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Evaluation of Macroeconomic Variables in the Indian Stock Market Using TOPSIS Method

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Abstract: *Asia's largest stock market, Indian stock market holds a pivotal position in the country's economy. Operating primarily through it is deeply influenced by government policies, global economic trends, corporate performance, and investor sentiment. These factors collectively shape the dynamics of the Indian economy as reflected in the market. Despite periodic fluctuations, the market has witnessed significant growth over the years, attracting both domestic and international investors. It offers diverse investment opportunities across various sectors such as technology, finance, pharmaceuticals, and manufacturing. Regulatory bodies like maintaining transparency and fairness in market procedures. the Indian stock market, conducting research holds significant importance. It serves as the cornerstone for making well-informed decisions, providing insights into market trends, company performance, and economic indicators. Thorough research empowers investors to identify profitable opportunities, mitigate risks, and enhance the long-term growth potential of their portfolios. Moreover, it facilitates understanding and compliance with regulatory changes and market dynamics, enabling investors to stay ahead of the curve. Essentially, research empowers investors in the Indian stock market, instilling confidence, minimizing risks, and maximizing opportunities. The TOPSIS ranking system, augmented with weighted averages and ambiguity comparisons, is commonly utilized. One approach involves addressing uncertainties to diminish ambiguity and adjusting both the weight and character of responses simultaneously. In TOPSIS, multiple responses are employed to adopt a holistic global perspective Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS) and Cryptocurrencies. Market Indices, Risk Management and Investor Sentiment. the Ranking of the Indian Stock Market. Direct Equity Investments got the first rank whereas the Real Estate Investment Trusts (REITs) have the Lowest rank.*

Keywords: *MCDM, Market Indices, Risk Management and Investor Sentiment.*

1. INTRODUCTION

Indian stock market for the economic well-being of the country acts as a measure and reflecting global trends its dynamic shows character it is stocks, derivatives various financial like Includes tools. commodities, and currencies, with distinct sections, prominently represented by housing numerous listed companies across diverse sectors. Both domestic and international investors engage in the market, aiming for wealth creation while navigating associated risks according to their objectives. Over the years, spurred by economic reforms, technological advancements, and increased investor participation, India's stock market has experienced significant expansion and evolution. It has transitioned to electronic trading platforms, enhancing efficiency, transparency, and accessibility. Regulatory reforms have bolstered investor confidence and market integrity [1]. India's share in the market has seen significant growth over the past two decades, driven by both international and domestic investment. The volatility in oil prices has historically been a major factor influencing markets worldwide. The role of oil in company portfolios has become increasingly important, especially since the instability in oil prices began in 1973. Additionally, innovations in stock and financial market technologies, along with economic

developments, have had a profound impact, particularly in emerging economies like India. crude oil and gold Prices of goods like, along with their volatility, have garnered significant attention from policymakers, economists, and financial institutions globally. In the global economy, fluctuations in oil prices are often considered indicative of broader economic trends and can influence interest rate decisions. It's worth noting that international oil transactions are predominantly conducted in US dollars, leading to currency depreciation in countries where local currencies strengthen against the dollar when oil prices rise [2]. Corporate earnings stand out as a pivotal driver in the Indian stock market, with investors meticulously scrutinizing companies' financial performances through quarterly and annual reports to inform their investment decisions. Earnings announcements frequently trigger fluctuations in stock prices, reflecting market sentiment and expectations. Moreover, macroeconomic GDP growth, inflation, Interest rates and government policies exert substantial influence on market dynamics, shaping investor behavior and market trends [3]. Indian stock markets, foreign company investors (FIIs) play an important role by enhancing liquidity and diversifying investment portfolios. Their involvement introduces foreign capital, but it also exposes the market to risks stemming from global economic conditions and geopolitics. Fluctuations in foreign financial flows and market sentiment can impact property prices, making the market susceptible to external shocks. The trading of derivatives on the Indian Stock Exchange has gained significance, allowing investors to hedge risks and capitalize on price movements. However, trading derivatives comes with challenges such as volatility, margin requirements, and regulatory oversight [4]. Market indices like Nifty 50 and Sensex serve as benchmarks, reflecting the stock market in various sectors. Investors Market Monitor trends, portfolio Evaluate performance, informed investment decisions Use these codes to pick up. Indian stock market and including institutional investors It covers different types of investors. Retail investor participation in recent years' financial literacy, technology and increased due to development of online trading platforms, they often face challenges such as lack of expertise and susceptibility to herd mentality and emotional biases [5]. Market integrity and investor protection are maintained through stringent regulation and monitoring by entities like brokers, and listed companies. Enforcement actions, monitoring mechanisms, and investor awareness programs play a pivotal role in safeguarding market stability and investor interests. Corporate governance practices are another critical aspect of the Indian Stock Exchange, listed companies follow the rules and disclose transparent information to shareholders and regulators. Strong governance practices enhance investor confidence and access to capital, leading to premium valuations in the market [6]. Despite its strengths, economic downturns, Geopolitical tensions, Regulatory changes and corporate scandals etc. These factors can significantly impact investor sentiment and market stability, necessitating continuous efforts to address structural issues and enhance efficiency and stability [7]. In the present decade, the Indian economy has achieved noteworthy GDP expansion, becoming the global leader in growth rate. Projections indicate further expansion, positioning it as a formidable player on the world stage. has witnessed remarkable activity in Single Stock Futures (SSFs), rendering it exceptionally dynamic. The utilization of data for price discovery in this rapidly evolving market presents an intriguing avenue for exploration. Consequently, India's trajectory as the world's fastest-growing major economy, propelled by a vibrant stock market, appears promising for future advancements [8]. This study delves into the ramifications of crude oil shocks in both real and financial sectors, assessing their impact in the Indian context. Specifically, it concentrates Expected demand and delivery oriented considering the factors, different types of oil respond to shocks stock market returns in terms of it explores volatility dynamics [9]. macroeconomics of uncertainty shocks Samples to know the effects the study evaluates. Monthly fluctuations in crude oil prices, revenues of major oil-producing firms, and the Policy Uncertainty Index from January 2003 to February 2020 are utilized in this analysis alongside stock returns data. Through this model, the study examines how oil shocks influence stock returns, observing fluctuations and adjustments in perceived fit. It particularly focuses on the relationship between stock returns and depreciation triggered by changes in oil prices, offering insights into the intricate interplay for oil shocks Between stock market performance [10]. Research conducted for the past twenty years in the Indian stock market has extensively explored various financial markets worldwide. In this context, GARCH models have been extensively studied to understand environmental variations in the Indian market. A significant body of literature has focused on modeling changes using these models. This paper proposes an alternative approach to evaluating modeling techniques, specifically in the Indian stock market in assessing volatility to model constantly changing unobserved state variables. In these models, unknown parameters are estimated [11]. Since 1991, the Indian stock market has witnessed remarkable growth, largely due to changes in policies towards liberalization and globalization. This shift has led to a growing emphasis on the stock market from a collective economic standpoint. Nowadays, discussions about the economy often revolve around the stock market, recognizing it as a major driver and primary source of resource mobilization for Indian companies, thereby facilitating financial and economic growth [12]. Internationally, the Indian stock market is recognized as one of the booming emerging markets, offering diverse investment opportunities. Its robust performance is fueled by both domestic and foreign capital, contributing to the overall development of the capital market. The combined performance of traded stock prices serves as a visible indicator of the market's movement, easily accessible through symbols. The stability of the Indian economy can be measured by various macroeconomic variables, economic conditions and exposure of companies, impacting their functioning throughout different stages of their

life cycle. Managing these macroeconomic variables becomes crucial for companies, as they directly affect share price volatility and market dynamics [13]. macroeconomic variables pricing process across the economy. Their uncertainty can lead to significant fluctuations in commodity markets, which, in turn, affect the stability of the stock market. Thus, understanding and managing these macroeconomic variables are essential for maintaining a stable and thriving financial system, where surplus sectors play a vital role in supplementing deficit sectors through savings [14]. Economic activities are flourishing, undergoing diverse applications. Investigations into these activities primarily employ two strands of instruments: the first strand focuses on share prices, while the second explores causal relationships within economic dynamics. Within the first group, Bethe and Karnick (2000) and Bhattachari and Mukherjee (2006) stand out as prominent representatives. Bethe and Karnick (2000) utilized monthly data spanning from 1992 to 1997 to delve into integration patterns and error corrections [15].

2. METHODOLOGY

Mutual Funds: There are many mutual funds from investors in various bonds in order to invest Collect money. They are professional Fund managers and are governed by privileges to various risk profiles to investors, providing exposure to different assets.

Exchange-Traded Funds (ETFs): ETFs, similar to individual stocks, trade on stock markets and typically track an index of goods, securities, or assets. They offer liquidity and flexibility to investors while exhibiting a diversified portfolio.

Real Estate Investment Trusts (REITs): REITs invest in income-generating real estate across residential, commercial, or industrial sectors, providing investors with dividends from rental income.

Gold and Precious Metals: Investing in gold and other precious metals is a strategy to diversify portfolios and hedge against inflation and economic uncertainties. Investors can buy gold directly, invest in gold futures or mining companies, or opt for gold ETFs.

Direct Equity Investments: Direct equity investments involve buying shares of individual listed companies, allowing investors to capitalize on fundamental analysis and explore market opportunities.

Derivatives: Both futures and options contracts are illustrations of derivatives that derive value to the assets underneath and give investors the ability to make assumptions on fluctuations in prices across various types of assets or to insure for risks.

Fixed Income Instruments: Fixed income instruments like bonds and debentures are used by Governments, corporations or by other entities to raise capital Published. They are Regular interest, and they provide the original repayment upon maturity, providing investors with a stable income stream.

Portfolio Management Services (PMS): PMS caters to high-net-worth individuals or corporations, offering personalized investment management services based on clients' financial goals and risk tolerance.

Cryptocurrencies: Cryptocurrencies are digital or virtual currencies encrypted for security and operate on decentralized blockchain networks. While they offer opportunities for profit and can be traded on online platforms, they are highly volatile and speculative investments, subject to regulation and security risks.

Market indices: Market indices represent a collection of assets within financial markets and serve as gauges for overall market sentiment, offering a snapshot of performance. Common evaluating investment performance and guiding decision-making.

Risk Management: Risk management is Potential Impacts Involves detection and mitigation affect a company's objectives. It encompasses evaluating various risks such as market, credit, operational, and liquidity risks, aiming to reduce losses and safeguard investments. Financial institutions and investors employ diverse strategies such as diversification, hedging, and portfolio optimization to manage risks and enhance the risk-return profile of portfolios.

Investor Sentiment: Investor sentiment reflects the collective outlook of investors towards financial markets or specific assets, indicating their overall attitude and perspective. It encompasses investors' emotions, beliefs, and perceptions regarding price direction and market conditions. Investor sentiment can range from bullish optimism during market upswings to bearish pessimism during downturns, influenced by factors like economic indicators, geopolitical events, and media coverage. Contrarian investors often use sentiment analysis to identify potential market shifts by going against prevailing trends.

Method: The TOPSIS ranking system, augmented with weighted averages and ambiguity comparisons, is commonly utilized. One approach involves addressing uncertainties to diminish ambiguity and adjusting both the weight and character of responses simultaneously. In TOPSIS, multiple responses are employed to adopt a holistic global perspective [16]. The TOPSIS process employs an advanced yet straightforward ranking mechanism. The sophisticated nature of TOPSIS seeks the optimal solution by selecting superior responses that enhance the scale while reducing costs. Conversely, inferior responses elevate costs, thereby leveraging favorable criteria and optimizing attribute utilization [17]. The TOPSIS method integrates two fuzzy functions, namely membership and a census sheet, to facilitate decision-making in FMCDM. Challenges and barriers exist in the adoption of FMCDM, warranting recommendations for researchers to enhance usability [18]. Topsis stands out due to its

fewer parameters compared to heuristics, making it more advantageous. Its adaptability to value changes when dealing with multiple response values underscores its utility in decision-making processes [19]. TOPSIS evaluates five distinct measurements to rank alternatives across various randomly generated problems of varying magnitudes. A numerical example showcases stability ratios, odds ratios for better alternatives, and mean Pearson coefficients, offering a comprehensive comparative analysis of preference ranking orders. This study delves into the relationship between variables and the influence of numerical measurements on the sequence regression of realized outcomes. Utilizing compromise programming, a "near ideal" solution is devised to cater to the majority while minimizing opposition, thereby maximizing group utility [20]. The TOPSIS method identifies optimal solutions by considering short-range and negative-optimal factors, disregarding insignificant distances in the process technique used for optimal solution detection [21]. TOPSIS, there are doubts about its efficacy due to several reasons. One criticism is the neglect of the relative importance of different sections, which can lead to issues, particularly when dealing with multiple goals in Multi-Objective Decision Making (MODM) [22]. To address this, TOPSIS can be modified by incorporating the satisfaction levels for each criterion, determined through the max-min operator. This enhances the technique's effectiveness in analyzing and comparing options. The true purpose of TOPSIS lies in facilitating decision-making processes, especially when there are diverse stakeholders involved, by considering various environmental factors [23]. It offers a comprehensive and efficient approach to selection. Initially, extensive statistical and theoretical analyses are conducted to understand the impacts of different attributes on decision-making. Additionally, the effects of environmental factors on TOPSIS are explored, leading to the development of approaches like E-TOPSIS or EW to optimize decision-making processes [24].

3. RESULTS AND DISCUSSION

TABLE 1. Indian Stock Market

	Market Indices	Risk Management	Investor Sentiment
Mutual Funds	0.1090	0.0960	0.1400
Exchange-traded funds (ETFs)	0.0840	0.1100	0.0390
Real Estate Investment Trusts (REITs)	0.0690	0.0836	0.1530
Gold and Precious Metals	0.1170	0.0954	0.1210
Direct Equity Investments	0.0790	0.1040	0.0250
Derivatives	0.1930	0.1320	0.1760
Fixed Income Instruments	0.0987	0.0940	0.1200
Portfolio Management Services (PMS)	0.0680	0.1430	0.0590
Cryptocurrencies	0.1830	0.1420	0.1670

Table 1 The Indian stock market analysis employing the TOPSIS Method incorporates various aspects such as market indices, risk management, and investor sentiment, alongside a range of investment options including Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS), and Cryptocurrencies, while considering alternative values.



FIGURE 1. Indian Stock Market

Figure 1 The Indian Stock Market Analysis utilizing the TOPSIS Method reveals insights into Market Indices, Risk Management, and Investor Sentiment across various investment avenues such as Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS), and Cryptocurrencies. From Figure 1 and Table 1, it's evident that Derivatives rank highest in Market Indices, whereas Portfolio Management Services (PMS) exhibit the lowest value in this category. Portfolio Management Services (PMS) excel in Risk Management, with Real Estate Investment Trusts (REITs) indicating a comparatively lower value. Additionally, Derivatives demonstrate the highest value in Investor Sentiment, while Direct Equity Investments present the lowest value.

$$X_{n1} = \frac{x_1}{\sqrt{(x_1)^2+(x_2)^2+(x_3)^2\dots}} \quad (1).$$

TABLE 2. Normalized Data

	Market Indices	Risk Management	Investor Sentiment
Mutual Funds	0.3038	0.2830	0.3789
Exchange-traded funds (ETFs)	0.2341	0.3242	0.1595
Real Estate Investment Trusts (REITs)	0.1923	0.2464	0.6257
Gold and Precious Metals	0.3261	0.2812	0.4948
Direct Equity Investments	0.2202	0.3066	0.1022
Derivatives	0.5379	0.3891	0.7197
Fixed Income Instruments	0.2751	0.2771	0.4907
Portfolio Management Services (PMS)	0.1895	0.4215	0.2413
Cryptocurrencies	0.5100	0.4186	0.6829

Table 2 The presentation showcases distinct normalized data sets for Market Indices, Risk Management, and Investor Sentiment, derived through Formula (1). Table 3 outlines the weights employed in the analysis, with uniform distribution across all parameters for comprehensive evaluation.

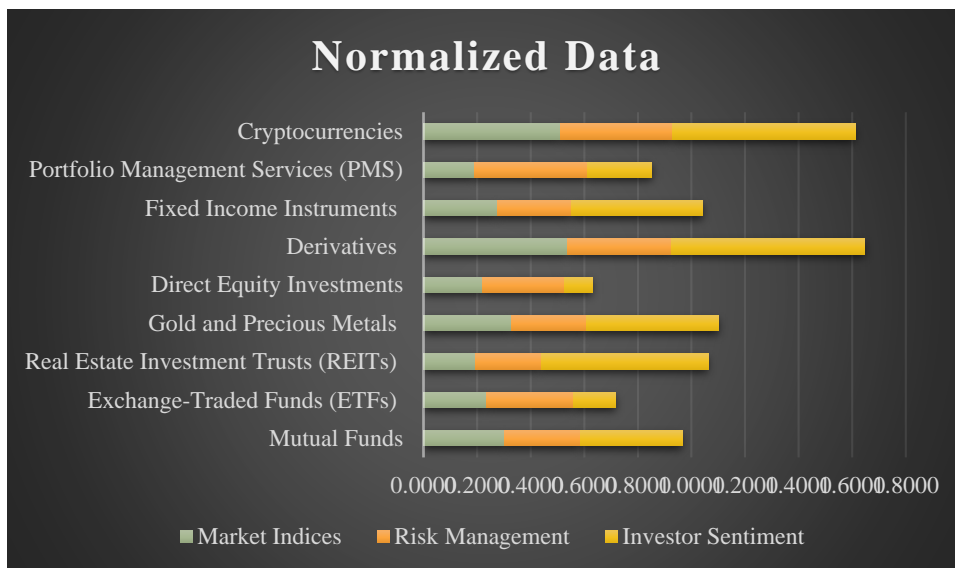


FIGURE 2. Normalized Data

Figure 2 The normalized data presentation depicts the Indian Stock Market analysis utilizing the TOPSIS Method, covering Market Indices, Risk Management, and Investor Sentiment, along with various investment options such as Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS), and Cryptocurrencies, including their respective normalized values.

TABLE 3. Weights

Weight		
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25

$$X_{wnormal1} = X_{n1} \times w_1 \tag{2}.$$

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix		
0.0759	0.0707	0.0947
0.0585	0.0811	0.0399
0.0481	0.0616	0.1564
0.0815	0.0703	0.1237
0.0550	0.0766	0.0256
0.1345	0.0973	0.1799
0.0688	0.0693	0.1227
0.0474	0.1054	0.0603
0.1275	0.1046	0.1707

Table 4 To determine the weighted normalized decision matrix for Market Indices, Risk Management, and Investor Sentiment, the formula (2) was applied.

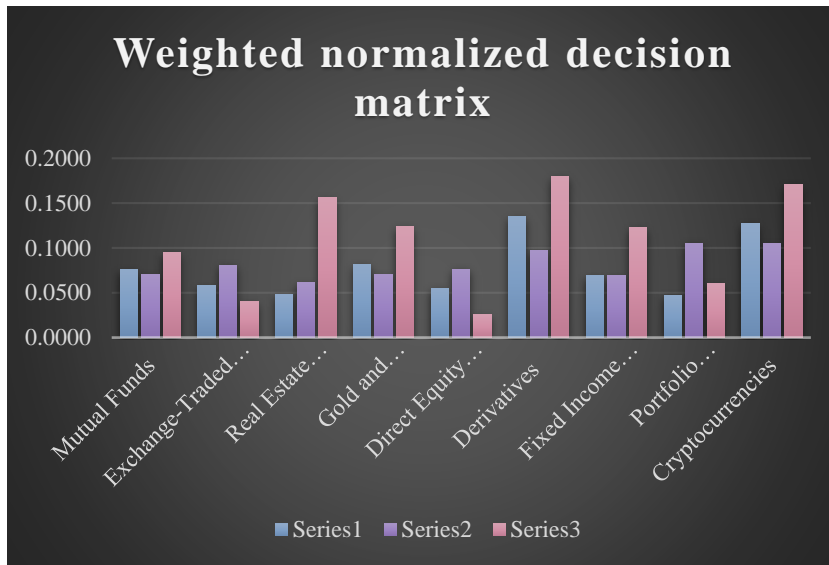


FIGURE 3. Weighted normalized decision matrix

Figure 3 In order to derive the weighted normalized decision matrix for Market Indices, Risk Management, and Investor Sentiment, formula (2) was utilized.

TABLE 5. Positive and Negative Matrix

Positive Matrix			Negative Matrix		
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799
0.1345	0.1054	0.0256	0.0474	0.0616	0.1799

Table 5 The Positive and Negative Matrices for various investment instruments including Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS), and Cryptocurrencies are summarized as in the Positive Matrix, the highest values observed are 0.1345 and 0.1054, while the lowest value is 0.0256. Conversely, in the Negative Matrix, the lowest values recorded are 0.0474 and 0.0616, with the highest value being 0.1799.

TABLE 6. Result of the Indian Stock Market

	SI Plus	Si Negative	Ci	Rank
Mutual Funds	0.0970	0.0903	0.4822	4
Exchange-traded funds (ETFs)	0.0810	0.1418	0.6365	2
Real Estate Investment Trusts (REITs)	0.1628	0.0235	0.1263	9
Gold and Precious Metals	0.1169	0.0664	0.3621	7
Direct Equity Investments	0.0845	0.1553	0.6477	1
Derivatives	0.1546	0.0941	0.3784	6
Fixed Income Instruments	0.1227	0.0616	0.3342	8
Portfolio Management Services (PMS)	0.0938	0.1274	0.5760	3
Cryptocurrencies	0.1453	0.0914	0.3861	5

Table 6 The outcome of TOPSIS for the Indian Stock Market is illustrated. Table 6 presents the TOPSIS Analysis Result for the Indian Stock Market as depicted in Figure 3. Six positive values are determined using formula (3). According to Figure 4, Derivatives exhibit a higher value in Si positive, whereas Exchange-Traded Funds (ETFs) indicate a lower value. Si Negative values are computed using formula (4), with Direct Equity Investments showing a higher value and Real Estate Investment Trusts (REITs) indicating a lower value. Ci values are calculated with formula (5), where Direct Equity Investments exhibit a higher value and Real Estate Investment Trusts (REITs) show a lower value.

$$X_{si+1} = \sqrt{((X_{wn1} - X_{p1})^2 + (Y_{wn1} - Y_{p1})^2 + (Z_{wn1} - Z_{p1})^2)} \quad (3)$$

$$X_{si-1} = \sqrt{((X_{wn1} - X_{n1})^2 + (Y_{wn1} - Y_{n1})^2 + (Z_{wn1} - Z_{n1})^2)} \quad (4)$$

$$X_{ci1} = \frac{X_{si-1}}{(X_{si+1}) + (X_{s(i-1)})} \quad (5)$$

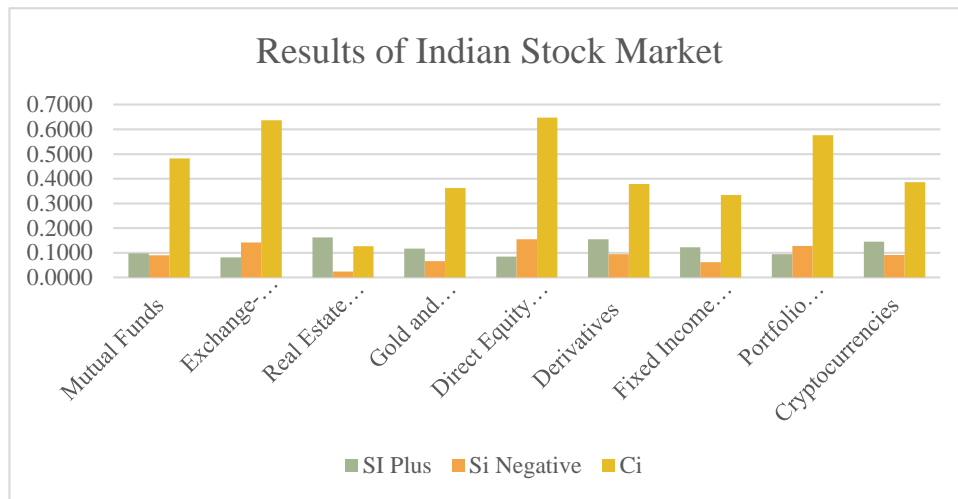


FIGURE 4. Indian Stock Market

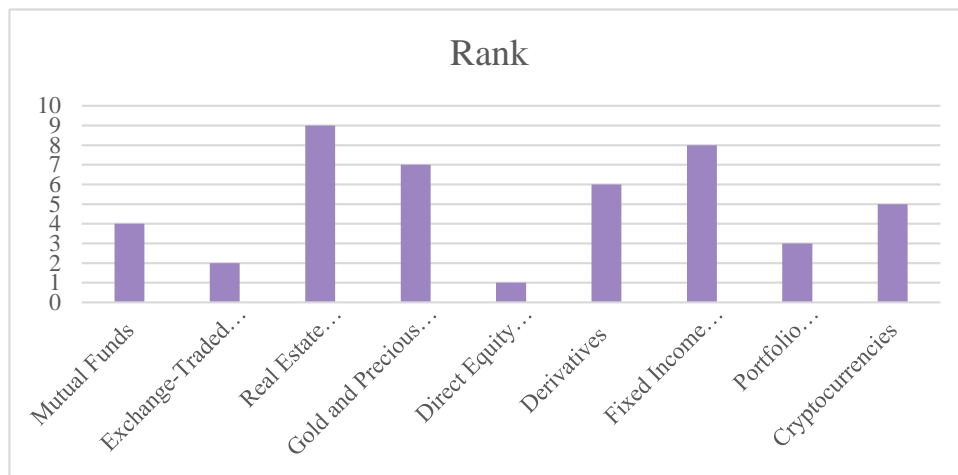


FIGURE 5. Shown The Rank

Figure 5 Shows the Rank of the Indian Stock Market. Direct Equity Investments got the first rank whereas the Real Estate Investment Trusts (REITs) have the lowest rank.

4. CONCLUSION

Asia's largest stock market, Indian stock market holds a pivotal position in the country's economy. Operating primarily through it is deeply influenced by government policies, global economic trends, corporate performance, and investor sentiment. These factors collectively shape the dynamics of the Indian economy as reflected in the market. Despite periodic fluctuations, the market has witnessed significant growth over the years, attracting both domestic and international investors. It offers diverse investment opportunities across various sectors such as technology, finance, pharmaceuticals, and manufacturing. Regulatory bodies like maintaining transparency and fairness in market procedures. the Indian stock market, conducting research holds significant importance. It serves as the cornerstone for making well-informed decisions and providing insights into market trends, company performance, and economic indicators. Indian stock market for the economic well-being of the country acts as a measure and reflects global trends its dynamic shows character it is stocks, derivatives various financial like Includes tools. commodities, and currencies, with distinct sections, prominently represented by housing numerous listed companies across diverse sectors. Both domestic and international investors engage in the market, aiming for wealth creation while navigating associated risks according to their objectives. Over the years, spurred by economic reforms, technological advancements, and increased investor participation, India's stock market has experienced significant expansion and evolution. It has transitioned to electronic trading platforms, enhancing efficiency, transparency, and accessibility. Regulatory reforms have bolstered investor confidence and market integrity. The TOPSIS ranking system, augmented with weighted averages and ambiguity comparisons, is

commonly utilized. One approach involves addressing uncertainties to diminish ambiguity and adjusting both the weight and character of responses simultaneously. In TOPSIS, multiple responses are employed to adopt a holistic global perspective in all the instruments: Mutual Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs), Gold and Precious Metals, Direct Equity Investments, Derivatives, Fixed Income Instruments, Portfolio Management Services (PMS) and Cryptocurrencies. Market Indices, Risk Management, and Investor Sentiment. In the ranking of the Indian Stock Market, Direct Equity Investments got the first rank whereas the Real Estate Investment Trusts (REITs) had the lowest rank.

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