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Effect of Macroeconomic Determinant on Indian Stock Market

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Abstract

The effect of macroeconomic determinants on the Indian stock market was examined through an analysis spanning from 2002 to 2022. Utilizing vector error correction modeling (VECM) techniques, the study revealed significant insights into the relationship between various macroeconomic variables and stock market indices. Cointegration tests indicated stable, long-term relationships among these variables, suggesting that changes in certain macroeconomic factors have lasting impacts on the stock market. Notably, GDP growth rate exhibited a negative association with gold prices, inflation rate, and the NIFTY 50 index, indicating that higher GDP growth tends to coincide with lower gold prices, inflation, and stock market performance. Conversely, it displayed a positive relationship with oil prices and the USD/INR exchange rate, implying potential positive impacts on GDP growth from higher oil prices and a weaker domestic currency. Moreover, gold prices and inflation showed negative relationships with GDP growth and stock market indices, suggesting adverse effects on economic growth and market performance in the long run. The findings underscore the importance of considering macroeconomic fundamentals when analyzing the Indian stock market, offering valuable insights for investors, policymakers, and analysts to make informed decisions aligned with prevailing economic conditions.

Keywords: Stock market, macroeconomic, GDP, inflation, interest rates, exchange rates.

INTRODUCTION

The Indian stock market is an important part of the nation's financial system and has a big impact on how money is distributed and how the economy grows. Investors, policymakers, and market players must all comprehend the elements that affect the Indian stock market.

Macroeconomic factors have been largely acknowledged as significant influences on stock market performance among the different determinants. A broad range of elements form macroeconomic determinants, which represent an economy's overall stability and health. These factors include "interest rates, inflation, exchange rates, and gross domestic product (GDP)". Changes in these factors can have a significant impact on the stock market, affecting market movements, investor sentiment, and business profitability**. (Mohapatra and Misra (2020)**

Macroeconomic factors & the stock market have a complicated and elaborate interaction. As a result, several research has been carried out to ascertain how these characteristics affect the global stock market. To examine the long-term relationship as well as causal relationships between macroeconomic factors and stock market indices, this research uses a variety of econometric tools and approaches. Several implications emerge from an understanding of how macroeconomic factors influence Interest rates, currency rates, GDP growth, inflation, international capital flows, and the market. Firstly, it gives information on the relationships and changes between the financial markets and the general economy, enabling investors to make better choices. Secondly, politicians may use this information to create suitable macroeconomic policies that support reliable stock markets and long-term economic growth. Also, it adds to the body of knowledge that exists about the connection between macroeconomic factors and stock markets and gives an expanded understanding of the Indian setting. While studying how macroeconomic factors, such as "GDP, inflation, exchange rates, and interest rates", affect the Indian stock market, this research seeks to add to the body of literature. The study aims to determine the long-run equilibrium connection and causal links between these factors and the stock market index by using econometric methods including co-integration and correlation testing. The study's conclusions can help investors, decision-makers, and researchers by putting the spotlight on the factors that influence stock market movements globally. It is critical to comprehend the complex interactions between macroeconomic factors and stock market dynamics in the dynamic world of financial markets. This anthology of studies explores several aspects of international finance, providing insightful information about the intricacies of stock market dynamics, the influence of macroeconomic circumstances, and the function of institutional quality in molding financial systems. The studies provide a thorough examination of economic phenomena and include a variety of geographical areas, including G7 and BRICS-T nations, India, Ghana, and Asian emerging economies. **(Ahuja and Kalra (2021)**

Monetary policy refers to the measures implemented by a country's monetary to manage the money supply, with the goals of achieving price stability and fostering economic growth. It is categorized as either contractionary or expansionary, wherein contractionary policies involve reducing interest rates to stimulate borrowing and expansion, while expansionary policies involve raising interest rates to control inflation. In India, the transmission of monetary policy primarily occurs through the interest rate channel, influencing the overall demand in the economy. The connection between money supply and stock prices is established through the liquidity effect. An excess of money supply enhances the overall liquidity of

the economy, leading to increased demand for stocks. Inflation also impacts the stock market, as a surge in inflation results in higher input costs and reduced consumption, leading to a decline in company revenue and profits. Foreign exchange rates can have varying effects on the stock market, with export-oriented economies benefiting from a weaker domestic currency, while import-dependent nations may face adverse consequences. This research investigates "the dynamic relationship between monetary variables and the Indian stock market spanning from January 1993 to December 2019", utilizing advanced "econometric methods and the autoregressive distributed lag-error correction model (ARDL-ECM) regression model". **(Bhattacharjee and Das,2022)**.

Oil prices are interconnected with financial markets, and fluctuations in crude oil prices has repercussions on the behavior of the equity market. Elevated crude oil prices lead to heightened production costs, increased transportation expenses, inflation, and higher borrowing costs for companies, resulting in diminished profitability and valuation. Crude oil is progressively being recognized as an asset class, and its price serves as a crucial factor influencing inflation. The impact of stocks in crude oil prices on the equity market is intricate, and existing literature does not yield a consistent conclusion. Some studies present counterevidence, while others assert that the effects of oil price shocks vary across countries, contingent upon the economic structure of each nation. The media often portrays the movement of oil prices as having an inverse relationship with equity market returns, influencing popular perceptions. Emerging markets exhibit greater volatility but also demonstrate "high average returns and relatively weak" ties with developed countries' capital markets. The impact of oil price shocks on economies is contingent on characteristics such as whether a country is a net importer or exporter of oil. High global oil prices adversely affect oil-importing nations, placing strain on their balance of payments, currency, inflation, and economic growth. Conversely, oil-exporting nations experience a positive effect due to increased oil revenue. This research aims to comprehend the asymmetric effects of structural shocks, specifically those related to supply and demand, in crude oil prices on equity market returns within the contexts of India and China—two of the largest oil importers among emerging economies. The findings challenge the prevailing media narrative of an inverse relationship between "crude oil prices and equity market returns", demonstrating that diverse structural exert distinct impacts on the stock. **(Banerjee and Mohanti 2023)**.

LITERATURE REVIEW

Parab and Reddy (2020) examined how macroeconomic factors impact stock returns. Scholars had focusedon the US and European stock markets while conducting extensive research on this subject. Nevertheless, being a developing country, India's financial markets were gaining attention. Studies carried out in India looked at the impact of various macroeconomic circumstances on stock returns. Notably, little was known about the complex dynamics and causal relationships among these elements. The current study aimed to address this gap by analyzing a 20-year dataset that contains a range of macroeconomic indices like GDP, FDI, inflation, gold prices, and interest rates. The study aimed to contribute to the corpus of knowledge in finance by providing perceptive analysis and analysis to market participants, analysts, and policymakers evaluating the Indian financial system market for stocks.

Ahuja and Kalra (2021) highlighted the importance of "capital structure" for corporate finance while looking at its theoretical and conceptual foundations A firm's "capital structure" refers to the combination ofdifferent sources of funding i.e. debt and equity that it employs to support its business operations and investments. There were differing opinions regarding the components of capital structure, with debates focusing on the relative significance of current vs short-term liabilities. Capital structure choices had a big influence on the organization's overall profitability as well as its financial strategy. The first theory of capital structure to be stated was the Modigliani and Miller hypothesis, which maintains that, under some perfect scenarios, a firm's value is independent of its capital structure. Net income theory and other conventional theories provide insight into the relationship between debt use and business value. Theory of netoperating income. The static trade-off hypothesis states that to get the optimal debt-to-equity ratio, enterprises must weigh the benefits and drawbacks of borrowing. Agency cost theory took internal conflictsof interest into account, whereas free cash flow theory and asymmetric information-based theories investigated how debt might be used to reduce agency costs and lessen information asymmetry. The Pecking Order Theory emphasizes how firms prefer debt and internal funds above equity when they need outside financing. The theory of market timing suggests that to capitalize on transient fluctuationsin stock costs, corporations ought to plan their equity issuances under historical market values.when considered as a whole, provides a foundation for understanding this significant field of corporate finance by representing a range of various opinions regarding the variables that both impact and were impacted by capital structure decisions.

Asravor and Fonu (2021) investigated the significance of stock markets as essential platforms for capital formation and indicators of economic expansion, especially in developing countries such as Ghana. The Ghana Stock Exchange's (GSE) success has led to its recognition on a global scale. The viability of the stock market as a long-term funding source has also come under scrutiny considering the recent financial crises. It was regularly discussed how macroeconomic variables like "GDP growth, inflation, foreign direct investment, and stock market returns" in Ghana relate to each other. This study utilized "the autoregressive distributed lag approach" to offer empirical acumen into the correlation between "macroeconomic indicators and stock market performance" and advancement in Ghana. The results aimed to provide decision-makers with valuable information to facilitate adjustments and improve the overall condition of thecapital market.

Shi, Ahmed, and Paramati (2021) Examined the variables affecting price volatility and the expansion of stock markets in ASEAN plus three more countries, paying special attention to the role of institutional

quality metrics. The study utilized “annual data from 1991 to 2014” and employed panel cointegration, fully modified ordinary least squares, as well as heterogeneous noncausality tests. The result indicated a substantial long-term relationship allying the variables under investigation. The findings indicated that institutions of trade freedom, sound money, regulation, and government size all contribute positively to theexpansion of the stock market. Additionally, these elements along with the legal framework greatly lessen stock price volatility. The study illustrated that policies promoting institutional independence effectively decrease the volatility of stock prices in ASEAN plus three nations, while also promoting growth of the stockmarket.

Gupta and Mahakud (2020) Examined how, in different macroeconomic conditions, group affiliation and firm size affect the susceptibility of Indian manufacturing enterprises to investment-cash flow (ICFS). The study examined how macroeconomic conditions had changed over time, with a focus on India, a developingnation. It examined the relationship between company investment decisions and the availability of internal funds in imperfect capital markets, where agency costs and information asymmetry create a gap between external and internal finances. The study enhanced our comprehension of ICFS by examining “the effect of macroeconomic variables in the context of India”, a developing country, while also considering the size of the firms and their group affiliations. It highlights how important it is to understand how changes in macroeconomic circumstances impact the financial constraints that companies encounter and, consequently,the choices they make regarding investing. The remaining section of the work includes a review of the literature, models and estimating methods, data and variables, findings, and conclusions.

Ahuja and Kalra (2021) focused on the theoretical and conceptual underpinnings of capital structure examination. A company's capital structure seen different sources of funding, i.e. debt and equity, that it uses to finance its operations and growth. The components included bonds, preferred stock, common stock,and long-term loans. It emphasized the importance of capital structure decisions, such as capital budgeting,dividend policy, and capital structure policy. The Modigliani and Miller theory stated that, under certain circumstances, a firm's value could exist independently of its capital structure. The relationship between capital structure and business value was addressed by conventional theories such as “net income theory and net operating income theory”. The static trade-off theories stated that companies should strive for a specificdebt-to-equity ratio to balance the advantages of taxes with the penalties connected to unstable finances. Agency cost theory accounted for conflicts of interest, however the pecking order hypothesis Favors internal funds over external financing. Asymmetric information-based theories and market timing theoriesexamine how information and market values impact capital structure decisions.

Nasir et al. (2021) overseed a comprehensive analysis of the Vietnamese stock market, exploring the influence of regional markets such as China, Japan, Hong Kong, and Thailand, as well as the local economicconditions. They utilized a time-varying structural vector autoregression framework from July 2000 to December 2016 and observed that factors such as credit and monetary policy easing, stable exchange rates,and economic growth played a crucial role in the development of the Vietnamese stock market. The study focuses on the importance of price stability for financial stability, as inflation shocks were found to have detrimental effects. Furthermore, it was noted that regional markets moved in tandem but with varying degrees of impact on the “Vietnamese stock market”. Interestingly, the study revealed

a decrease in responsiveness compared to the Global Financial Crisis.

Belcaid and Ghini (2021) used the "GARCH-MIDAS technique" to examine the macro-financial determinantsof volatility in the Morocco stock market from 1998 to 2018. The "GARCH-MIDAS model", which was primarily driven by realized volatility or lagged stock returns, was crucial for modeling long-term future volatility, according to the study. Economic factors, especially those that were predictive in nature, such as interest rates, inflation, the US dollar's value in euros, and the expansion of the EU GDP, mostly influence long-term volatility. However, historical realized volatility outperforms all models of macroeconomicindicators, indicating that investors attach great importance to past returns and volatility. The analysis indicated that Morocco's stock market volatility could only be partially explained by macroeconomic causes.However, this result provided helpful advice on asset allocation and management of macroeconomicinstability for governments and investors. It was said that the decision to widen the dirham's volatility band by Morocco's central bank had raised concerns about potential effects on the financial and stock markets. Thereport also discussed the global implications of the COVID-19 epidemic, emphasizing the degree of volatilityand unpredictability of these exogenous shocks in the stock market. Despite these challenges, the paper concluded with recommendations for policymakers to sustain investor confidence—especially considering Morocco's vulnerability to external shocks such as the European Union's economic downturn. It highlighted how the Casablanca Stock Exchange, and the financial and economic climate were evolving together, suggesting that investors were becoming more conscious of macro-financial factors while making choices about their investments.

Thampanya et al. (2020) Examined the unique potential and contributed fresh information to the academic debate by analyzing how behavioral and fundamental factors "affect stock market volatility in the ASEAN-5 nations". There were three primary findings reached. While behavioral factors play a significantrole in "developing markets, developed and more developed emerging markets" place greater emphasis on fundamental factors. The study demonstrates the advancement of regional integration and emphasizes the superiority of monetary policies over fiscal measures. The policy implications include the need for targeted assistance to be given to Indonesia and the Philippines, close monitoring of market stability in thesecountries, and collaborative efforts between central banks to achieve regional economic development. The report suggests further research topics, such as looking at other regime divides and adding data concerning.

Pradhan et al. (2020) explored "connection between the returns of gold and silver" in the Indian market. Various Granger-causality methods were utilized, including "conditional, partial conditional, difference conditional, Toda-Yamamoto, and frequency domain analysis". The study used a rolling-window methodology and accounts for change in both metals. The findings indicate a causal relationship that is bidirectional between gold and silver, albeit the degree of the association varies based on the approach employed. Spectral-causality analysis reveals short-term causation from silver to gold, while conditional analysis reveals a dual relationship. Out-of-sample data supports a bi-directional relationship between returns on "gold and silver". The paper offers policy recommendations for investors and emphasizes the benefits of participating in the gold market for portfolio diversification. The results validate the semi-strongvariant of market efficiency.

Olokoyo, Ibhagui, and Babajide (2020) Examined the "Vector Error Correction Model analysis" and the "Johansen cointegration process" to find out how macroeconomic issues affected the Nigerian capital

market's performance. Among the macroeconomic variables being studied are "interest rates, currency rates, GDP growth, inflation, foreign capital flows, and trade". The research findings revealed the intricate interplay between macroeconomic indicators and the performance of the stock market. According to the resultsof the "Vector Error Correction Model", there were favorable correlations with the "exchange rate, GDP growth rate, and inflow of foreign capital", while adverse linkages were observed with the interest rate, inflation, and trade about market capitalization. In conclusion, the study highlighted that higher interest rates had a contrary impact on market performance, while increased capital flows and currency devaluation had positive repercussions. Furthermore, the paper emphasized the influence of global external factors, particularly the fluctuations in oil prices, on the Nigerian economy and stock market performance. These findings provide a holistic understanding of the intricate connections between "macroeconomic variables and the Nigerian stock market", thereby offering valuable insights for both policymakers and investors.

Sreenu and Rao (2021) Applied the "GARCH-MIDAS model", to investigate the macroeconomic factors influencing the commodities market's volatility. The study recognizes the correlation between high-frequency market data and commodity volatility, but it also emphasizes the significance of macroeconomicvariables at various stages of commodity exchange across different enterprises. The study, which focuses on the Indian market, concludes that macroeconomic factors both domestically and globally have some effect on "the volatility of commodity futures" in India. It highlights how important it is to consider the risks associated with these macroeconomic elements to understand the volatility of the commodities market. The results suggested that rather than immediately enacting price control laws, authorities should closely monitor macroeconomic conditions to avert undesirable outcomes. Decision-makers and other parties involved in the commodity. The insightful insights of the study can have a significant impact on themarket.

Mohapatra and Misra (2020) Examined momentum investing about asset allocation suggestions made by fund houses, focusing on factors relevant to the portfolio and the macroeconomic environment. From 2005 to 2015, an analysis of "momentum strategies in the Indian market" was conducted, resulting in the identification of successful and unsuccessful portfolios. Unlike the US market, the Indian equities marketdid not exhibit a reversal in momentum for returns over a two to five-year holding period. The study expanded on the Jegadeesh and Titman model by including macroeconomic data such as "Net FII Flows, Term Spread, and Index of Industrial Production, as well as portfolio-specific attributes like Price-EarningsRatio, Price-to-Book Ratio, and Dividend Yield, using the VAR methodology". The results highlighted thesignificance of variables such as PB Ratio and PE Ratio at the portfolio level, while also emphasizing the importance of Net FII inflows as a macroeconomic indicator. Additionally, the study delved into anomalousreturns and examined "time series patterns, cross-sectional risk, and lead-lag" effects for both short- and long-term strategies. The intention was to equip portfolio managers with insights into constructing momentum-driven portfolios to achieve abnormal returns.

Bhattacharjee and Das (2022) examined "the impact of monetary variables on the Indian stock market". monthlydata from 1993 to 2019. The pairs "Granger causality test and the ARDL test" were used in the evaluation. Theresults showed an equilibrium link between the monetary variable and the Indian market index through cointegration. In both the short & long terms, "interest rates and foreign exchange rates" showed a negative correlation with the index. Changes in structure, such as the Ambani brothers' conflict

being resolved and positive feelings surrounding elections, helped the market. On the other hand, the Kargil War of 1999 had a bad impact on the market. The study suggested that financial factors be included by "investors and portfolio managers in their long-term investment plans".

Banerjee and Mohanti (2023) examined, using monthly data from 1996 to 2022, the unequal "effects of structural shocks on equity market returns in China and India". The study refuted the inverse relationship betweencrude oil prices and equity market returns by using "structural vector autoregression and the NARDL model".The responses of the Chinese and Indian markets to structural shocks were comparable, with the Chinese market exhibiting a notable asymmetry in the impact of shocks on cautious demand. By refuting the idea that rising crude oil prices invariably result in a fall in the Indian equity market unless they are connected toa rise in India-specific oil demand. On the other hand, within the framework of the Chinese equities market, the research supported the conclusions of Hu et al. (2018) by being consistent with their findings. These findings have important ramifications for scholars, investors, andlegislators, particularly in sizable developing nations that import a lot of oil. Increasing strategic crude oil reserves, diversifying, and hedging equities portfolios, and putting precautionary shock protection measures in place are some of the ideas.

Nguyen et al. (2022) investigated the significance of liquidity and an institutional framework in a nation as major determinants of stock market results. Between 2002 and 2013, it examined stock market returns in 34 emerging nations using the Sys-GMM model and governance indices. According to the study, stock market returns are positively impacted by excess liquidity, which can be further increased by creating an appropriateinstitutional framework. With the right institutional framework, rising nations with high levels of national liquidity volatility can control their volatility and build long-term prosperity for the benefit of society. The study underscores the potential for controlling stock volatility through the deployment of an adequate institutional framework and stresses the significance of a nation's institutional structure in boosting the prosperity of a financial system.

Karanasos, Yfanti, and Hunter (2021) investigated the global and American economic variables that increased volatility in emerging stock markets and identified them as systemic risk factors. The study employed a bivariate HEAVY system, which encompasses both daily and intra-day volatility equations, andresulted in a substantial enhancement in predictive accuracy. The data was collected from March 1, 2000, toNovember 30, 2020. The impact of infectious disease news and uncertainties in the United States on stock markets was assessed using "the macro-augmented asymmetric power HEAVY model". Additionally, the research investigated the effects of commodities and global credit on the volatility of stock indices. The findings underscored the importance of economic uncertainty, demonstrating that high levels of policy- related uncertainty in the U.S. influenced leverage effect & the impact of commonly used macro-financial indicators on the financial volatility of developing economies. The research findings demonstrated the critical effect that events related to the financial and health crises have in intensifying market volatility and enhancing the influence of macroeconomic factors on it. The results provided a paradigm for volatility forecasting and have important ramifications for practitioners in the market and policymakers. They can closely monitor and anticipate patterns of financial volatility thanks to this framework, which also makes it easier to formulate strict policies, enforce legislation pertaining to the financial system, and make decisions about how to allocate assets and implement hedging measures.

Sachdeva, Dhingra, and Nandal (2022) investigated "how macroeconomic variables affect the volatility of the stock market". The global significance of the stock market reinforced the notion that finance was a necessary component of economic development. It was well-recognized that cheap money transfers between domestic and international markets were made possible by a well-functioning capital market. The study set out to assess "the relationship between the volatility of stock prices in Russia, South Africa, and India and the interest rate, money supply, exchange rate, and inflation". The Nifty 50-time series data was used to evaluate the role that macroeconomic factors had in creating volatility. the "Augmented Dickey-Fuller (ADF) test" was employed. Furthermore, "the Johansen cointegration test" was utilized to assess the integration of the selected variables, and the results showed how poorly integrated things were. The outcomes of the regression analysis indicated that "interest rates and inflation" were the two main elements impacting "the stock market volatility in each of the three countries".

Dang et al. (2023) examined the factors that influence sectoral volatility spillovers in Vietnam using an analysis of data from 14 sectors of the country's stock market between 2012 and 2021. This essay also looked at how intersectoral relationships in Vietnam are affected by macroeconomic fundamentals and the continuing pandemic. Throughout the research period, there were notable variations in the transmission of volatility across sectors, with a peak occurring during the COVID-19 pandemic. That volatility was present in about 64.23 percent of the whole spillover index. The empirical results showed that as COVID-19 infections increased daily, there was a larger volatility spillover across sectors. The research findings were utilized to generate policy suggestions for the government of Vietnam and other developing countries.

Rath (2022) examined, using the VAR method, "the relationship between macroeconomic shocks and Indian financial markets". During the period from "April 2002 to March 2021", we examined "the fluctuation in six major sectors of the Indian financial markets including" "money, equity, gsec, forex, equities, and banking stocks". Furthermore, we also analyzed "the volatility in the current account deficit, GDP, inflation, market capitalization to GDP ratio, US Treasury yield, and foreign portfolio investment". The statistical methods used in this investigation were Variance Decomposition, Variance Analysis of R, and Diagnostic Tests. The VAR results verified that policymakers should prioritize preserving macroeconomic stability to foster stability in the financial markets. In addition, it was crucial to keep an eye on a customized and dynamic rangeof macroeconomic variables associated with every financial market sector to regularly ascertain the type, volume, and timing of policy and regulatory responses.

Alam et al. (2022) investigated how macroeconomic and firm-specific factors influenced the profitability ofnon-bank financial institutions in Bangladesh during the period from 2011 to 2019. The research utilized "a one-step difference generalized technique" of the moments model to analyze 15 NBFIs listed on the Dhaka Stock Exchange. The findings indicated that the "debt-to-equity ratio and cost of funds" positively impacted NBFI profitability, while "the capital adequacy ratio, non-performing loans, GDP, and inflation" had adverse effects. These results are particularly crucial for regulators, investors, policymakers, and other financial market participants. The report stressed the importance of enhancing the efficiency of the banking sector to support "Bangladesh's goal of becoming an upper-middle-income nation by 2031". It's important to note that the study had limitations, including its focus

on only two profitability indices and its examination of a singlenation.

Ayoub (2022) investigated "the interrelationship between the growth of the stock market and macroeconomic factors in emerging African economies between 2002 and 2021". Along with proxy metrics like "Index Return,Market capitalization, Volume Traded, and Value Traded", the study also used independent variables includingCore Inflation, Deposit Rate, and Foreign Direct Investment. The goal was to use important macroeconomicelements to improve the overall platform through an analysis of the stock market in Egypt, Morocco, Nigeria, and South Africa. The results reflected that there is a unidirectional "relationship between macroeconomic factors & the growth of the stock market in each nation".

Alexander and Al-Malkawi (2022) examined the connection between "macroeconomic factors and the S&PBSE Auto index from January 2017 to August 2019", a time marked by a substantial decline in India's car sales and revealed significant findings. The research utilized an "autoregressive distributed lag technique andidentified a long-term, co-integrating, negative correlation between the exchange rate and the S&P BSE Auto index". Additionally, the study found that the index was notably influenced in the short term by crude oil prices and consistently demonstrated underperformance in comparison to car index values. Ultimately, the study inferred that while the "S&P BSE Auto index" could be anticipated in the short term by lagged values of crude oil prices, its long-term prediction was reliant on the exchange rate.

Islam, Parvin, and Milon (2023) examined "the impact of macroeconomic variables on the Dhaka stock exchange, particularly the DSE 30 index, including GDP, inflation, and the Industrial Production Index". A statistical analysis was performed on secondary data that was gathered and covered the years 2010 to 2021. Changes in the "GDP rate" had a strong effect on stock market returns, according to the study, which found a substantial positive link between "GDP and the Bangladesh Stock Market index". Although there were positive correlations between "the inflation rate and the Industrial Production index and stock market returns",these interactions were not statistically significant. The study concluded that Bangladesh's stock market's performance was significantly influenced by its GDP. An increase in GDP brought a boost in "corporate activity, consumer spending, and investment opportunities", all of which had a favorable impact on the stock market. Moreover, it was found that the stock market stimulates entrepreneurship and creates new job prospects. The results emphasized how crucial it is to understand how the stock market and the economy areintertwined when making financial and investing decisions.

Aruna and Acharya (2023) examined the asymmetric effects of fluctuations in oil prices on firm-level stock returns. Using a variety of oil price shock metrics, panel structural vector autoregression was applied to 1,168 Indian stock market enterprises. The irreversible investment theory and the reallocation effect wereboth supported by the results. A net reduction in the prices of oil was found to hurt stock returns, and the reallocation effect suggested that higher oil prices induced a recession that resulted in labor displacement but not full employment. With an emphasis on less developed nations, the study reexamined the empirical literature on the impact of oil price shocks on firm stock returns. It was discovered that industries including abrasives, farm equipment, air conditioners, refrigerators, aluminum, and aluminum-related products showed a brief decrease in stock returns before seeing a rise until the remaining period.

Agwu and Haydar (2023) examined how macroeconomic variables affected the London Stock

Exchange. Afew variables were examined, including "the interest rate, the consumer price index, the money supply, industrial production, GDP, oil prices, and the unemployment rate". Events such as "quantitative easing and long-term refinancing schemes" were captured using data from Reuters 3000X and an economics trading website spanning ten years. The results showed that the London Stock Exchange was highly impacted by the "consumer price index, interest rate, and exchange rate". According to the study, the consumer price index consumer price index, interest rate, and exchange rate". According to the study, the consumer price index was substantial but not as significant as the interest rate when it came to its impact on the UK economy. The stock market was least impacted by the exchange rate. The study emphasized how crucial it is for governments, corporations, and investors to understand macroeconomic data to prevent losses and make wise decisions. Understanding these signals was essential to keeping a profitable portfolio and preventing losses.

Irani, Athari, and Hadood (2021) examined "the effects of macroeconomic variables, country-specific risks, political and economic hazards, and uncertainty in global economic policy on the stock prices of Turkish travel companies between 2000 and 2017". The findings showed that over time, declining stock prices were correlated with rising political and economic concerns, uncertainty surrounding global economic policy, and a real exchange rate. Stock prices were negatively impacted in the short term by the real exchange rate and uncertainty surrounding "global economic policy", but positively by political risk. This study was the first to investigate this relationship, particularly in developing nations like Turkey where the travel and tourist industry has grown significantly and significantly boosted the national economy. By using a thorough "Political Risk Index and Economic Risk Index and developing a new index called the Borsa Istanbul Tourism Index (TSI)", the study contributed to the body of literature already in existence. The results have consequences for corporate managers, policymakers, and investors in the hospitality industry. They highlight the necessity of "strong fiscal and monetary policies" to lessen the negative effects of uncertain economic policies on stock markets.

Sreenu (2023) examined "the relationship between market return volatility and inflation and exchange rates using RBI data spanning the period from January 2000 to June 2020". "To investigate the influence on stock market return volatility", "GARCH, the Error Correction Model (ECM), and autoregressive distributed lag (ARDL)" were used. The findings showed a "" negative short-term impact and a substantial long-term link between market returns and the exchange rate. The study concluded that two important macroeconomic factors affecting India's investment cycle are inflation and exchange rates. Furthermore, the study investigated if stock markets had a consistently favorable long-term relationship, particularly during the COVID-19 crisis. The results showed that "market returns, inflation rate, and exchange rate" are significantly correlated, suggesting that rising exchange rates encourage investors to raise stock prices.

3.1 NEED OF THE STUDY

"The purpose as well as scope of this study are to better understand the complex relationship between macroeconomic factors and the performance of the Indian stock market. The globalization of financial markets has made it necessary for investors and policymakers to have a better understanding of how variables like interest rates, exchange rates, GDP growth, inflation, international capital flows, and trade affect stock market dynamics. The study's importance comes from its ability to help with policymaking and investment choices. The research findings can be applied by investors to enhance their ability to navigate Indian financial markets, hence reducing risks and optimizing rewards. The results can also be used by policymakers to create fiscal and monetary policies that will promote steady and sustained economic growth. The scope of the research includes a thorough examination of numerous macroeconomic variables and how they affect the performance of the Indian stock market. Using like the Vector Error Correction Model, Granger Causality Test the study looks for patterns in the short- and long-term dynamics between Indian market capitalization and macroeconomic variables. Moreover, the study aims to enhance the current body of literature by delivering a comprehensive analysis of this intricate relationship, supplying insightful viewpoints for investors, politicians, and researchers equally".

3.2 Objective of the study

The study has been performed to meet the following objectives:

- "To analyze the impact of key macroeconomic variables on the stock market".
- "To examine the long-term relationships between macroeconomic variables and the stock market".
- "To analyze the dynamic relationship and short-term adjustments between macroeconomic variables and the stock market."
- "To examine the causal effect between macroeconomic variables and the stock market"

3.3 Research methodology

"Writing a research methodology on how macroeconomic factors affect the Indian stock market requires a thorough approach. The technique should describe the actions taken to investigate the connection between macroeconomic factors and the performance of the Indian stock market. This study's structured research technique is as follows".

Research Design:
Quantitative Analysis: Examine how macroeconomic factors affect the Indian stock market using statistical methods. A longitudinal study looks at data over a long period to identify patterns and trends.

Variables used in the study.

Dependent Variable: The stock market success as determined by stock indexes. In this study, NIFTY - 50 has been taken as the dependent variable.

Independent Variables: Independent variables include a range of macroeconomic measures like GDP growth, inflation rate, exchange rate, gold price, oil price, etc.

Period of study and data sources "Historical data of NIFTY 50 and macroeconomic indicators (GDP growth, inflation rate, exchange rate, gold price, Oil price, etc.) have been taken from 2002-2022. The data for this analysis was sourced from various trusted financial and economic websites commonly used by researchers and analysts. These include websites like Trading Economics, Bloomberg, Reuters, FRED (Federal Reserve Economic Data), IMF Data (International Monetary Fund), and investing. co. These websites offer a wealth of economic indicators, financial market data, and analysis reports, providing valuable insights for our research".

Statistical Techniques used.

Vector Error Correction Model (VECM): Utilize the VECM framework to analyze the dynamic relationship and short-term adjustments between "macroeconomic variables and stock market" performance.

Johnson Co Integration Test: Assess the presence of cointegration between variables by employing the Johnson Co Integration Test. This test helps "determine if there exists a long-term relationship between macroeconomic variables and stock market performance".

Granger Causality Test: Determine the causal linkages between "macroeconomic variables and stock market" performance using the Granger Causality Test.

Statistical Software: For data analysis, statistical software such as SPSS and EViews has been used.

Data Analysis and Interpretation

Date: 04/07/24 Time: 22:28
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP_GROWTH_RATE GOLD_PRICE INFLATION_RATE NIFTY_50 OIL_PRICE USD_INR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.847187	122.2252	95.75366	0.0002
At most 1 *	0.800092	82.77580	69.81889	0.0033
At most 2 *	0.769484	48.96794	47.85613	0.0391
At most 3	0.343162	18.15178	29.79707	0.5549
At most 4	0.228697	9.325099	15.49471	0.3362
At most 5 *	0.168379	3.871949	3.841466	0.0491

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.847187	39.44940	40.07757	0.0587
At most 1	0.800092	33.80786	33.87687	0.0510
At most 2 *	0.769484	30.81615	27.58434	0.0185
At most 3	0.343162	8.826685	21.13162	0.8462
At most 4	0.228697	5.453150	14.26460	0.6839
At most 5 *	0.168379	3.871949	3.841466	0.0491

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
-0.643141	10.00699	-5.461682	9.139358	0.306356	42.33642
0.233946	-14.49293	4.940120	1.422458	4.922509	0.001573
-2.176456	1.080853	-2.332289	6.577313	-1.543044	3.402534
-0.457419	-4.813914	-5.454214	3.189553	3.902382	-11.84964
2.356770	-6.622398	8.430872	-2.571450	-7.422201	-45.42717
1.518167	-7.112907	2.790663	-3.577018	-5.875794	-19.72375

Unrestricted Adjustment Coefficients (alpha):

D(GDP_GRO	-0.167944	0.069322	0.147861	-0.062457	-0.288419	-0.132185
D(GOLD_PRI	-0.037221	0.053782	0.023436	-0.003292	-0.008981	0.026832
D(INFLATION	-0.068659	-0.109439	0.025830	0.111529	0.009942	0.039134
D(NIFTY_50)	-0.156422	0.033275	-0.070765	-0.036689	-0.074505	0.036103
D(OIL_PRICE)	0.000753	-0.100245	0.165575	-0.086322	-0.037474	0.055051
D(USD_INR)	-0.025110	-0.014900	-0.005607	0.010500	0.011319	-0.006727

1 Cointegrating Equation(s): Log likelihood 57.68906

Normalized cointegrating coefficients (standard error in parentheses)

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
1.000000	-15.55955	8.492194	-14.21050	-0.476344	-65.82754
	(3.32335)	(1.51884)	(1.61020)	(1.72367)	(8.81335)

Adjustment coefficients (standard error in parentheses)

D(GDP_GRO	0.108012
	(0.12843)
D(GOLD_PRI	0.023938
	(0.01715)
D(INFLATION	0.044157
	(0.04458)
D(NIFTY_50)	0.100602

	(0.03918)					
D(OIL_PRICE)	-0.000484					
	(0.05470)					
D(USD_INR)	0.016149					
	(0.00710)					

2 Cointegrating Equation(s): Log likelihood 74.59299

Normalized cointegrating coefficients (standard error in parentheses)

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
1.000000	0.000000	4.257939	-21.01611	-7.693435	-87.90863
		(2.22891)	(2.75826)	(2.75506)	(12.7823)
0.000000	1.000000	-0.272132	-0.437392	-0.463837	-1.419134
		(0.09456)	(0.11702)	(0.11688)	(0.54228)

Adjustment coefficients (standard error in parentheses)

D(GDP_GRO	0.124229	-2.685290
	(0.13603)	(3.50059)
D(GOLD_PRI	0.036520	-1.151921
	(0.01512)	(0.38914)
D(INFLATION	0.018555	0.899024
	(0.04265)	(1.09754)
D(NIFTY_50)	0.108386	-2.047571
	(0.04121)	(1.06049)
D(OIL_PRICE)	-0.023936	1.460368
	(0.05501)	(1.41566)
D(USD_INR)	0.012664	-0.035334
	(0.00700)	(0.18016)

3 Cointegrating Equation(s): Log likelihood 90.00107

Normalized cointegrating coefficients (standard error in parentheses)

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
1.000000	0.000000	0.000000	1.772746	2.782644	21.87729
			(1.03442)	(0.97900)	(4.85646)
0.000000	1.000000	0.000000	-1.893867	-1.133381	-8.435742
			(0.32087)	(0.30368)	(1.50643)
0.000000	0.000000	1.000000	-5.352086	-2.460364	-25.78382
			(0.81522)	(0.77154)	(3.82734)

Adjustment coefficients (standard error in parentheses)

D(GDP_GRO	-0.197585	-2.525473	0.914859
	(0.44372)	(3.43172)	(1.50238)
D(GOLD_PRI	-0.014486	-1.126591	0.414317
	(0.04818)	(0.37262)	(0.16313)
D(INFLATION	-0.037663	0.926942	-0.225892
	(0.14124)	(1.09231)	(0.47820)
D(NIFTY_50)	0.262403	-2.124058	1.183756
	(0.12988)	(1.00446)	(0.43974)
D(OIL_PRICE)	-0.384303	1.639330	-0.885499
	(0.15051)	(1.16406)	(0.50961)
D(USD_INR)	0.024866	-0.041394	0.076612
	(0.02307)	(0.17840)	(0.07810)

4 Cointegrating Equation(s): Log likelihood 94.41441

Normalized cointegrating coefficients (standard error in parentheses)

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
1.000000	0.000000	0.000000	0.000000	2.074736	12.41714
				(0.79228)	(3.74911)
0.000000	1.000000	0.000000	0.000000	-0.377105	1.670760
				(0.17463)	(0.82634)
0.000000	0.000000	1.000000	0.000000	-0.323121	2.777258
				(0.48559)	(2.29785)
0.000000	0.000000	0.000000	1.000000	0.399329	5.336438
				(0.17661)	(0.83573)

Adjustment coefficients (standard error in parentheses)

D(GDP_GRO	-0.169016	-2.224810	1.255513	-0.662971
	(0.45075)	(3.54300)	(1.83180)	(2.28370)
D(GOLD_PRI	-0.012981	-1.110746	0.432269	-0.120025
	(0.04909)	(0.38587)	(0.19951)	(0.24872)
D(INFLATION	-0.088678	0.390051	-0.834194	-0.257552
	(0.12477)	(0.98075)	(0.50707)	(0.63216)

D(NIFTY_50)	0.279185	-1.947441	1.383865	-1.964730
	(0.13033)	(1.02440)	(0.52963)	(0.66029)
D(OIL_PRICE)	-0.344817	2.054876	-0.414682	0.677995
	(0.14304)	(1.12434)	(0.58131)	(0.72471)
D(USD_INR)	0.020063	-0.091942	0.019341	-0.254069
	(0.02253)	(0.17709)	(0.09156)	(0.11414)

5 Cointegrating Equation(s): Log likelihood 97.14099

Normalized cointegrating coefficients (standard error in parentheses)

GDP_GROW	GOLD_PRICE	INFLATION_R	NIFTY_50	OIL_PRICE	USD_INR
1.000000	0.000000	0.000000	0.000000	0.000000	-1.339056
					(3.85111)
0.000000	1.000000	0.000000	0.000000	0.000000	4.171096
					(1.02068)
0.000000	0.000000	1.000000	0.000000	0.000000	4.919660
					(2.00828)
0.000000	0.000000	0.000000	1.000000	0.000000	2.688752
					(0.65573)
0.000000	0.000000	0.000000	0.000000	1.000000	6.630337
					(1.58591)

Adjustment coefficients (standard error in parentheses)

D(GDP_GRO	-0.848753	-0.314785	-1.176111	0.078684	1.958603
	(0.58430)	(3.43180)	(2.23510)	(2.12879)	(1.73778)
D(GOLD_PRI	-0.034147	-1.051270	0.356552	-0.096931	0.270990
	(0.06938)	(0.40752)	(0.26541)	(0.25279)	(0.20636)
D(INFLATION	-0.065246	0.324209	-0.750371	-0.283119	-0.238171
	(0.17736)	(1.04167)	(0.67843)	(0.64617)	(0.52748)
D(NIFTY_50)	0.103593	-1.454038	0.755720	-1.773144	0.634890
	(0.17241)	(1.01262)	(0.65951)	(0.62814)	(0.51276)
D(OIL_PRICE)	-0.433136	2.303046	-0.730624	0.774359	-0.807431
	(0.20066)	(1.17856)	(0.76758)	(0.73107)	(0.59679)
D(USD_INR)	0.046740	-0.166903	0.114772	-0.283176	-0.115424
	(0.03033)	(0.17816)	(0.11604)	(0.11052)	(0.09022)

The Trace Unrestricted Cointegration Rank Test

"This test looks at how many cointegrating equations are required to explain the long-term relationship between the variables. Cointegration links appear to be present, according to the Trace test.
The test rejects the null hypothesis that there is no cointegration for up to two equations by showing the existence of three cointegrating equations at the 0.05 significance level."

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Maximum Eigenvalue in the Unrestricted Cointegration Rank Test:

An additional technique to ascertain the quantity of cointegrating equations is through this test.
Up to two equations may not have cointegration, according to the Max-Eigenvalue test, which finds no evidence of cointegration at the 0.05 significance level.

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Cointegrating Coefficients Without Restrictions:

The long-term associations between the variables are expressed by these coefficients. There is a cointegrating equation for each row.
For example, the coefficients show how long-term changes in one variable influence the others.

Adjustment Coefficients Without Constraints (alpha):

The rate at which departures from the long-term equilibrium undergo modification is shown by these coefficients.
They show the immediate modifications needed to bring the system back to balance following a shock.

Cointegrating coefficients normalized:

The weights assigned to each variable in the cointegrating relationships are represented by these coefficients.
They display the percentage of each variable's influence on the equilibrium over the long term

Analysis

The analysis of the "Johansen cointegration test results reveal significant insights into the long-term relationships among the variables considered: GDP growth rate, gold price, inflation rate, NIFTY 50 index, oil price, and USD to INR exchange rate".

The Trace test indicates the presence of "cointegration among the variables, rejecting the null hypothesis of no cointegration for up to two equations". This suggests a long-term relationship exists among the variables, implying that they move together in the long run.

Moreover, the Trace test suggests the existence of three cointegrating equations at the 0.05 significance level. This indicates that there are three underlying relationships among the variables that maintain equilibrium in the long run. However, the Max-Eigenvalue test fails to find evidence of cointegration at the 0.05 significance level, suggesting that up to two equations may not have cointegration. This discrepancy underscores the importance of considering multiple tests for robust analysis.

The cointegrating coefficients "provide insights into the variables. Each row represents a cointegrating equation, showing how changes in one variable affect the others in the long run". For instance, the coefficients indicate the weights of each variable in maintaining long-term equilibrium.

Additionally, the adjustment coefficients reveal the speed at which departures from long-term equilibrium are corrected following a shock, offering insights into short-term dynamics. Furthermore, the normalized cointegrating coefficients represent the relative influence of each variable on the equilibrium over the long term, aiding in understanding the percentage contribution of each variable to maintaining stability in the system

Vector Error Correction Estimates
Date: 04/07/24 Time: 23:36
Sample (adjusted): 2003 2022
Included observations: 20 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP_GROWTH_RATE(-	1.000000
GOLD_PRICE(-1)	-0.510443 (1.02298) [-0.49898]
INFLATION_RATE(-1)	2.496538 (0.60678) [4.11444]
NIFTY 50(-1)	-3.990570 (0.68448) [-5.83006]
C	0.885688

Error Correction:	D(GDP_GR	D(GOLD_PR	D(INFLATIO	D(NIFTY_50)
CointEq1	0.395571 (0.76159) [0.51940]	-0.018552 (0.09207) [-0.20149]	-0.488048 (0.19437) [-2.51088]	0.421127 (0.23762) [1.77225]
D(GDP_GROWTH_RAT	-0.559358 (0.75907) [-0.73689]	0.207488 (0.09177) [2.26093]	0.449592 (0.19373) [2.32070]	-0.268999 (0.23684) [-1.13579]
D(GDP_GROWTH_RAT	-0.752617 (1.05242) [-0.71513]	0.001473 (0.12724) [0.01157]	0.589003 (0.26860) [2.19287]	-0.280176 (0.32837) [-0.85324]
D(GOLD_PRICE(-1))	-0.909161 (3.04804) [-0.29828]	0.061322 (0.36850) [0.16641]	-0.679851 (0.77792) [-0.87393]	0.031793 (0.95102) [0.03343]
D(GOLD_PRICE(-2))	-0.136894 (2.29460) [-0.05966]	-0.136059 (0.27741) [-0.49045]	0.929128 (0.58563) [1.58655]	-0.041133 (0.71594) [-0.05745]
D(INFLATION_RATE(-1))	-0.934187 (1.62992) [-0.57315]	0.297064 (0.19705) [1.50752]	0.064863 (0.41599) [0.15593]	-0.122432 (0.50855) [-0.24075]
D(INFLATION_RATE(-2))	-0.132436 (1.31409) [-0.10078]	0.356695 (0.15887) [2.24518]	0.261942 (0.33538) [0.78102]	0.374312 (0.41001) [0.91294]
D(NIFTY_50(-1))	0.411115 (2.23242) [0.18416]	-0.534720 (0.26990) [-1.98121]	-1.609593 (0.56976) [-2.82504]	0.053540 (0.69654) [0.07687]
D(NIFTY_50(-2))	0.664727 (2.32347) [0.28609]	-0.022495 (0.28090) [-0.08008]	-1.597862 (0.59300) [-2.69456]	0.073037 (0.72495) [0.10075]
C	-0.172300 (0.32513) [-0.52994]	0.016657 (0.03931) [0.42376]	0.157332 (0.08298) [1.89604]	-0.084061 (0.10144) [-0.82864]
R-squared	0.433116	0.721743	0.763949	0.772315
Adj. R-squared	-0.077080	0.471312	0.551504	0.567398
Sum sq. resids	11.48213	0.167828	0.747915	1.117788
S.E. equation	1.071547	0.129548	0.273480	0.334333
F-statistic	0.848921	2.882002	3.595980	3.768923
Log likelihood	-22.82937	19.42673	4.483209	0.465038
Akaike AIC	3.282937	-0.942673	0.551679	0.953496
Schwarz SC	3.780803	-0.444807	1.049545	1.451362
Mean dependent	-0.000739	-0.012095	0.008423	0.000535
S.D. dependent	1.032494	0.178169	0.408363	0.508318

Determinant resid covariance (dof adj.)	4.00E-05
Determinant resid covariance	2.50E-06
Log likelihood	15.46466
Akaike information criterion	2.853534
Schwarz criterion	5.044145
Number of coefficients	44

Interpretation

The long-term relationship between the variables is represented by this equation. The coefficients indicate how each variable affects the state of equilibrium. For example, a coefficient of -0.510443 for GOLD_PRICE (-1) suggests a rise of one unit in the lag gold price causes the equilibrium state to decline by approximately 0.51 units.

Terms for Error Correction:
The immediate remedies needed to return the system to equilibrium following deviations are captured by these phrases.
For instance, if there is a one-unit variations in GDP growth rate, the coefficient 0.395571 for D(GDP_GROWTH_RATE) indicates that about 39.56% of the deviation from the long-run equilibrium is corrected in the subsequent period.
R-squared and its modifications:

The goodness-of-fit of the model is determined by these statistics.
The dependent variable's variations as a percentage of the independent variables' variance is represented by the R-squared value.
The number of predictors in the model is taken into consideration by the adjusted R-squared.
The R-squared values, in this case, are rather high, indicating that the model and the data are well-fitted.
Total of Standard Errors and Squared Residuals:

The precision and goodness-of-fit of the estimates can be assessed by these statistics.
A better fit and more accurate predictions are indicated by lower numbers.
F-value

This statistic evaluates the model's overall importance.
The model is statistically significant overall if the F-statistic is higher.
The model's overall meaning is indicated by the comparatively high F-statistic values in this instance.

Analysis
"The "Vector Error Correction Model (VECM)" analysis offers valuable insights into the interplay of economic variables and their impacts over time. The coefficients within the VECM equation delineate the long-term effects of each variable on others. For instance, a negative coefficient for the lagged gold price implies a decrease in the equilibrium state with a rise in gold prices. On the other hand, error correction terms illuminate the short-term adjustments needed to restore equilibrium following deviations. These terms indicate the swiftness of the system's correction process after a disturbance. Moreover, metrics like R-squared and Adjusted R-squared gauge the model's goodness-of-fit, elucidating how well it captures the variation in the data. A higher F-statistic suggests the overall significance of the model in explaining the relationships between the variables. In essence, the VECM analysis provides a nuanced understanding of how economic variables influence each other, aiding in informed decision-making and forecasting within financial markets".

Granger Causality Tests

Pairwise Granger Causality Tests
Date: 04/08/24 Time: 23:44
Sample: 2000 2023
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GOLD_PRICE does not Granger Cause GDP_GROWTH_RATE	21	1.82347	0.1935
GDP_GROWTH_RATE does not Granger Cause GOLD_PRICE		0.46548	0.6361
INFLATION_RATE does not Granger Cause GDP_GROWTH_RATE	21	0.23698	0.7917
GDP_GROWTH_RATE does not Granger Cause INFLATION_RATE		0.26470	0.7707
NIFTY_50 does not Granger Cause GDP_GROWTH_RATE	21	2.72583	0.0958
GDP_GROWTH_RATE does not Granger Cause NIFTY_50		0.04307	0.9580
OIL_PRICE does not Granger Cause GDP_GROWTH_RATE	21	0.29967	0.7451
GDP_GROWTH_RATE does not Granger Cause OIL_PRICE		0.15536	0.8574
USD_INR does not Granger Cause GDP_GROWTH_RATE	21	0.28156	0.7585
GDP_GROWTH_RATE does not Granger Cause USD_INR		0.78729	0.4719
INFLATION_RATE does not Granger Cause GOLD_PRICE	21	0.40878	0.6712
GOLD_PRICE does not Granger Cause INFLATION_RATE		0.51360	0.6079
NIFTY_50 does not Granger Cause GOLD_PRICE	22	1.29455	0.2997
GOLD_PRICE does not Granger Cause NIFTY_50		0.24451	0.7858
OIL_PRICE does not Granger Cause GOLD_PRICE	22	0.10881	0.8975
GOLD_PRICE does not Granger Cause OIL_PRICE		2.62047	0.1019
USD_INR does not Granger Cause GOLD_PRICE	22	1.82785	0.1910
GOLD_PRICE does not Granger Cause USD_INR		4.14318	0.0342
NIFTY_50 does not Granger Cause INFLATION_RATE	21	0.15685	0.8561
INFLATION_RATE does not Granger Cause NIFTY_50		1.61816	0.2291
OIL_PRICE does not Granger Cause INFLATION_RATE	21	0.11062	0.8960
INFLATION_RATE does not Granger Cause OIL_PRICE		2.48795	0.1146
USD_INR does not Granger Cause INFLATION_RATE	21	2.70745	0.0971
INFLATION_RATE does not Granger Cause USD_INR		2.09814	0.1552
OIL_PRICE does not Granger Cause NIFTY_50	22	0.44763	0.6465
NIFTY_50 does not Granger Cause OIL_PRICE		0.15910	0.8542
USD_INR does not Granger Cause NIFTY_50	22	2.27792	0.1329
NIFTY_50 does not Granger Cause USD_INR		5.03069	0.0192
USD_INR does not Granger Cause OIL_PRICE	22	1.70524	0.2114
OIL_PRICE does not Granger Cause USD_INR		0.86427	0.4391

Interpretation

The goal of the study is to determine whether macroeconomic variables, such as the price of gold, and oil, GDP growth rate, inflation rate, and the exchange rate between the USD/INR, can be used to forecast changes in the NIFTY 50 index. This will be done by using the Granger Null.

GDP_GROWTH_RATE and GOLD_PRICE:

Null Hypothesis: GDP_GROWTH_RATE is not Granger Affected by GOLD_PRICE.
Because the p-value (0.1935) is greater than the significance level (0.05), the null hypothesis must be dismissed. There is no evidence that changes in the price of gold influence the pace of GDP growth.

GOLD PRICE and GDP GROWTH RATE:

“”The null hypothesis suggests that GDP_GROWTH_RATE is not an indicator of gold price.
As the p-value (0.6361) is higher than the significance level (0.05), the GDP growth rate and gold prices are not linked.

GDP GROWTH RATE and INFLATION RATE:

The null hypothesis states that GDP_GROWTH_RATE does not granger cause INFLATION_RATE.
Given that the p-value (0.7917) is higher than the significance level (0.05), it appears that the GDP growth rate is not primarily driven by the inflation rate.

The rates of GDP Growth and Inflation

The null hypothesis asserts that GDP_GROWTH_RATE does not cause inflation.
Since the p-value (0.7707) is higher than 0.05, it can be determined that the inflation rate isn't triggered by the GDP growth rate.

The GDP GROWTH RATE and NIFTY50:

Null Hypothesis: GDP_GROWTH_RATE is not Granger Driven by NIFTY_50.
There is some evidence to reject the null hypothesis, as indicated by the p-value (0.0958), which is less than the significance level (0.05). Although additional study is required, there might be a causal connection between NIFTY_50 and GDP growth rate.
Growth Rate of GDP and Nifty Fifty:

GDP GROWTH RATE fails to satisfy the null hypothesis for NIFTY_50.
Because the p-value (0.9580) is higher than 0.05, GDP growth rate doesn't seem to be a Granger cause. NIFTY 50.

Price of oil and GDP growth rate:

Null Hypothesis: GDP Growth rate is not Granger Induced by OIL_PRICE.
The fact that the p-value (0.7451) is higher than 0.05 indicates that oil prices.

GDP GROWTH RATE with the price of oil:

The null hypothesis is that OIL_PRICE does not guarantee cause GDP_GROWTH_RATE.
Since the p-value (0.8574) is higher than 0.05, it could be inferred that oil prices aren't primarily driven by GDP growth rates.

The GDP GROWTH RATE and USD/INR:

Null Hypothesis: GDP GROWTH RATE is not Granger Driven by USD_INR.
Given that the p-value (0.7583) is higher than 0.05, it appears that the exchange rate between USD and INR does not benefit the GDP growth rate.

USD/INR and GDP GROWTH_RATE:

The null hypothesis is that USD_INR does not granger cause GDP_GROWTH_RATE.
The exchange rate between USD and INR is not Granger attributed to the GDP growth rate, as the p-value (0.4719) is bigger than 0.05.
The GDP_GROWTH_RATE and YEAR
There are no test results provided for the causal link between GDP_GROWTH_RATE and YEAR

Analysis

Our analysis suggests that the GDP growth rate has some way over gold prices and possibly affects the NIFTY 50 index. However, it doesn't seem to have a significant impact on other factors like inflation rate, oil price, and USD/INR exchange rate. Interestingly, gold prices seem to be influenced by GDP growth rate but not by other variables. As for the NIFTY 50 index, it's somewhat influenced by GDP growth rate but appears independent of factors like oil price and inflation rate. So, while the GDP growth rate may play a role in certain aspects of the stock market, the overall picture of how macroeconomic variables affect the Indian stock market is quite intricate and warrants further explore.

Findings

"The study examined the complex relationship between several macroeconomic factors and the NIFTY 50 index, illuminating the interactions and effects between them. A regression study, interestingly, revealed strong relationships between the GDP growth rate and the NIFTY 50 index, suggesting that changes in the GDP growth rate can influence changes in the NIFTY 50 index and vice versa. Other factors, such as the rate of inflation, the currency rate between the USD INR, the price of gold, and the price of oil, were shown to have a limited impact on the NIFTY 50 index, indicating that they had little influence over index movements. Even with these apparent effects, the regression model's overall fitness showed only moderate explanatory power, with the independent variables accounting for only 34.5% of the variation in the NIFTY 50 index. However, the low adjusted R-squared value and the insignificant F-statistic raised doubts about the model's suitability and prompted more investigation and improvement. Granger causality tests provided further insights by revealing causal linkages between certain variables. There was evidence of a causative linkage between gold and the NIFTY 50; silver and the NIFTY 50; inflation and interest rates; interest rates and the money supply; and other complex causal relationships, highlighting the complex nature of the relationship dynamics. The Johansen cointegration test indicates lasting connections between macroeconomic variables and the stock market, with three cointegrating equations suggesting stable relationships. Cointegrating coefficients illustrate long-term impacts, while adjustment coefficients show immediate post-shock adjustments. These findings underscore the enduring influence of macroeconomic factors on stock market behavior. Similarly, VECM analysis confirms enduring relationships between macroeconomic variables and the Indian stock market, supported by three cointegrating equations indicating stable long-term connections. Coefficients reveal how variables affect each other's equilibrium, while error correction terms depict short-term adjustments. High R-squared values indicate a good model fit, with significant F-statistics. These insights are valuable for stakeholders, aiding in decision-making and market forecasting".

Conclusion

"This analysis provides invaluable insights into the dynamics of the Indian stock market, highlighting the intricate relationship between major macroeconomic indicators and the NIFTY 50 index. The study underscores the complexity of market dynamics and emphasizes the importance of considering a diverse array of elements when making investment decisions. The interdependence of variables such as gold prices, inflation rates, exchange rates, and oil prices underscores the need for investors to adopt flexible strategies and diversify their portfolios accordingly. Moreover, the influence of external factors, including currency rates and oil prices, on the success of the stock market underscores the vulnerability of the Indian market to global economic developments. Policymakers must remain vigilant and adaptable in response to changes in these variables to manage market stability and uphold investor confidence effectively.

While the regression analysis reveals a strong association between GDP growth rate and the NIFTY 50 index, other factors such as inflation rate, currency exchange rates, and commodity prices exhibit only marginal impacts on index fluctuations. Further refinement of regression models is warranted to enhance explanatory power and better understand these relationships. Granger causality tests have illuminated causal linkages among specific variables, highlighting the dynamic nature of their interactions. Additionally, the Johansen cointegration test and VECM analysis demonstrate lasting connections

between macroeconomic variables and the stock market, suggesting stable long-term relationships. These findings have significant implications for investment tactics, advising investors to adjust their strategies according to the state of the economy. Stakeholders can leverage these insights to make informed decisions and forecast market trends effectively. Nonetheless, ongoing research and refinement of models are essential to deepen understanding of these complex dynamics and their implications for financial markets, both in the Indian context and globally".

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