices, gold prices, the U.S. 10-year Treasury yield, and the Dollar Index influence India’s Nifty 50 index across the return distribution. Using 1,512 weekly observations spanning November 1995 to October 2024, we employ **quantile regression** to capture heterogeneous effects across nine quantiles (τ = 0.1 to 0.9), addressing issues of non-normality and heteroscedasticity that traditional OLS methods fail to resolve. The Dow Jones displays a strong and statistically significant influence on Nifty 50 returns across all quantiles, endorsing global equity interdependence. Gold and U.S. bond yields have varying degrees of impact across the quantile spectrum, while the Dollar Index exerts mixed, mostly negative effects. Notably, WTI crude oil displays no statistically significant impact across any quantile. By offering a long-horizon, distribution-aware analysis, this research enhances understanding of how global shocks transmit to Indian equity markets. The findings provide insights for investors managing exposure in emerging markets and for policymakers aiming to strengthen financial market resilience against external shocks.

**1. Introduction:**

The connection of world financial markets and India's Nifty 50 index has grown with financial integration intensifying after LPG policy adopted by India in 1990. Global benchmarks like the Dow Jones, U.S. Treasury yields, the Dollar Index, crude oil, and gold prices affect investor sentiment and capital flows in emerging economies like India. Fluctuations in the benchmarks can potentially influence stock prices at home and cause volatility or directional action in the Nifty 50. The interdependence is a reflection of India's sensitivity to global shocks and the necessity for investors and policymakers to track global market trends while evaluating risks, managing portfolios, or crafting macroeconomic and financial stability policies.

Nifty 50, comprising the 50 largest and most liquid stocks traded on the National Stock Exchange of India, is a benchmark of the Indian equities market. Meanwhile, the Dow Jones Industrial Average (DJIA) is a significant indicator of the U.S. equities market, reflecting the performance of 30 prominent American companies. Such indexes not only reflect domestic economic conditions but also reflect cross-market interdependencies, particularly in the context of global financial integration.

Among the numerous global financial indicators, WTI crude oil prices, gold prices, U.S. 10-year Treasury yields, and the U.S. Dollar Index are among the key drivers of emerging equity market activity (Mishra et al., 2023). Each of these indicators reflects different macroeconomic and geopolitical forces. Crude oil prices, for instance, drive input costs and inflation expectations, especially in oil-importing countries like India. Gold always considered as safe asset wyadavith behaviour inversely correlated to equities during uncertainty in the market. Bond yields drive investment between equities and fixed income with changes in the Dollar Index driving foreign investment flows through relative currency strength.

Though previous research has identified bilateral relationships between some of these variables with Indian markets, little empirical work exists on how they contribute to the Nifty 50 jointly and asymmetrically across the return distribution (Fathali et al., 2022). Traditional linear methods such as OLS (Ordinary Least Square) and GLS (Generalised Least Square) cannot track these features of non-normality and tail behaviour which are common in finance. This research bridges that gap with quantile regression to examine the impacts of five significant global indicators those are Dow Jones, WTI crude oil, gold, U.S. 10-year bond yield, and the Dollar Index on the Nifty 50 index returns using weekly returns from November 1995 to October 2024. This helps us to reveal heterogeneity of effects with varying market conditions (bull market-upper quantile, normal market-middle quantile, bear market-lower quantile phases), thus providing a distribution sensitive view.

The key contributions of the present research are:

* A longitudinal study that covers nearly three decades, giving the study temporal depth.
* The application of quantile regression to identify asymmetric and non-linear associations throughout the whole range of returns.
* An in-depth analysis of the relative importance of key world macro-financial variables to shape the Indian equity market.

These findings are helpful to policymakers who may make projections for market vulnerabilities due to shocks in the world financial market and portfolio managers who need risk adjusted solutions.

**2. Review of literature:**

The connection between the Indian equity market and world financial indicators has been widely studied, yet as of now, evidence is inconclusive and scattered, necessitating an integrated, distribution-conscious analysis. This section deals with the past studies which are crucial to draw conclusion how Indian stock market affected due to shock in world financial market.

**Stock Markets and Bond Yields:**

Various studies report a negative relationship between U.S. bond yields and Indian stock market performance. Increased bond yields are seen to push capital out of equities into fixed income securities, thereby placing downward pressure on stock indices such as the Nifty 50 (Paul & Reddy, 2022). The evidence is not consistent, as Balakrishnan & Rahman, (2022) reported that no material effect of U.S. bond yields on foreign institutional investor (FII) flows in the Indian equity market exists. Such inconsistency shows the necessity of techniques that can detect various types of relationships under different market scenarios versus mean based estimations alone.

**Dollar Index and Market Sentiment:**

The U.S. Dollar Index (DXY) is a macroeconomic barometer that has considerable but unpredictable effects on Indian markets. Kumar & Robiyanto, (2021) reported a significant effect of dollar index on India and Chinese stock market, meaning that the strength of US currencies influences capital flow decisions in other emerging markets. On the other side Tran & Nguyen, (2022) found that the relationship of dollar index and Indian stock market is dynamic and particularly sensitive during periods of global stress, e.g., the COVID-19 pandemic. These conflicting findings suggest the presence of non-linear or quantile-dependent effects that require further examination.

**Gold as a Safe-Haven Asset**

Gold previously had an inverse relationship with equity markets and acts as a hedge in times of market decline. Tripathy, (2016) discovered no causality between Indian stock market performance and the price of gold in the short run, whereas Afsal & Haque, (2016) and Al-Ameer et al., (2018) reported weak or changing inverse correlations in Saudi and German markets, respectively. These findings suggest that the function of gold can vary over time and in the kind of markets, supporting the utility of a quantile based approach in projecting such changing variation.

**Indian Market Volatility and Crude Oil**

Volatility in prices, especially of WTI crude, is generally associated with India's economic and stock market performance as India is a significant oil-importing economy. While (Sreenu, 2022) and Rahman & Kodikal, (2019) detected positive and significant correlations between oil prices and the Indian stock market, the direction and extent of the impact may differ depending on inflation expectations, exchange rates, and investor sentiment.

**Global Equity Spillover and in the Case of the Dow Jones:**

Global equity linkages between India and the U.S., more specifically, have been debated at large. Whereas Bhattacharjee & Das,( 2020) report no long-run co-integration between NSE Nifty and NASDAQ whereas Khondekar et al., (2009) indicated a robust short-run association between Indian and U.S. markets. Such contrast in results highlights the importance of modelling time-variant and distribution-sensitive effects of global indices like the Dow Jones on Indian equities.

**Research Gap and Rationale:** Although earlier work gives us partial evidence on how individual global indicators influence Indian markets, we find a definite lack of integration across variables and a weak examination of how these interactions vary as we move across various market regimes. There are some papers that examine the collective role of several global indicators, and even fewer use quantile regression to reveal how these effects vary along the distribution of returns. This research bridges that gap by analysing the asymmetric impacts of five prominent world indices those are Dow Jones, WTI crude oil, gold, U.S. 10-year bond yield, and the Dollar Index on the Nifty 50 for a long run weekly time series dataset and based on a quantile regression model.

**2.1 Research objective:**

* To study the impact of Dow Jones, crude oil, gold, bond yields, and the dollar index on the Nifty 50.

**3. Research methodology:**

For the study of the impact of Dow Jones, crude oil (WTI), gold (dollar denomination), US 10-year bond yield, and dollar index on the nifty50 index, data has been taken from investing.com. The period of study includes weekly data from November 5th, 1995, to October 27th, 2024. Here nifty is a dependent variable, and Dow Jones, WTI crude, gold (dollar denomination), US 10-year bond yield, and dollar index are independent variables. Before testing the impact of these variables, researchers decided to test the stationarity of these variables as it is utmost needed for any econometric model (Petrică et al., 2017).In order to apply any econometric model data stationarity is required so we decided to take return series of the above variables.

The return series are expressed are as follows.

– return series of all variables – Price of day “t”

- Price of day “t-1” – Log of natural base

**Quantile Regression**

The quantile model is effective in cases where there is heteroscedasticity and non-normality in the residual distribution (Koenker & Bassett, 1978; Koenker & Hallock, 2001).The quantile regression is the best regression model for study the impact of variables in the field of stock market (Yadav & Naik, 2024).

The Quantile Regression is described by the following equation.

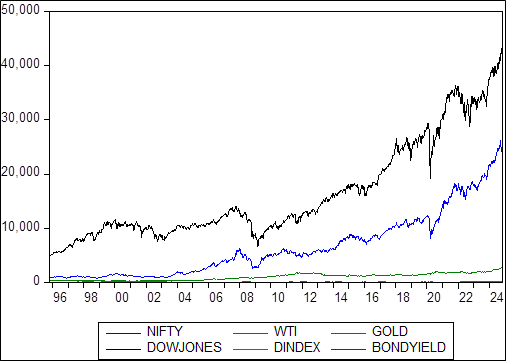
, where is the vector of unknown parameters related to the Quantile further the median regression also called least absolute deviation regression minimizes. The quantile Regression minimize which is a sum that produces the asymmetric penalties q representing under prediction and (1-q) for over prediction.

Where, are unknown parameter associated with qth quantile and is the error associated with qth quantile such that 0 < q < 1.

**4. Data analysis and Findings:**

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Figure 1: Raw data Figure2: Return series data

  
(Source: Authors Own) (Source: Authors Own)

In Figure 1 the level data are not in stationary so we decided to take return series as these are in stationary.

Table 1: Descriptive statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variables | RNIFTY | RWTI | RGOLD | RDOW | RDINDEX | RBYIELD |
| Mean | 0.00215 | 0.0009 | 0.001292 | 0.001426 | 0.000144 | -0.000207 |
| Median | 0.00397 | 0.00447 | 0.001808 | 0.002911 | 0.000458 | -0.000861 |
| Maximum | 0.14357 | 0.27576 | 0.1258 | 0.12084 | 0.047744 | 0.313009 |
| Minimum | -0.1738 | -0.3469 | -0.101316 | -0.200298 | -0.044346 | -0.408479 |
| Std. Dev. | 0.03051 | 0.05322 | 0.022883 | 0.024114 | 0.010606 | 0.046539 |
| Skewness | -0.2636 | -0.6007 | -0.030297 | -0.974539 | 0.074224 | -0.014106 |
| Kurtosis | 6.06931 | 7.81663 | 5.91969 | 11.7476 | 4.055323 | 11.43596 |
| Jarque-Bera | 611.011 | 1552.51 | 537.2806 | 5060.124 | 71.55181 | 4483.471 |
| Probability | 0 | 0 | 0 | 0 | 0 | 0 |
| ADF(P Value) | 0 | 0 | 0 | 0 | 0 | 0 |
| Observations | 1512 | 1512 | 1512 | 1512 | 1512 | 1512 |

(Source: Authors Own)

The descriptive statistics shows in table 1 and it is found that the Indian market nifty is more attractive market as the mean return is highest .00215 further the WTI crude oil market is most volatile having highest standard deviation value .05322. As the p value for Jarque-Bera statistics is less than.05 at the 5% level of significance, the distributions of variables are not normal. The variables are in stationary as it confirmed from augmented dicky fuller test as the p value are less than .05. To check the impact of these variables on nifty we first test ordinary least square (OLS) but after doing it we found the deviation OLS assumptions that the error term distribution must follow normality(Gujarati, 2003).

Table 2: Ordinary Least Square

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| RWTI | 0.011837 | 0.013984 | 0.846426 | 0.3974 |
| RGOLD | 0.091488 | 0.035337 | 2.588995 | 0.0097 |
| RDOWJONES | 0.474804 | 0.030973 | 15.32983 | 0 |
| RDINDEX | -0.267067 | 0.075801 | -3.523262 | 0.0004 |
| RBONDYIELD | 0.051202 | 0.016255 | 3.149962 | 0.0017 |
| C | 0.001388 | 0.00071 | 1.95663 | 0.0506 |
| R-squared | 0.192724 | Mean dependent var |  | 0.002145 |
| Adjusted R-squared | 0.190043 | S.D. dependent var |  | 0.030514 |
| S.E. of regression | 0.027462 | Akaike info criterion |  | -4.348089 |
| Sum squared resid | 1.14E+00 | Schwarz criterion |  | -4.326973 |
| Log likelihood | 3293.155 | Hannan-Quinn criter. |  | -4.340226 |
| F-statistic | 71.90644 | Durbin-Watson stat |  | 1.976591 |
| Prob(F-statistic) | 0 |  |  |  |

(Source: Authors Own)

Table 3: Auto correlation and Heteroscedasticity

|  |  |  |  |
| --- | --- | --- | --- |
| Breusch-Godfrey Serial Correlation LM Test: | | | |
| F-statistic | 0.148557 | Prob. F(2,1504) | 0.862 |
| Obs\*R-squared | 0.298636 | Prob. Chi-Square(2) | 0.8613 |
| Heteroscedasticity Test: Breusch-Pagan-Godfrey | | | |
| F-statistic | 0.821926 | Prob. F(5,1506) | 0.534 |
| Obs\*R-squared | 4.114772 | Prob. Chi-Square(5) | 0.533 |
| Scaled explained SS | 9.382573 | Prob. Chi-Square(5) | 0.0947 |

(Source: Authors Own)

Figure 3: OLS error term distribution

(Source: Authors Own)

In table 3 it is found that the OLS model is violate the assumptions of homoscedasticity and autocorrelation of error term and further the distribution of error term not following normality as the p value of Jarque-Bera test is less than .05 confirmed from figure 3, so we decided to proceed to Quantile Regression which is robust to deal heteroscedasticity.

Table 4: Quantile Regression output at different Quantiles

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Var/  tau | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| WTI | 0.0021 (.94) | 0.0057 (.74) | (-).003 (.83) | .00611 (.71) | 0.0066 (.71) | 0.0167 (.41) | 0.0172 (.36) | 0.0179 (.36) | 0.0381 (.06) |
| GOLD | 0.1010 (.16) | 0.0920 (.03) | 0.0865 (.04) | 0.1047 (.03) | 0.0947 (.05) | 0.0649 (.16) | 0.0678 (.15) | 0.1220 (0) | 0.1150 (.02) |
| DOW | 0.4474 (0) | 0.4605 (0) | 0.4952 (0) | 0.4860 (0) | 0.4889 (0) | 0.4696 (0) | 0.4950 (0) | 0.5084 (0) | 0.5044 (0) |
| DINDEX | (-)0.277  (.08) | (-)0.247 (.02) | (-)0.316 (0) | (-)0.213 (.03) | (-)0.153 (.10) | (-)0.150 (.09) | (-)0.098 (.25) | (-)0.143 (.08) | (-)0.300 (0) |
| BONDYIELD | 0.02043 (.30) | 0.0490 (0) | 0.0423 (.07) | 0.0290 (.18) | 0.0360 (.07) | 0.0447 (.01) | 0.0327 (.04) | 0.0458 (.02) | 0.0755 (0) |
| C | (-).0306  (0) | (-)0.017 (0) | (-)0.009 (0) | (-)0.003 (0) | 0.0020 (0) | 0.0080 (0) | 0.0140 (0) | 0.0212 (0) | 0.0313 (0) |
| Pseudo R-squared | 0.0975 | 0.10427 | 0.10646 | 0.10167 | 0.09610 | 0.09083 | 0.09047 | 0.09817 | 0.108320 |
| Prob(Quasi-LR stat) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(Source: Authors Own)

\*The p value of corresponding coefficient are in bracket ( )

From Table 4, the WTI crude have no significant impact on nifty throughout all the quintiles (may be bear, moderate or bull phase) as the p value are more than .05. In case of gold it is not significant at .1, .6 and .7 but it has significant impact on nifty in all others quantiles. It signify that during bull phase the impact of gold price is significant on nifty index. Interestingly the US market has significant impact on Indian stock market as the Dow has significant impact on nifty across all quantiles because the p value are less than .05 across all quantiles. The impact of US stock market is significant in all phases of market on Indian stock market. The dollar index have significant impact at .2, .3, .4 and .9 quantiles which indicates that in case of bear and bull phase the impact of dollar index on Indian stock market is significant. Apart form .3, .4 and .5 quantile the US 10 year bond yield have significant impact on nifty. The quasi LR statistics p values are less than .05 so it is assumed that the model is stable. The median, or.5 quantile regression equation, will be as follows:

Nifty50(.5q)=0020+.0066\*WTI+.0360\*Bondyield+(.153)\*Dollarindex+.4889\*Dowjones+.0947\*Gold (US Dollar).

At the middle level of Nifty (50 % of the distribution) 1 percent change in WTI is associated with .66 percentage increase in nifty, similarly 1 percentage change in bond yield creates .36 percentage change in nifty, but increase of dollar index 1 percentage changes having negatively impact nifty .153 percentage. 1 percentage change in Dow and gold creates.48 percentage and .094 percentage in nifty respectively.

Figure 4: Graphical presentation of coefficient of independent variable across the quantiles

(Source: Authors Own)

From figure 4 it is found that the coefficient of different independent variable across different quantile varies which indicates that the impact of these variables on Nifty is different across different market phases.

**5. Conclusion:**

This study addresses the dynamic impact of key global indicators, such as WTI crude oil, gold prices, and major stock indices on the Nifty 50 index using quantile regression, a method well-suited for capturing variations across the return distribution. Its relevance lies in highlighting how the financial and commodity market linkages behave under different market conditions, especially during extreme quantiles, offering more nuanced insights than traditional mean-based models.

The study's findings provide crucial insights into how key global and domestic issues affect the Nifty 50 index. The study uses quantile regression to provide a robust analysis that accounts for heteroscedasticity and non-normality in the dataset. The findings show that the Dow Jones has a consistent and significant influence across all quantiles, illustrating the interdependence of the Indian stock market on US stock markets. Similarly, gold prices have a considerable impact on the Nifty across most quantiles, proving its importance as a safe-haven asset in times of market instability. The impact of the US 10-year bond yield and the Dollar Index varies by quantile, with the bond yield positively influencing the Nifty in multiple quantiles while the Dollar Index has a negative association at higher quantiles. Interestingly, WTI crude oil had no significant influence, implying that oil price swings did not directly impact the Indian stock market during the study period. These findings emphasise the role of global market dynamics in determining the Indian stock market. These findings provide valuable implications for both investors and policy makers in Indian context. For investors especially portfolio managers and institutional stakeholders the results emphasize the importance of adopting risk management strategies that are sensitive to different market conditions. In periods of bull market (upper quantile), the impact of US bond yields and dollar index is significant on Indian stock market increasing becomes pronounced, indicating the need for measurement to global interest rate movement and vigilance towards currency fluctuations. On the other hand, during decreases or bears phase (lower quantities), gold and Dow Jones appear as more influential. These insights support more informed synchronization, timely rebalancing, and dynamic property allocation strategies based on global market signal.

For policy makers, the constant effect of Dow Jones in all segment strengthens the idea that the Indian stock market is practically linked with global market cycles, especially those in the United States. This mutual connection emphasizes the need for strong macro prudent policies that can cushion the domestic financial system against external accidents. In addition, the asymmetric effect of the dollar index and US bond yield on different segments of the return distribution indicates that India's monetary and exchange rate framework should be reactive to developing international financial conditions especially when handling volatility of volatile flows of foreign money and maintaining investor confidence. This study provides a rich, subtle understanding of how global forces work with India's stock market by moving beyond average results and examining the full distribution of market responses, supporting both controlled investment decisions and evidence based policy formulation. Understanding these links can help policymakers develop mitigation methods for exogenous shocks. This research provides investors with useful insights into the key drivers of the Nifty, allowing them to make more informed investment decisions. It contributes to the scientific community by expanding the methodological application of quantile regression in emerging market contexts, particularly within the Indian equity market. Future research could expand this approach to include more factors like investors sentiment (Bharti et al., 2025) and investigate dynamic relationships during times of increased global economic instability.

Disclaimer:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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