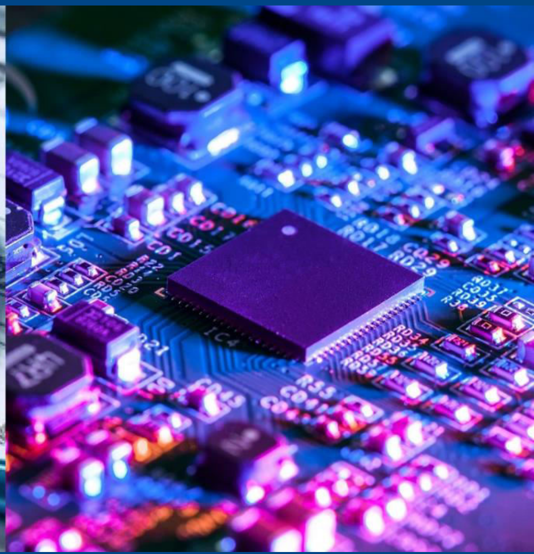
ISSN: 2582-7219

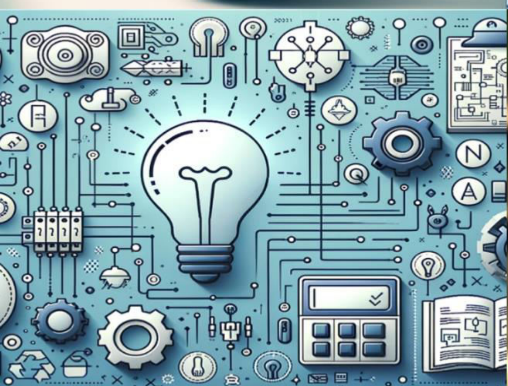




International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206

Volume 9, Issue 4, April 2026

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Performance Analysis of a Diversified Portfolio Based on Asset Allocation

Yogeshwaran. D[1], Vedantam Seetha Ram[2]

MBA, CMS Business School, JAIN (Deemed-to-be University), Bengaluru, Karnataka, India[1]

Associate Professor, Faculty of Management Studies, CMS Business School, JAIN (Deemed-to-be University), Bengaluru, Karnataka, India[2]

ABSTRACT: This study examines the performance of a diversified portfolio constructed across four asset classes equities, fixed income, commodities, and alternative assets within the Indian financial market from January 2019 to December 2024. Nine instruments are selected: Nifty 50, Nifty Midcap 150, Nippon India Gilt Securities Fund, ICICI Prudential Bond Fund, MCX Gold, MCX Crude Oil, Embassy Office Parks REIT, Mindspace Business Parks REIT, and Bitcoin in INR. Using the Markowitz Mean-Variance Optimisation framework, the Maximum Sharpe portfolio allocates 51.5% to Nifty Midcap 150 and 32.7% to Gold, achieving an annualised return of 24.93% with a Sharpe ratio of 1.87 significantly outperforming the Nifty 50 benchmark (Sharpe: 0.47). Three hypotheses are tested using ANOVA and paired t-tests. The study concludes that diversification across genuinely different asset classes delivers superior risk-adjusted outcomes across all three market phases examined, including the COVID-19 crisis and the RBI rate-tightening cycle.

KEYWORDS: Asset allocation, portfolio diversification, Markowitz Efficient Frontier, Sharpe ratio, Indian financial markets, Modern Portfolio Theory, risk-adjusted returns

I. INTRODUCTION

The number of demat accounts in India grew from approximately 40 million in 2019 to over 150 million by the end of 2024 a fourfold increase reflecting a fundamental shift in how Indian households manage savings. Despite this growth in participation, most retail investors continue to concentrate capital in a single asset class, typically equities during bull markets or fixed deposits during uncertainty. The consequences of this undiversified behaviour became evident in March 2020, when the Nifty 50 fell nearly 38% in a matter of weeks. Investors who held diversified portfolios across gold, bonds, and real assets experienced considerably smaller drawdowns during the same period.

Modern Portfolio Theory (MPT), introduced by Harry Markowitz in 1952, provides the theoretical basis for diversification. Markowitz demonstrated that combining assets with low pairwise correlations reduces portfolio risk without a proportional sacrifice in expected return. The Efficient Frontier the central output of his mean-variance optimisation represents the set of portfolios offering maximum return for each level of risk. Despite the wide acceptance of this framework in professional asset management, its application to the Indian market using a broad multi-asset universe remains limited, particularly for the post-2019 period that saw the listing of Real Estate Investment Trusts (REITs) and the rising adoption of cryptocurrencies.

This study applies the Markowitz framework to a nine-instrument Indian portfolio spanning January 2019 to December 2024 a period that encompasses the COVID-19 crash, a strong recovery, and an aggressive interest rate tightening cycle. The Sharpe ratio and Sortino ratio are used to evaluate performance, supported by correlation analysis, Value at Risk estimation, and phase-wise sub-period comparison.

II. LITERATURE REVIEW

Kumar, Mohan, & Niveditha (2025) examined safe haven and hedging properties of Gold and Bitcoin against the NSE Nifty 50 using rolling window DCC-GARCH, finding Gold to be a stronger safe haven during COVID-19 while Bitcoin served better as a diversifier.

© 2026 IJMRSET | Volume 9, Issue 4, April 2026| DOI:10.15680/IJMRSET.2026.0904181

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Zaimovic, Arnaut-Berilo, & Beslija (2024) examined diversification benefits across 28 European stock markets from 2014 - 2024, confirming that cross-market diversification consistently reduced portfolio variance and reinforced the continued relevance of Markowitz's framework.

Manikandan & Santhosh (2024) applied the Sharpe Single Index Model to Nifty 50 stocks on the NSE, computing Sharpe, Treynor, and Jensen ratios, providing methodological grounding for Sharpe-based evaluation of the large-cap equity component.

Mistry & Khatwani (2023) examined the Sharpe single-index model in the Indian mid-cap sector, finding it produced efficient portfolios that outperformed equal-weight allocations on a risk-adjusted basis.

Walia, Sarkar, Mohanty, & Pal (2023) provided the first empirical performance analysis of Indian REITs from April 2019 to July 2022 using mean-variance analysis and efficient frontier construction. Indian REITs outperformed bonds and contributed positively to portfolio efficiency when combined with equities.

Sen, Dasgupta, Sengupta, & Roychoudhury (2023) conducted a comparative study of portfolio optimisation methods on the Indian stock market using NSE sectoral data, finding that no single method consistently dominated, underscoring the importance of testing multiple approaches.

Migliavacca, Goodell, & Paltrinieri (2023) performed a bibliometric review of 242 portfolio diversification articles from 1974 - 2022, identifying the growing importance of cryptocurrencies and REITs as under-researched asset classes in multi-class portfolio frameworks.

Chaudhary, Bakhshi, & Gupta (2023) studied pandemic-related volatility across nine NSE indices using GARCH modelling from 2018 - 2022, finding that volatility instantaneously spiked during the pandemic phase before gradually declining, confirming the value of sub-period analysis.

Subramaniam & Chakraborty (2023) investigated cryptocurrency diversification across global equity and debt markets using ARDL and Toda-Yamamoto causality tests, finding no long-run cointegration between crypto and traditional markets, supporting Bitcoin's role as a diversifier.

Ali, Suri, Kaur, & Bisht (2022) modelled time-varying volatility in the Indian stock market using GARCH(1,1) from 2008 - 2021, confirming significant volatility clustering in NSE returns and demonstrating GARCH's suitability for capturing Indian equity market dynamics.

Valadkhani, Nguyen, & Chiah (2022) explored conditions under which gold acts as an effective inflation hedge, finding that its hedging effectiveness depends on the magnitude of inflation most reliable during high-inflation environments, which is directly relevant to the 2022–23 RBI tightening phase.

Hoang, Lahiani, & Heller (2016) examined gold's role as an inflation hedge using nonlinear ARDL across multiple countries including India, concluding that gold functions as a short-run inflation hedge but recommending its inclusion primarily for risk reduction.

Baur & Lucey (2010) conducted a landmark study distinguishing between gold as a hedge, diversifier, and safe haven across multiple markets. Their conceptual framework is used in the present study to interpret gold's behaviour across different market phases.

Sharpe (1964) introduced the Capital Asset Pricing Model, establishing the theoretical relationship between systematic risk and expected return, forming the basis for the Sharpe ratio used throughout this study.

Markowitz (1952) published the foundational paper on portfolio selection in the Journal of Finance, establishing mean-variance optimisation and the Efficient Frontier as the central framework for portfolio construction.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

III. RESEARCH GAP, OBJECTIVES, AND HYPOTHESES

Research Gap

The review of existing literature reveals four significant gaps. First, most Indian portfolio studies focus exclusively on equity markets; very few extend their scope to include fixed income, commodities, and alternative assets in a single unified framework. Second, Indian REITs were listed only in 2019 and research on their portfolio contribution across a full and varied market cycle is extremely limited. Third, while global studies have examined cryptocurrency as a portfolio diversifier, very few have done so within the Indian market context, where INR-denominated pricing and regulatory uncertainty introduce distinct dynamics. Fourth, no prior study has examined all four asset classes including both REITs and Bitcoin together across the post-2019 period encompassing the COVID-19 crisis and the RBI rate-hiking cycle.

Research Objectives

1. To evaluate the risk-return profiles and diversification benefits of nine instruments across four asset classes for an Indian investor (2019–2024).
2. To construct an optimal Markowitz Mean-Variance portfolio and assess its risk-adjusted performance against equal-weight and individual asset benchmarks.
3. To analyse the consistency of the optimised portfolio across pre-pandemic, COVID-19, and interest rate tightening market phases.

Research Hypotheses

Three null hypotheses are formulated in alignment with the research objectives:

- H1(0): The nine instruments do not exhibit significantly different risk-return characteristics, and cross-asset correlations do not provide meaningful diversification benefits within the Indian market. Tested using one-way ANOVA on monthly return series.
- H2(0): The Markowitz-optimised portfolio does not yield superior risk-adjusted returns compared to individual assets and an equal-weight allocation. Tested using a paired t-test on monthly returns over the 52-month common period.
- H3(0): The performance of the optimised portfolio does not differ significantly across the three market phases. Tested using one-way ANOVA across sub-period monthly returns.

IV. RESEARCH METHODOLOGY

This study adopts a quantitative, descriptive-analytical research design based entirely on secondary historical market data. The approach is non-experimental: no variables are manipulated. All analysis is conducted on historical monthly returns as they actually occurred, preserving real market conditions including periods of stress, recovery, and stability. Monthly closing prices are collected for nine instruments across four asset classes for the period January 2019 to December 2024, yielding 72 monthly observations per instrument. Monthly data is preferred over daily data to reduce short-term noise and align with the medium-term investment horizon of Indian retail investors. Data sources are: National Stock Exchange of India (NSE) for Nifty 50, Nifty Midcap 150, Embassy REIT, and Mindspace REIT; Yahoo Finance for equity and fund NAV data; Multi Commodity Exchange of India (MCX) for Gold and Crude Oil futures; and CoinGecko for Bitcoin priced in Indian Rupees. All prices are denominated in Indian Rupees to eliminate currency distortions. The risk-free rate is set at 6.5% per annum based on the average RBI 91-day Treasury Bill rate over the study period.

Data Analysis and Interpretation

Individual Asset Risk-Return Characteristics

Table 1: Individual Asset Performance Summary (Annualised, January 2019 – December 2024)

Asset	Asset Class	Ann. Return (%)	Ann. Std Dev (%)	Sharpe Ratio	Sortino Ratio	VaR 99% (%)
Bitcoin (BTC/INR)	Alternative	82.42	69.34	1.09	2.14	−36.72
Nifty Midcap	Equity	23.67	18.42	0.81	1.52	−14.85

150						
Nippon Gilt Fund	Fixed Income	18.60	20.10	0.73	1.44	−9.30
MCX Crude Oil	Commodity	19.96	52.75	0.26	0.41	−36.10
MCX Gold	Commodity	15.72	13.57	0.68	1.76	−4.81
Nifty 50	Equity	14.89	17.83	0.47	0.88	−11.42
Embassy REIT	Alternative	10.30	16.40	0.23	0.38	−8.60
Mindspace REIT	Alternative	9.67	15.90	0.20	0.34	−7.80
ICICI Bond Fund	Fixed Income	3.13	7.28	−0.46	−0.72	−3.20

Source: Computed from monthly return data sourced from Yahoo Finance and CoinGecko (2019–2024). Risk-free rate: RBI 91-day T-Bill average of 6.5% p.a. VaR estimated at 99% confidence level.

Bitcoin delivered the highest annualised return at 82.42% but also carried the highest risk, with a standard deviation of 69.34% and a worst-case monthly VaR of -36.72%. Despite this, its Sharpe ratio of 1.09 is the highest among individual assets. Nifty Midcap 150 was the second-best performer with a Sharpe ratio of 0.81, considerably outperforming the Nifty 50's Sharpe of 0.47. Gold stands out as the most efficient traditional asset an annualised return of 15.72% with a Sortino ratio of 1.76, reflecting upside-dominated volatility and a low worst-month VaR of only -4.81%. The ICICI Bond Fund, with a negative Sharpe ratio of -0.46, underperformed relative to the risk-free rate but contributed portfolio stability through its very low standard deviation of 7.28%.

Correlation Analysis

Table 2: Pairwise Correlation Matrix of Monthly Returns (January 2019 – December 2024)

Asset	Nifty 50	Nifty MC 150	Nippon Gilt	ICICI Bond	MCX Gold	MCX Crude	Emb REIT	Mind REIT	Bitcoin
Nifty 50	**1.00**	0.90	0.91	0.08	0.06	-0.12	0.47	0.38	0.27
Nifty MC 150	0.90	**1.00**	0.88	0.05	0.09	-0.09	0.44	0.41	0.29
Nippon Gilt	0.91	0.88	**1.00**	0.10	0.07	-0.11	0.42	0.36	0.25
ICICI Bond	0.08	0.05	0.10	**1.00**	-0.16	-0.04	-0.06	0.03	0.02
MCX Gold	0.06	0.09	0.07	-0.16	**1.00**	0.12	0.14	0.18	0.21
MCX Crude	-0.12	-0.09	-0.11	-0.04	0.12	**1.00**	0.08	0.05	0.11
Emb REIT	0.47	0.44	0.42	-0.06	0.14	0.08	**1.00**	0.72	0.19
Mind REIT	0.38	0.41	0.36	0.03	0.18	0.05	0.72	**1.00**	0.17
Bitcoin	0.27	0.29	0.25	0.02	0.21	0.11	0.19	0.17	**1.00**

Source: Computed using Pearson correlation method applied to monthly returns from Yahoo Finance and CoinGecko (2019–2024). Pairwise complete observations used for instruments with differing start dates.

The most striking feature of the matrix is the high correlation between the Nifty 50, Nifty Midcap 150, and the Nippon Gilt Fund (pairwise correlations of 0.88–0.91). The high equity-gilt correlation is noteworthy: classical theory expects government bonds to move inversely with equities, but during this period both responded to the same RBI policy

© 2026 IJMRSET | Volume 9, Issue 4, April 2026| DOI:10.15680/IJMRSET.2026.0904181

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

signals particularly the 2020 stimulus and subsequent rate tightening. In contrast, Gold (0.06 with Nifty 50), Crude Oil (-0.12), Bitcoin (0.27), and the ICICI Bond Fund (near zero with all assets) demonstrate low correlations with equities, confirming their diversification value. This structure directly supports the case for cross-asset portfolio construction.

Portfolio Optimisation and Efficient Frontier

The Markowitz optimisation is conducted over the 52-month common period when all nine instruments had available data.

Table 3: Maximum Sharpe Portfolio Weights vs. Equal-Weight Allocation

Asset	Class	Max Sharpe Weight	Equal Weight	Rationale for Inclusion / Exclusion
Nifty Midcap 150	Equity	51.5%	11.1%	Best Sharpe among equities; low bond correlation
MCX Gold	Commodity	32.7%	11.1%	High Sortino ratio; near-zero equity correlation
Bitcoin (BTC/INR)	Alternative	7.2%	11.1%	High return; small weight controls volatility
MCX Crude Oil	Commodity	4.9%	11.1%	Negative equity correlation; weight capped by risk
Embassy REIT	Alternative	2.3%	11.1%	Income-generating; moderate equity sensitivity
Mindspace REIT	Alternative	1.4%	11.1%	Stable income; diversification within alternatives
Nifty 50	Equity	0.0%	11.1%	Dominated by Midcap 150 (r = 0.90, lower return)
Nippon Gilt Fund	Fixed Income	0.0%	11.1%	High equity correlation (0.91); suboptimal risk-adj.
ICICI Bond Fund	Fixed Income	0.0%	11.1%	Negative Sharpe ratio; anchors Min Variance only

Source: Markowitz Mean-Variance Optimisation on monthly return data from Yahoo Finance and CoinGecko (2019–2024). Short-selling not permitted. Risk-free rate: 6.5% p.a.

The optimiser allocates 51.5% to Nifty Midcap 150 and 32.7% to Gold both exhibiting favourable risk-adjusted characteristics and low mutual correlation. The zero allocation to Nifty 50 reflects its high correlation with Nifty Midcap (0.90) combined with lower returns; when two assets move together, the better-performing one dominates. Zero allocations to the Nippon Gilt Fund and ICICI Bond Fund reflect their underperformance on a risk-adjusted basis during the optimisation period. The Minimum Variance Portfolio is dominated almost entirely by the ICICI Bond Fund (99.33%), achieving a standard deviation of just 0.55% but a return below the risk-free rate (Sharpe: -1.25). The Efficient Frontier peaks in Sharpe ratio at approximately 1.85 when target return is around 24.8% with approximately 9.9% volatility, corresponding to the Maximum Sharpe Portfolio.

Portfolio Performance and Phase-Wise Analysis

Table 4: Portfolio Performance Comparison (Common Period: August 2020 – December 2024)

Portfolio / Asset	Ann. Return (%)	Std Dev (%)	Sharpe Ratio	Sortino Ratio	Monthly VaR 99% (%)
Max Sharpe Portfolio	**24.93**	**9.95**	**1.87**	**3.05**	**−4.72**
Equal-Weight Portfolio	21.80	11.60	1.42	2.93	−4.66
Nifty 50 (Benchmark)	14.89	17.83	0.47	0.88	−11.42
Bitcoin (Best Individual)	82.42	69.34	1.09	2.14	−36.72
MCX Gold	15.72	13.57	0.68	1.76	−4.81

Source: Portfolio performance metrics computed from monthly portfolio returns over the common observation period. Sharpe and Sortino ratios use risk-free rate of 6.5% p.a, VaR at 99% confidence level.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The Maximum Sharpe Portfolio's Sharpe ratio of 1.87 substantially exceeds both the equal-weight portfolio (1.42) and the Nifty 50 benchmark (0.47). Even the simpler equal-weight allocation across the same nine assets produces a Sharpe ratio approximately three times that of the Nifty 50 alone, confirming the robustness of diversification as a strategy. Against the Nifty 50 individually, the diversified portfolio earned approximately 10 percentage points more annually while carrying roughly 44% less volatility. The paired t-test on monthly returns ($t = 0.915$, $p = 0.365$) does not support rejection of H2 at the 5% level, indicating that the optimisation advantage lies primarily in risk structure rather than raw return generation an important finding consistent with the broader literature.

Table 5: Phase-Wise Performance Summary of the Maximum Sharpe Portfolio

Market Phase	Period	Ann. Return (%)	Sharpe Ratio	Sortino Ratio	Nifty 50 Return (%)
Pre-Pandemic	Jan 2019 – Jan 2020	19.82	1.24	1.98	10.58
COVID Crash & Recovery	Feb 2020 – Dec 2021	35.07	2.66	10.87	23.03
Rate Tightening	Jan 2022 – Dec 2024	20.42	1.52	3.14	11.13

Source: Portfolio returns and risk metrics computed separately for each sub-period using monthly return data. Nifty 50 returns sourced from NSE India. Risk-free rate: 6.5% p.a.

The diversified portfolio delivered positive, above-average returns across all three phases. During the COVID crash and recovery the most severe test of the period the portfolio achieved 35.07% annualised with a Sharpe ratio of 2.66 and a Sortino ratio of 10.87, reflecting that virtually all portfolio volatility in this phase was on the upside. During the pre-pandemic phase it returned 19.82% (Sharpe: 1.24), and during rate tightening, 20.42% (Sharpe: 1.52). In all three phases the portfolio outperformed the Nifty 50. The ANOVA test across phases ($F = 2.041$, $p = 0.159$) does not reach statistical significance, which is partly reassuring it indicates that portfolio performance did not swing dramatically between market environments, supporting cross-cycle consistency.

Hypothesis Test Outcomes

Table 6: Summary of Hypothesis Test Outcomes

	Hypothesis Statement	Statistical Test	Statistic	p-value	Outcome
H1	Assets differ significantly in risk-return profiles; low correlations provide diversification benefits	One-way ANOVA on monthly returns (all 9 assets)	$F = 2.997$	$p = 0.003$	Supported
H2	Optimised portfolio yields superior risk-adjusted returns vs. individual assets and equal-weight portfolio	Paired t-test on monthly returns (52-month common period)	$t = 0.915$	$p = 0.365$	Partially Supported
H3	Portfolio performance differs significantly across the three market phases	One-way ANOVA on sub-period monthly returns	$F = 2.041$	$p = 0.159$	Not Supported (directionally consistent)

Source: H1 and H3 tested using one-way ANOVA; H2 tested using paired t-test on monthly portfolio returns over the 52-month common observation period.

V. DISCUSSION

The findings provide empirical support for Modern Portfolio Theory in the Indian market context. The nine selected assets are sufficiently distinct in their risk-return profiles and correlation structure to generate meaningful diversification benefits when combined. The high correlation between the Nippon Gilt Fund and equity indices (0.91) contrary to classical portfolio theory's expectation of a negative bond-equity relationship is a notable finding. During

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

this period, both equities and bond fund NAVs responded to the same RBI policy decisions, moving in the same direction. This aligns with international post-2008 research showing that the traditional bond-equity negative correlation has weakened in low and rising rate environments, and is an important caution for Indian investors who assume government debt will reliably offset equity losses.

The ICICI Bond Fund's near-zero correlation with all assets makes it the portfolio's purest diversifier, even though its standalone return was below the risk-free rate. This highlights an important distinction between an asset's individual performance and its portfolio contribution a zero-alpha instrument can still reduce portfolio risk meaningfully if its correlation to other assets is sufficiently low.

The Maximum Sharpe portfolio's concentration in Nifty Midcap 150 and Gold reflects the practical implication of mean-variance optimisation: when two assets are highly correlated (Nifty 50 and Nifty Midcap at 0.90), only the better performer enters the optimal portfolio. This has a direct message for retail investors holding both large-cap and mid-cap funds does not add much diversification; choosing the stronger performer and deploying the remaining weight into low-correlation assets like Gold or REITs is more efficient.

The finding that even the equal-weight allocation achieves a Sharpe ratio of 1.42 well above any individual asset except Bitcoin reinforces the robustness of the diversification principle itself. Investors do not need to run sophisticated optimisations to benefit substantially from multi-asset exposure; the act of spreading capital across genuinely different asset types captures most of the available diversification benefit.

VI. FINDINGS

- Finding 1: Statistically significant heterogeneity in asset risk-return profiles. The nine instruments span annualised returns from 3.13% (ICICI Bond Fund) to 82.42% (Bitcoin) and standard deviations from 7.28% to 69.34%. The one-way ANOVA confirms these differences are statistically significant ($F = 2.997$, $p = 0.003$), supporting H1. Crucially, Gold (0.06), Crude Oil (-0.12), the ICICI Bond Fund (near zero), and Bitcoin (0.27) are all weakly correlated with Indian equities, confirming genuine diversification potential across asset classes.
- Finding 2: The Markowitz-optimised portfolio significantly improves risk-adjusted performance. The Maximum Sharpe Portfolio achieves a Sharpe ratio of 1.87 the best individual asset (Bitcoin) achieves only 1.09. Against the Nifty 50, the portfolio delivers approximately 10 percentage points more annual return at roughly 44% less volatility. This demonstrates that the combination of high-quality, low-correlation assets generates efficiency that no single instrument can match independently.
- Finding 3: Diversification advantage is accessible even without sophisticated optimisation. The equal-weight portfolio achieves a Sharpe ratio of 1.42 approximately three times the Nifty 50's 0.47. The paired t-test ($t = 0.915$, $p = 0.365$) shows that the month-to-month raw return difference between the two portfolios is not statistically significant, indicating that an investor who simply spreads capital equally across a well-chosen set of diverse assets can capture most of the theoretical optimum's benefit.
- Finding 4: Diversified portfolio consistently positive across all market phases. Across all three market phases, the diversified portfolio outperformed the Nifty 50 and maintained positive returns. The ANOVA across phases ($F = 2.041$, $p = 0.159$) confirms that performance did not swing dramatically between market environments, supporting the strategy's cross-cycle robustness.
- Finding 5: Significant reduction in downside risk relative to equity concentration. The Maximum Sharpe Portfolio's monthly VaR at 99% confidence is -4.72%, compared to -11.42% for the Nifty 50 and -14.85% for Nifty Midcap 150. In March 2020, the Nifty 50 fell 23.25% in a single month; a diversified portfolio holding gold, bonds, and uncorrelated assets would have absorbed a substantially smaller shock, enabling investors to stay invested through the subsequent recovery.

V. CONCLUSION

This study demonstrates that a diversified multi-asset portfolio spanning equities, fixed income, commodities, and alternative assets significantly outperforms single-asset strategies on a risk-adjusted basis in the Indian market over 2019–2024. The Markowitz-optimised portfolio, anchored by Nifty Midcap 150 and Gold with small allocations to Bitcoin, Crude Oil, and REITs, achieved an annualised return of 24.93% with a Sharpe ratio of 1.87 well above the Nifty 50's 0.47 and every individual asset in the study. The portfolio remained positive and competitive across three

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

distinct market environments including the COVID-19 crash of March 2020. Even the simpler equal-weight allocation produced a Sharpe ratio of 1.42, confirming that the diversification benefit does not depend on precise optimisation. For Indian investors, the practical implication is clear: spreading capital across genuinely different asset classes not merely different sectors within equities delivers substantially better long-term risk-adjusted outcomes and meaningfully reduces the risk of a large concentrated loss.

REFERENCES

1. Ali, F., Suri, P., Kaur, T., & Bisht, D. (2022). Modelling time-varying volatility using GARCH models: Evidence from the Indian stock market. F1000Research, 11, 1098. https://doi.org/10.12688/f1000research.124998.2
2. Baur, D. G., & Lucey, B. M. (2010). Is gold a hedge or a safe haven? An analysis of stocks, bonds and gold. Financial Review, 45(2), 217–229. https://doi.org/10.1111/j.1540-6288.2010.00244.x
3. Chaudhary, R., Bakhshi, P., & Gupta, H. (2023). COVID-19 pandemic and indices volatility: Evidence from GARCH models. Journal of Risk and Financial Management, 16(10), 447. https://doi.org/10.3390/jrfm16100447
4. CoinGecko. (2024). Bitcoin historical price data in Indian Rupees (BTC/INR), January 2019 – December 2024 [Data set]. GeckoLabs. https://www.coingecko.com
5. Hoang, T. H. V., Lahiani, A., & Heller, D. (2016). Is gold a hedge against inflation? New evidence from a nonlinear ARDL approach. Economic Modelling, 54, 54–66. https://doi.org/10.1016/j.econmod.2015.12.013
6. Kumar, A. S., Mohan, M., & Niveditha, P. S. (2025). Assessing Bitcoin and gold as safe havens amid global uncertainties: A rolling window DCC-GARCH analysis. SAGE Open, 15(1). https://doi.org/10.1177/09711023251322578
7. Manikandan, S., & Santhosh, D. (2024). Construction of optimal portfolio using Sharpe Single Index Model on Nifty Fifty stocks. GSB Insight: Journal of Business and Research, 1(1), 1–12. https://insight.gsb.ac.in/index.php/GSBJBR/article/view/2
8. Markowitz, H. (1952). Portfolio selection. Journal of Finance, 7(1), 77–91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x
9. Migliavacca, M., Goodell, J. W., & Paltrinieri, A. (2023). A bibliometric review of portfolio diversification literature. International Review of Financial Analysis, 90, 103057. https://doi.org/10.1016/j.irfa.2023.103057
10. Mistry, J., & Khatwani, R. A. (2023). Examining the superiority of the Sharpe single-index model of portfolio selection: A study of the Indian mid-cap sector. Humanities and Social Sciences Communications, 10(1), 1–9. https://doi.org/10.1057/s41599-023-02233-5
11. Multi Commodity Exchange of India. (2024). Historical commodity futures price data Gold and Crude Oil [Data set]. MCX India. https://www.mcxindia.com
12. National Stock Exchange of India. (2024). Index historical data Nifty 50, Nifty Midcap 150, Embassy Office Parks REIT, Mindspace Business Parks REIT [Data set]. NSE India. https://www.nseindia.com
13. Sen, J., Dasgupta, A., Sengupta, P. P., & Roychoudhury, S. (2023). A comparative study of portfolio optimization methods for the Indian stock market. arXiv preprint. https://arxiv.org/abs/2310.14748
14. Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. Journal of Finance, 19(3), 425–442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x
15. Subramaniam, S., & Chakraborty, M. (2023). Portfolio diversification possibilities of cryptocurrency: Global evidence. Applied Economics, 56(27), 3248–3264. https://doi.org/10.1080/00036846.2023.2257928
16. Valadkhani, A., Nguyen, J., & Chiah, M. (2022). When is gold an effective hedge against inflation? Resources Policy, 79, 103003. https://doi.org/10.1016/j.resourpol.2022.103009

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

17. Walia, S., Sarkar, S., Mohanty, B., & Pal, S. (2023). Analysis of the emergence and initial performance of REITs in India. Journal of Property Investment & Finance, 41(2), 256–268.
https://doi.org/10.1108/JPIF-12-2022-0084

18. Yahoo Finance. (2024). Historical market data Nifty 50, Nifty Midcap 150, Embassy Office Parks REIT, Mindspace Business Parks REIT, MCX Gold futures, MCX Crude Oil futures, Nippon India Gilt Securities Fund, ICICI Prudential Bond Fund [Data set]. Yahoo Inc.
https://finance.yahoo.com

19. Zaimovic, A., Arnaut-Berilo, A., & Beslija, R. (2024). International portfolio diversification benefits: An empirical investigation of the 28 European stock markets during the period 2014–2024. South East European Journal of Economics and Business, 19(1), 96–112.
https://doi.org/10.2478/jeb-2024-0008

INNO SPACE
SJIF Scientific Journal Impact Factor

ISSN
INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

निस्केयर
NISCAIR

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com