

Investigating the Impact of Crypto Currency Market Movements on Selected Indian Sectoral Stock Markets Using Explainable Regression Techniques

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Abstract: Cryptocurrencies have emerged as a significant component of the global financial systems, attracting considerable attentions from investors, researchers and policymakers. Simultaneously, Indian sectoral stock market plays a crucial role in the country's economic development and investment landscape. Due to their high volatility, crypto currency markets may influence traditional financial markets and investment decisions. This study investigates the impact of crypto currency market movements from on selected Indian sectoral stock markets, including the information Technology, Banking, Pharmaceutical sectors. Historical data from major cryptocurrencies and sectoral stock indices like Bitcoin, Ethereum, Nifty IT, Nifty Bank, and Nifty Pharma indices which was collected and analyzed using explainable regression techniques. Based on the given datasets, the findings provide valuable insights into the relationship between cryptocurrency markets and selected Indian sectoral stock market indices, particularly in understanding how crypto currency market fluctuations during major global events, such as pandemics, geopolitical conflicts, and economic uncertainty, may influence investor behavior and sectoral performance across the Indian economy.

Keywords: Cryptocurrency, Economy, Investor, Nifty.

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I. INTRODUCTION

Cryptocurrency is a digital form of currency that operates on decentralized block chain technology without the need for a central authority. Since the introduction of Bitcoin in 2009 and Ethereum in 2015, crypto currencies have gained significant attention from investors, researchers, and financial institutions worldwide. However, crypto currency markets are highly volatile, experiencing frequent and substantial price fluctuations. Between 2019 and 2023, digital currency markets were influenced by several major events, including the COVID-19 pandemic, the Russia-Ukraine conflict, rising inflation, and the collapse of major digital currency platforms such as Terra/Luna and FTX. These events increased market uncertainty and highlighted the interconnectedness of crypto currency and traditional financial markets. At the same time, sectoral indices such as Nifty IT, Nifty Bank, and Nifty Pharma play an important role in representing the

performance of key sectors of the Indian economy. These indices were selected for this study because they represent key sectors of the Indian economy with distinct characteristics. The Information Technology sector was chosen due to its strong association with technological innovation and digital transformation, which may make it more sensitive to developments in cryptocurrency markets. The Banking sector was selected because financial institutions play a crucial role in investment activities, monetary transactions, and the adoption of emerging financial technologies. The Pharmaceutical sector was included to provide a comparison with a relatively defensive industry whose performance is often influenced by healthcare demand rather than technological or financial market trends. Changes in investor sentiment and financial conditions may affect these sectors differently, making them suitable for comparative analysis. Although previous studies have focused primarily on crypto currency price forecasting,

limited research has examined how crypto currency market movements influence Indian sectoral stock markets. Therefore, this study investigates the relationship between Bitcoin and Ethereum price movements and the performance of sectoral stock markets of India using explainable regression techniques. The study aims to determine whether crypto currency fluctuations affect these sectors and to identify which sector is most sensitive to such movements.

II. LITERATURE REVIEW

Susovon Jana and Tarak Nath Sahu (2023) investigated whether cryptocurrencies could improve investment diversification in the Indian equity market. The study found that Bitcoin and Ethereum can contribute to portfolio diversification, although their effectiveness depends on market conditions and price volatility. These findings demonstrate the growing importance of cryptocurrencies in the Indian financial market. Nevertheless, the study does not examine how cryptocurrency price movements affect specific sectors of the Indian stock market. Building on these findings, the present research analyses the impact of Bitcoin and Ethereum on Nifty IT, Nifty Bank, and Nifty Pharma to better understand the relationship between cryptocurrency markets and selected Indian sectoral stock market indices.

Susovon Jana and Tarak Nath Sahu (2023) investigated the potential role of cryptocurrencies in improving investment diversification within the Indian equity market. Their study primarily focused on the relationship between major cryptocurrencies, particularly Bitcoin and Ethereum, and the Indian stock market. The findings indicated that cryptocurrencies can provide diversification benefits when incorporated into traditional investment portfolios. Bitcoin and Ethereum were found to have the potential to reduce portfolio risk because their price movements do not always correspond closely with movements in conventional equity assets. However, the extent of these diversification benefits was found to vary depending on prevailing market conditions, volatility, and changes in investor behaviour.

The study is particularly relevant because the increasing adoption and recognition of cryptocurrencies have introduced a new asset class into the financial investment environment. The relatively independent price movements of cryptocurrencies may provide investors with opportunities to construct more diversified portfolios. At the same time, the highly volatile nature of cryptocurrency prices makes their inclusion in investment portfolios a complex decision. Factors such as market uncertainty, speculative trading, global economic developments, regulatory changes, and changes in investor sentiment can significantly influence cryptocurrency prices and consequently affect their diversification potential.

Although Jana and Sahu (2023) provide important evidence regarding the relationship between cryptocurrencies and the broader Indian equity market, their study does not specifically examine how cryptocurrency price movements influence individual sectors of the Indian stock market. Sectoral indices may respond differently to changes in

cryptocurrency prices because each sector has distinct economic characteristics, investor profiles, and exposure to technological and financial developments.

Building on the findings of Jana and Sahu (2023), the present research extends the analysis by examining the relationship between Bitcoin and Ethereum prices and three selected Indian sectoral indices: Nifty IT, Nifty Bank, and Nifty Pharma. By comparing these sectors, the study aims to determine whether cryptocurrency price movements have a significant impact on sector-specific stock market performance. This approach may provide a more detailed understanding of the interconnectedness between the emerging cryptocurrency market and different segments of the Indian equity market.

III. METHODOLOGY

This study adopts a quantitative research methodology, as it enables the analysis of numerical data using statistical techniques. The research is based entirely on secondary data, consisting of the monthly closing prices of Bitcoin (BTC), Ethereum (ETH), Nifty IT, Nifty Bank, and Nifty Pharma for the period January 2019 to December 2023. Cryptocurrency price data were collected from Investing.com, whereas the sectoral stock market index data were obtained from NSE India. Monthly closing prices were selected to ensure consistency in the dataset and to minimize the influence of short-term market fluctuations.

For the purpose of analysis, Bitcoin and Ethereum were considered the independent variables, whereas Nifty IT, Nifty Bank, and Nifty Pharma were treated as the dependent variables. The collected data were organized and analyzed using Microsoft Excel, which provided the necessary tools for statistical analysis and graphical representation.

The analysis began with descriptive statistics, including the mean, median, standard deviation, minimum value, and maximum value, to summarize the characteristics and distribution of the data. This was followed by Pearson's correlation analysis, which measured the strength and direction of the relationship between cryptocurrency prices and the selected sectoral stock market indices. Finally, linear regression analysis was performed to evaluate the extent to which variations in the prices of Bitcoin and Ethereum explain changes in the performance of Nifty IT, Nifty Bank, and Nifty Pharma.

IV. RESULT AND DATA ANALYSIS

The result was obtained from statistical analysis is presented and interpreted (from table 1.1) to measure the statistics for correlation and linear regression in Microsoft excel. The Descriptive statistics provide a summary of the characteristics of the dataset by presenting measures of central tendency and dispersion. In this study, the mean, median, standard deviation, minimum value, and maximum value were calculated for Bitcoin, Ethereum, Nifty IT, Nifty Bank, and Nifty Pharma.

Table 1 Descriptive Statistics of Bitcoin, Ethereum, Nifty IT, Nifty Bank and Nifty Pharma (2019–2023)

Column1	NIFTY IT	NIFTY PHARMA	NIFTY BANK	BITCOIN	ETHEREUM
MEAN	24632.49	11706.87	33930.78	1892954.99	110510.73
MEDIAN	26936.75	12366.45	34697	1870117	114014.7
STD DEVIATION	7597.84	2462.32	7189.41	1231925.72	89861.08
MINIMUM	12045.85	7026.7	18208.35	102253.19	7512.38
MAXIMUM	39123.8	16257.05	45592.5	4594486.5	345177.07

This shows that cryptocurrencies recorded higher average monthly closing prices than the selected Indian sectoral stock market indices where Bitcoin (1892954.99) is considered to be the highest average market closing price and it was followed by Ethereum (110510.73) which has higher market closing price as compared to the selected sectoral stock market indices. In contrast, the highest closing price of sectoral stock market is nifty Bank (33930.78) which was followed by nifty IT and nifty Pharma.

Median provides us the monthly middle closing prices of the study where it shows us that the middle values are very close to their corresponding mean value the market prices remained to be close to overall average price, although the price was fluctuated over the entire time period of the given study.

The standard deviation provides a variability of the data around the mean. Bitcoin and Ethereum have been recorded as the highest standard deviation among every variable. This has explained that cryptocurrencies have experienced a substantial fluctuation over the time period; meanwhile the selected sectoral stock market indices have been exhibited a

low standard deviation and their price movement was stable as compared to cryptocurrencies. Nifty Pharma is considered as the least volatile because this has the lowest standard deviation price as compared to nifty IT and nifty Bank.

The maximum and minimum values further explains the wide range of price movements observed during the entire study period. Bitcoin recorded the widest price range where it has a minimum value of 1,02,253.19 to a maximum value of 45,94,486.5. while ethereum has a range of 7,512.38 upto 3,45,177.07. Among the sectoral indices, Nifty Bank has recorded the highest maximum values whereas Nifty Pharma had the lowest maximum value.

Overall, the descriptive statistics provide a preliminary understanding of the characteristics of the selected variables. The observed differences in average prices, price ranges, and variability indicate that cryptocurrencies and sectoral stock market indices do not exhibit identical market behaviour. These initial findings justify the need for further statistical analysis to determine whether a significant relationship exists between cryptocurrency prices and the performance of the selected Indian sectoral stock market indices.

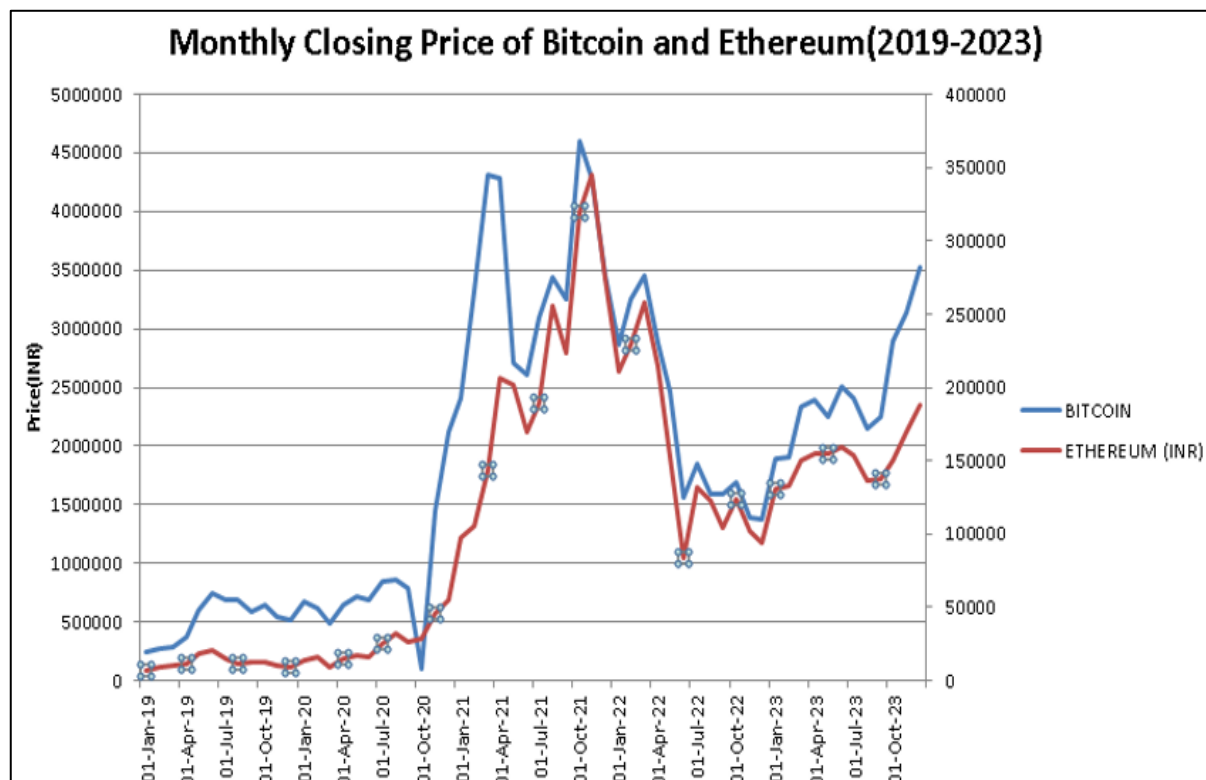


Fig 1 Monthly Price Trends of Bitcoin and Ethereum

This line graph illustrates the monthly closing prices of bitcoin and ethereum. This graph tells us that both crypto currencies followed a similar trend all-over the entire period. Bitcoin maintained a consistently higher and stable price level than ethereum.

Both cryptocurrencies exhibited substantial fluctuations throughout the study period, highlighting the highly volatile nature of the cryptocurrency market. After relatively stable

price movements during the initial period, both cryptocurrencies experienced a sharp upward trend, followed by a significant market correction and a gradual recovery towards the end of the study period. The overall movement of Bitcoin and Ethereum followed a similar pattern, with periods of growth, decline, and recovery occurring simultaneously. These observations indicate that both cryptocurrencies displayed comparable market behaviour and were subject to considerable price volatility throughout the study period.

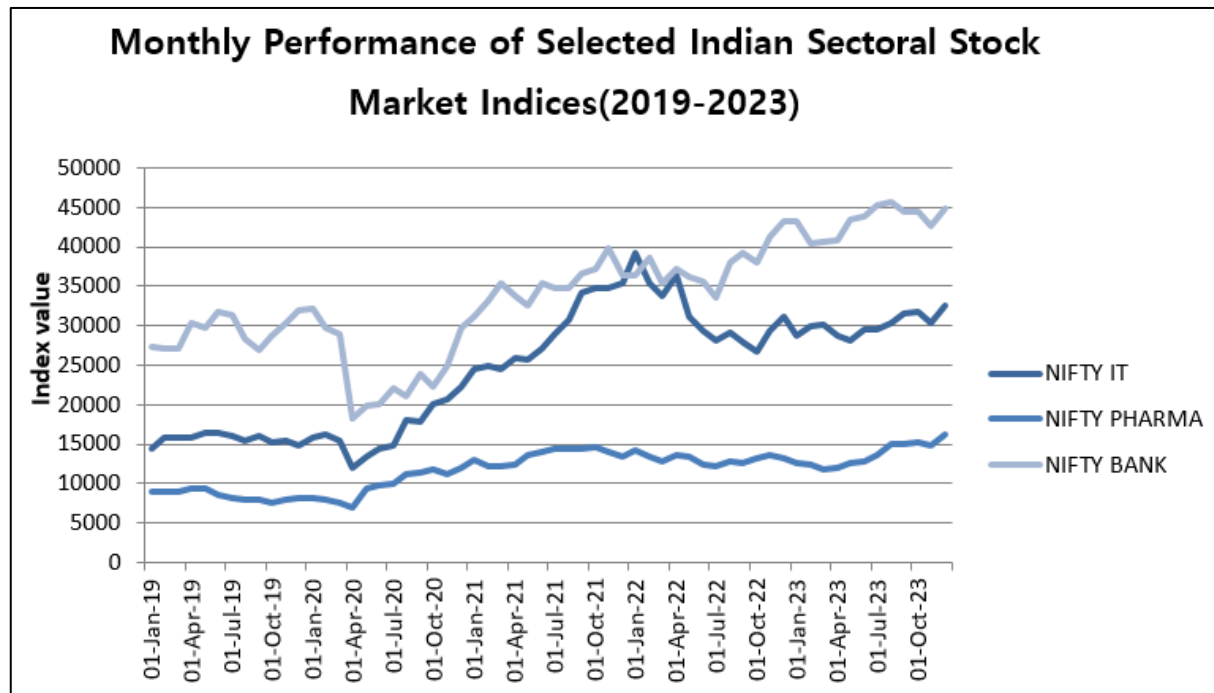


Fig 2 Monthly Trends of Selected Sectoral Indices

The monthly performance of the selected Indian sectoral stock market indices, namely Nifty IT, Nifty Pharma, and Nifty Bank, during the period from 2019 to 2023. The graph shows that all three sectoral indices experienced fluctuations throughout the study period, although the degree of variation differed across sectors. Following a relatively stable performance during the initial period, the indices recorded a noticeable decline in early 2020, after which they exhibited a steady recovery and an overall upward trend. Among the three sectors, Nifty Bank displayed the highest index values and experienced comparatively larger fluctuations, while Nifty IT also showed significant variations with periods of rapid growth followed by moderate

corrections. In contrast, Nifty Pharma exhibited relatively stable movements with smaller fluctuations throughout the study period. Overall, the graph indicates that the selected Indian sectoral stock market indices demonstrated resilience by recovering from the temporary market decline and maintaining an overall positive growth trend between 2019 and 2023.

➤ Correlation Analysis

Pearson's correlation analysis was performed to determine the strength and direction of the relationship between cryptocurrency prices and the selected Indian sectoral stock market indices.

Table 2 Correlation Between Cryptocurrency Prices and Selected Sectoral Indices

	NIFTY IT	NIFTY PHARMA	NIFTY BANK	BITCOIN	ETHEREUM
NIFTY IT	1				
NIFTY PHARMA	0.9002851	1			
NIFTY BANK	0.7912544	0.707192417	1		
BITCOIN	0.8172223	0.788732633	0.594904908	1	
ETHEREUM (INR)	0.8996336	0.815558427	0.636141644	0.92354915	1

The result of person's correlation analysis explains that all variable has positive correlation which increases the crypto currency prices and this factor directly influence in the increase of selected Indian sectoral stock market indices.

From the above table we can observe that nifty IT-nifty pharma (0.90) and Bitcoin – Ethereum (0.92) shows very strong positive relationship. Strong positive relationship was observed in nifty IT - nifty Bank (0.79), nifty Bank – nifty

Pharma (0.70), Bitcoin – nifty (0.81), Bitcoin - nifty Pharma (0.78), Ethereum – nifty IT (0.89) and ethereum – nifty Pharma (0.81) and moderate positive relationship was observed in nifty Bank – Bitcoin (0.59) and Ethereum – nifty Bank (0.63). Based on this analysis we can say that nifty IT

and nifty Pharma are closely associated with the cryptocurrency market movement whereas nifty Bank is not closely associated with this movement because nifty Bank shows moderate positive correlation with Bitcoin and Ethereum.

Table 3 Regression Results for Indian Sectoral Indices

science research paper	R Square	F-Value	significance F	Bitcoin coefficient	Ethereum coefficient	Bitcoin P-Value	Ethereum P-Value
nifty IT	0.81060	121.97887	0.00000	-0.00057	0.08330	0.53985	0.00000
nifty Pharma	0.67372	58.84752	0.00000	0.00048	0.01623	0.22584	0.00397
nifty Bank	0.40505	19.40304	0.00000	0.00029	0.04718	0.80921	0.03089

The overall regression models were found to be statistically significant, indicating that the selected independent variables are appropriate for explaining the behaviour of the sectoral indices. The findings reveal that Ethereum exerts a significant positive influence across all three sectors, suggesting that changes in Ethereum prices are associated with the performance of the selected Indian sectoral stock market indices. In contrast, Bitcoin does not exhibit a statistically significant influence on any of the selected sectors, indicating that its price movements alone do not meaningfully explain variations in sectoral stock market performance during the study period. Furthermore, the regression model indicates that the Information Technology sector has the most responsive to cryptocurrency market movements. It was followed by the Pharmaceutical sector, while the Banking sector exhibits the weakest relationship. Therefore, the results partially support the research hypothesis. While cryptocurrency market movements do influence the selected Indian sectoral stock market indices, this influence is primarily driven by Ethereum rather than Bitcoin. This suggests that the impact of cryptocurrency market movements varies across sectors and depends on the characteristics of each sector.

V. CONCLUSIONS

The present study was undertaken to examine the relationship between cryptocurrency market movements and the selected Indian sectoral stock market indices. By analyzing the selected variables, the study sought to determine whether fluctuations in cryptocurrency prices have any measurable influence on the performance of these sectors.

The findings indicate that the relationship between cryptocurrency markets and the Indian stock market is neither uniform nor identical across all sectors. Instead, the degree of influence varies depending on the nature of the industry. Among the selected sectors, the Information Technology sector appeared to be the most responsive to cryptocurrency market movements, while the Banking sector exhibited comparatively lower responsiveness. This suggests that sectors associated with technological innovation are more likely to reflect developments in the cryptocurrency market than sectors whose performance is largely determined by conventional economic and financial factors.

The study also demonstrates that cryptocurrencies should not be viewed as a single homogeneous asset class. While Ethereum showed a meaningful influence on the selected sectoral indices, Bitcoin did not display the same level of impact during the study period. This highlights that different cryptocurrencies may interact with traditional financial markets in different ways and should therefore be evaluated individually rather than collectively.

The findings of this research contribute to a better understanding of the evolving relationship between digital assets and traditional financial markets in India. As cryptocurrencies continue to gain wider acceptance and investor participation increases, monitoring their interaction with sectoral stock markets becomes increasingly important. The study therefore provides useful insights for investors seeking diversified investment strategies, researchers exploring emerging financial markets, and policymakers interested in understanding the growing integration between cryptocurrencies and the Indian stock market.

Overall, this research concludes that cryptocurrency market movements have become a relevant consideration in analysing the performance of selected Indian sectoral stock market indices. Although their influence differs across sectors, the increasing interaction between digital assets and traditional financial markets suggests that cryptocurrencies are likely to remain an important component of future investment analysis and financial market research.

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