IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, August 2024

Evaluating Risk and Return in Indian Telecommunications: A Comparative Analysis of Bharti Airtel and Vodafone Idea

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Abstract: *In the domain of investment analysis, the balance between risk and return is pivotal. This study explores the risk-return profiles of two major Indian telecommunications companies, Bharti Airtel and Vodafone Idea, over a two-year period from 2022 to 2024. By analyzing historical share price data, the research aims to provide insights into the volatility and average returns of these stocks, as well as their correlation with the broader market index. The study also evaluates investor behavior and preferences towards these stocks and examines factors impacting their share prices. The findings reveal that while Vodafone Idea exhibits higher volatility and lower average returns compared to the more stable Bharti Airtel, both stocks offer potential diversification benefits due to their moderate correlation with the market index. This research highlights the importance of understanding risk and return dynamics for optimizing investment strategies and constructing balanced portfolios.*

Keywords: Risk and Return, Bharti Airtel, Vodafone Idea, Volatility, Investment Diversification, Capital Asset Pricing Model (CAPM), Telecommunications Sector.

I. INTRODUCTION

In the realm of investing, understanding the relationship between risk and return is fundamental to making informed decisions. Stocks, as a primary asset class in financial markets, offer the potential for high returns but also come with varying degrees of risk. This balance between risk and return is a core concept in investment theory and practice, influencing portfolio management strategies and investment decisions.

1. Definition and Importance

Risk and return are two key dimensions in investment analysis. Return refers to the gain or loss generated from an investment over a specific period, often expressed as a percentage of the initial investment. It can come in the form of capital gains, dividends, or interest payments. Risk, on the other hand, represents the uncertainty or variability associated with the return on an investment. In the context of stocks, risk is often quantified by the volatility of stock prices, which reflects the degree to which a stock's return can fluctuate.

The risk-return tradeoff is a principle that suggests that higher potential returns are associated with higher levels of risk. Investors must balance their desire for higher returns with their tolerance for risk. Understanding this tradeoff helps investors make choices that align with their financial goals, risk appetite, and investment horizon.

2. Risk Factors in Stock Investments

Stocks are subject to various risk factors that can impact their performance. These risks can be categorized into systematic and unsystematic risks:

- **Systematic Risk**: Also known as market risk, systematic risk affects the entire market or a broad segment of it. Factors contributing to systematic risk include economic recessions, political instability, changes in interest rates, and inflation. This type of risk is generally unavoidable and cannot be eliminated through diversification. Systematic risk is often measured by a stock's beta, which indicates its sensitivity to overall market movements.

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- **Unsystematic Risk**: Unsystematic risk, or specific risk, pertains to individual companies or industries. This risk arises from factors such as management decisions, competitive pressures, operational challenges, and company-specific events. Unlike systematic risk, unsystematic risk can be mitigated through diversification, as holding a portfolio of diverse stocks reduces the impact of any single stock's performance on the overall portfolio.

3. Measuring Risk and Return

Several metrics and models are used to quantify and analyze risk and return in stock investments:

- **Return**: The return on a stock is typically measured using historical data. The average return can be calculated using historical price data and dividends. This historical return provides a baseline for assessing the stock's performance over time.
- **Volatility**: Volatility measures the degree of variation in a stock's return. It is commonly quantified using standard deviation, which represents the dispersion of returns from the mean. Higher volatility indicates greater uncertainty and risk.
- **Beta**: Beta measures a stock's sensitivity to market movements. A beta greater than 1 indicates that the stock is more volatile than the market, while a beta less than 1 suggests lower volatility. Beta helps investors understand how a stock might respond to broader market changes.
- **Sharpe Ratio**: The Sharpe Ratio is a risk-adjusted performance metric that compares a stock's excess return to its standard deviation. It provides insight into how well the return compensates for the risk taken. A higher Sharpe Ratio indicates better risk-adjusted performance.

4. The Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is a widely used framework to evaluate the expected return of a stock based on its risk. According to CAPM, the expected return on a stock is a function of the risk-free rate, the stock's beta, and the market risk premium. The formula is expressed as:

Expected Return=Risk-Free Rate+β×(Market Return−Risk-Free Rate)

CAPM helps investors assess whether a stock is fairly priced based on its risk and the expected return. It also highlights the relationship between systematic risk and expected return.

5. Practical Implications

For investors, understanding risk and return is crucial in constructing and managing investment portfolios. Diversification is a key strategy to reduce unsystematic risk by spreading investments across various assets. However, diversification cannot eliminate systematic risk, which necessitates careful consideration of market conditions and economic factors.

Investors must also consider their own risk tolerance, which is influenced by their financial goals, investment horizon, and personal circumstances. Risk tolerance helps determine the appropriate mix of assets in a portfolio, balancing high-risk stocks with more stable investments.

II. REVIEW OF LITERATURE

Kaur, S., & Gupta, M. (2019) this study explored the risk-return characteristics of Indian stock markets, emphasizing the importance of volatility in assessing investment potential. The authors used historical price data to analyze the performance of major stocks, including those in the telecommunications sector. They found that stocks with higher volatility often offered higher returns, but also posed greater risks. The study underscored the need for investors to carefully balance risk and return when constructing their portfolios.

Patel, R., & Singh, A. (2020) this paper examined the impact of macroeconomic factors on stock volatility and returns. The authors applied econometric models to assess how variables such as inflation, interest rates, and economic growth influenced stock performance. The study highlighted that macroeconomic factors significantly affect stock volatility and, consequently, the risk-return profile of investments. Their findings are relevant for understanding the broader economic influences on stock prices, including those of companies like Bharti Airtel and Vodafone Idea.

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Sharma, P., & Kumar, S. (2021) this research focused on the telecommunications sector, specifically analyzing the risk-return profiles of major telecom stocks in India. The authors employed statistical techniques to evaluate the performance of stocks from companies such as Bharti Airtel and Vodafone Idea. They found that while these stocks showed high potential returns, they also experienced significant volatility, reflecting the sector's inherent risks and opportunities.

Mishra, R., & Sharma, A. (2022) this study examined the financial performance and risk factors of major telecom companies, including Vodafone Idea and Bharti Airtel. The authors used a combination of financial ratios and risk metrics to assess the companies' performance. The research indicated that despite the high risk associated with these stocks, their potential for high returns made them attractive for certain investors. The study also discussed the impact of regulatory changes and market competition on stock performance.

Agarwal, N., & Sinha, M. (2023) this paper investigated investor behavior in relation to high-risk stocks, with a focus on the telecommunications sector. The authors conducted surveys and analyzed investor preferences for stocks like Bharti Airtel and Vodafone Idea. They found that investor sentiment significantly influenced stock prices, with higher-risk stocks often attracting speculative investments despite their volatility.

Gupta, R., & Mehta, V. (2024) this study explored the impact of investor sentiment and market trends on the performance of stocks in emerging markets. The authors analyzed data from various sectors, including telecommunications, and found that market sentiment and trends played a crucial role in shaping risk-return profiles. The research provided insights into how external factors, such as market news and investor emotions, affect stock performance.

Singh, R., & Patel, L. (2021) this paper reviewed various methodologies for analyzing risk and return in stock investments, including the use of statistical tools and financial models. The authors discussed the strengths and limitations of different approaches, such as the Sharpe Ratio and CAPM, and their applicability to sector-specific analysis. The study emphasized the importance of selecting appropriate methods for accurate risk-return evaluation.

Roy, S., & Jain, K. (2022) this research focused on the application of advanced statistical techniques for risk-return analysis, including time-series analysis and econometric models. The authors applied these methods to study the performance of telecom stocks, providing a detailed examination of their risk-return profiles over time. The study highlighted the benefits of using sophisticated analytical tools for more accurate investment assessments.

Objectives of the Study

- To evaluate the risk and return profiles of Bharti Airtel and Vodafone Idea.
- To analyze the factors affecting the share prices of Bharti Airtel and Vodafone Idea.
- To investigate investor behavior and their preferences regarding investments in Bharti Airtel and Vodafone Idea.

Need of the Study

In the financial sector, capital is a limited resource, and maximizing returns is a primary goal for investors. However, achieving high returns typically involves accepting higher risks, creating a direct trade-off between risk and reward. This fundamental principle of investing—where higher returns come with increased risk—is central to portfolio management. The challenge lies in selecting securities that offer the highest potential returns with the least amount of volatility. Effective investing requires a thorough analysis of securities to build a portfolio that balances these factors.

This study addresses the necessity of evaluating securities to optimize investment strategies. Specifically, it focuses on creating a diversified portfolio by examining the risk-return profiles of different securities, which in turn impacts the overall investment strategy.

Scope of the Study

This research concentrates on analyzing investor risk and return with a focus on securities from Vodafone Idea and Bharti Airtel. The study encompasses data from these companies over a two-year period, providing insights into their performance and volatility. It includes the calculation of standard deviations for each security, which helps in

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understanding the risk associated with these investments. The scope of this study is to analyze how these two stocks behave in terms of risk and return, and how this information can guide investment decisions.

III. METHODOLOGY OF THE STUDY

This study relies on secondary data sources, including websites, journals, newspapers, and books, to gather relevant information on the share prices of Vodafone Idea and Bharti Airtel. The analysis involves technical tools used in equity market trading and risk assessment. The data covers a two-year period from 2022 to 2024, focusing on historical share price movements to evaluate the risk-return dynamics of the selected stocks.

IV. DATA ANALYSIS AND INTERPRETATION

Table 1 Calculation of average rate of return and standard deviation:

DATE	RETURN	$(x-\bar{x})$	$(x-\bar{x})^2$
Mar24	-4.68	6.02	36.3
Feb24	-5.21	6.55	43.0
Jan24	-11.42	12.77	162.9
Dec23	20.30	18.96	359.3
Nov23	9.66	8.32	69.2
Oct23	0.85	0.49	0.2
Sep23	27.32	25.98	674.8
Aug23	8.38	7.04	49.5
Jul23	10.67	9.32	86.9
Jun23	3.47	2.13	4.5
May23	2.86	1.51	2.3
Apr23	18.80	17.46	304.8
Mar23	-15.33	16.67	278.0
Feb23	-4.90	6.24	38.9
Jan23	-10.76	12.10	146.5
Dec22	-4.82	6.16	38.0
Nov22	-4.07	5.42	29.3
Oct22	-3.39	4.74	22.4
Sep22	-1.68	3.02	9.1
Aug22	3.43	2.08	4.3
Jul22	4.79	3.45	11.9
Jun22	-12.04	13.39	179.2
May22	1.59	0.24	0.1
Apr22	-1.55	2.90	8.4

Average Rate of Return $= \frac{\sum returns}{no\ of\ periods} = \frac{\sum 32.29}{24} = 1.35$

Risk calculation:

Standard deviation: $\sqrt{\frac{\sum_{i=1}^{n}(x-\bar{x})^2}{n-1}} = \sqrt{\frac{2559.984}{24-1}} = \sqrt{\frac{2559.984}{23}} = \sqrt{111.304} = 10.550$

The average return rate for Vodafone Idea over the period was 1.35%, with a high standard deviation of 10.55%, indicating significant volatility. Monthly returns ranged from 15.33% to 27.32%. This variability suggests substantial

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risk, influenced by market conditions, company performance, and regulatory changes. Investors should align their risk profiles with these fluctuations before investing.

Table2 Calculation of average rate of return and standard deviation:

DATE	RETURN	$(x-\overline{x})$	$(x-\overline{x})^2$
Mar24	8.92	6.67	44.4
Feb24	-3.58	5.83	34.0
Jan24	13.45	11.19	125.3
Dec23	1.69	0.56	0.3
Nov23	12.37	10.12	102.4
Oct23	-0.42	2.67	7.1
Sep23	8.59	6.33	40.1
Aug23	-4.26	6.51	42.4
Jul23	1.13	1.13	1.3
Jun23	4.87	2.62	6.9
May23	6.20	3.95	15.6
Apr23	5.87	3.62	13.1
Mar23	0.89	1.36	1.9
Feb23	-4.34	6.59	43.5
Jan23	-4.46	6.71	45.0
Dec22	-5.50	7.75	60.1
Nov22	2.51	0.25	0.1
Oct22	3.56	1.31	1.7
Sep22	10.10	7.85	61.6
Aug22	7.18	4.92	24.2
Jul22	-1.01	3.26	10.6
Jun22	-2.37	4.62	21.3
May22	-4.60	6.86	47.0
Apr22	-2.74	4.99	24.9

Average Rate of Return $= \frac{\sum returns}{no\ of\ periods} = \frac{\sum 54.04}{24} = 2.25$

Risk calculation:

Standard deviation: $\sqrt{\frac{\sum_{i=1}^{24}(x-\bar{x})^2}{n-1}} = \sqrt{\frac{774.866}{24-1}} = \sqrt{\frac{774.866}{23}} = \sqrt{33.690} = 5.804$

The average return rate for the stock was 2.25%, with a coefficient of variance of 5.804%, indicating moderate volatility. Monthly returns fluctuated from 5.50% in December 2022 to 13.45% in January 2024. The stock shows moderate risk and should be added to portfolios based on individual risk tolerance and investment goals.

Table 3 Calculation of average rate of return and standard deviation:

DATE	RETURN	$X\overline{x}$	$(x-\overline{x})^2$
Mar24	-1.03	2.93	8.58
Feb24	-0.80	0.80	0.64
Jan24	4.81	4.81	23.15

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Dec23	7.01	7.01	49.19
Nov23	10.07	10.07	101.42
Oct23	-4.15	4.15	17.26
Sep23	3.55	3.55	12.58
Aug23	3.34	3.34	11.17
Jul23	4.94	4.94	24.41
Jun23	5.82	5.82	33.86
May23	5.67	5.67	32.18
Apr23	5.28	5.28	27.92
Mar23	-0.49	0.49	0.24
Feb23	-2.64	2.64	6.98
Jan23	-3.02	3.02	9.10
Dec22	-2.15	2.15	4.63
Nov22	1.59	1.59	2.52
Oct22	2.48	2.48	6.14
Sep22	-1.93	1.93	3.71
Aug22	5.67	5.67	32.18
Jul22	12.44	12.44	154.65
Jun22	-6.68	6.68	44.60
May22	-4.64	4.64	21.57
Apr22	0.49	0.49	0.24

Average Rate of Return $= \frac{\sum returns}{no\ of\ periods} = \frac{\sum 45.63}{24} = 1.90$

Risk calculation:

Standard deviation: $\sqrt{\frac{(xi-\bar{x})^2}{n-1}} = \sqrt{\frac{534.63}{24-1}} = \sqrt{\frac{534.63}{23}} = \sqrt{23.24} = 4.82$

The stock's average return was 1.90%, with a standard deviation of 4.82%, indicating moderate volatility. Monthly returns varied from 6.68% to 12.44%. Despite fluctuations, the stock showed positive average returns. Investors should assess their risk tolerance and investment goals before including it in their portfolio.

Table 4 Calculation of covariance of vi and ba:

DATE	RETURN	(X-$\bar{x}$)	RETURN	X-$\bar{x}$	$\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_{2)}$
Mar24	4.68	6.02	8.92	6.67	40.1534
Feb24	5.21	6.55	3.58	5.83	38.1865
Jan24	11.42	12.77	13.45	11.19	142.896
Dec23	20.30	18.96	1.69	0.56	10.6176
Nov23	9.66	8.32	12.37	10.12	84.1984
Oct23	0.85	0.49	0.42	2.67	1.3083
Sep23	27.32	25.98	8.59	6.33	164.4534
Aug23	8.38	7.04	4.26	6.51	45.8304
Jul23	10.67	9.32	1.13	1.13	10.5316
Jun23	3.47	2.13	4.87	2.62	5.5806

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May23	2.86	1.51	6.20	3.95	5.9645
Apr23	18.80	17.46	5.87	3.62	63.2052
Mar23	15.33	16.67	0.89	1.36	22.6712
Feb23	4.90	6.24	4.34	6.59	41.1216
Jan23	10.76	12.10	4.46	6.71	81.191
Dec22	4.82	6.16	5.50	7.75	47.74
Nov22	4.07	5.42	2.51	0.25	1.355
Oct22	3.39	4.74	3.56	1.31	6.2094
Sep22	1.68	3.02	10.10	7.85	23.707
Aug22	3.43	2.08	7.18	4.92	10.2336
Jul22	4.79	3.45	1.01	3.26	11.247
Jun22	12.04	13.39	2.37	4.62	61.8618
May22	1.59	0.24	4.60	6.86	1.6464
Apr22	1.55	2.90	2.74	4.99	14.471

COVARIANCE = $COV_{A,B} = \frac{\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{N}$

$= COV_{A,B} = \frac{\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{N} = \frac{347.393}{24} = 14.49971$

The covariance between Vodafone Idea and Bharti Airtel is 14.50. This positive value suggests that the returns of these two stocks tend to move together; when one stock's return increases, the other's is likely to increase as well.

Calculation of correlation coefficient:

Correlation coefficient (P_{AB}) = $\frac{COV_{AB}}{(Std.A)(Std.B)}$

$P_{AB} = 14.49971$

$P_{AB} = \frac{14.49971}{(10.550)(5.804)}$

$P_{AB} = 0.23680$

The correlation coefficient between Vodafone Idea and Bharti Airtel is 0.24. This indicates a weak positive relationship between the returns of the two stocks. They tend to move in the same direction, but the correlation is not strong, suggesting limited predictability between their performances.

Calculation of expected return of portfolio:

$$\bar{R}_p = \sum_{i=1}^{n} x_i \bar{r}_i$$

Assume that the investment portfolio is 50% in each investment

Average return in investment Vodafone idea is 1.35

Average return in investment bharti airtel is 2.25

$\bar{R}_p = \sum_{i=1}^{n} x_i \bar{r}_i$ = (0.501.35) + (0.502.25)

= (0.675) + (1.125)

= 1.8 percent

The expected return of a portfolio with 50% investment in Vodafone Idea and 50% in Bharti Airtel is 1.8%. This reflects the weighted average return of the two investments, indicating a moderate return based on their individual average returns.

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Calculation of portfolio variance:

Formula: $\sigma_p^2 = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2x_1x_2(r_{12}\sigma_1\sigma_2)$

$= (0.50)^2(10.550)^2 + (0.50)^2(5.804)^2 + 2(0.50)(0.50)(0.23680 \times 10.550 \times 5.804)$

= (0.25)(111.30)+(0.25)(33.686)+2(0.25)(14.50)

= 27.825+8.421+7.25

$\sigma^2 = 43.496$

$\sigma = \sqrt{43.496}$

$\sigma = 6.595$

The portfolio variance is 43.496, and the standard deviation is 6.595. This indicates the portfolio's total risk, accounting for both individual investment risks and their correlation. A higher standard deviation signifies greater risk in the portfolio's returns.

Table 5 Calculation of covariance for index and vodafone idea

DATE	RETURN	XX	RETURN	XX	$\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)$
Mar24	4.68	6.02	1.03	2.93	17.6
Feb24	5.21	6.55	0.80	2.70	17.7
Jan24	11.42	12.77	4.81	2.91	37.1
Dec23	20.30	18.96	7.01	5.11	96.9
Nov23	9.66	8.32	10.07	8.17	68.0
Oct23	0.85	0.49	4.15	6.06	3.0
Sep23	27.32	25.98	3.55	1.65	42.8
Aug23	8.38	7.04	3.34	1.44	10.1
Jul23	10.67	9.32	4.94	3.04	28.3
Jun23	3.47	2.13	5.82	3.92	8.3
May23	2.86	1.51	5.67	3.77	5.7
Apr23	18.80	17.46	5.28	3.38	59.1
Mar23	15.33	16.67	0.49	2.39	39.9
Feb23	4.90	6.24	2.64	4.54	28.3
Jan23	10.76	12.10	3.02	4.92	59.5
Dec22	4.82	6.16	2.15	4.05	25.0
Nov22	4.07	5.42	1.59	0.31	1.7
Oct22	3.39	4.74	2.48	0.58	2.7
Sep22	1.68	3.02	1.93	3.83	11.6
Aug22	3.43	2.08	5.67	3.77	7.9
Jul22	4.79	3.45	12.44	10.53	36.3
Jun22	12.04	13.39	6.68	8.58	114.9
May22	1.59	0.24	4.64	6.55	1.6
Apr22	1.55	2.90	0.49	1.41	4.1

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COVARIANCE = $COV_{A,B} = \frac{\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{N}$

$= \frac{645.2}{24} = 26.9$

The covariance between Vodafone Idea and the Index is 26.9, indicating a positive relationship. This suggests that, on average, as the Index's returns increase, Vodafone Idea's returns also tend to rise. The positive covariance highlights a tendency for these assets to move together.

Correlation coefficient $(P_{AB}) = \frac{COV_{AB}}{(Std.A)(Std.B)}$

$= \frac{26.9}{(10.550)(4.82)} = \frac{26.9}{50.851} = 0.52899$

The correlation coefficient of 0.529 between Vodafone Idea and the Index indicates a moderate positive relationship. This means that, on average, as the Index's returns increase, Vodafone Idea's returns tend to rise moderately as well, showing a moderate degree of co-movement between the two.

Table 6 Calculation of covariance for index and bharti airtel

DATE	RETURN	XX	RETURN	XX	$\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)$
Mar24	8.92	6.67	1.03	2.93	19.53
Feb24	3.58	5.83	0.80	2.70	15.77
Jan24	13.45	11.19	4.81	2.91	32.57
Dec23	1.69	0.56	7.01	5.11	2.85
Nov23	12.37	10.12	10.07	8.17	82.66
Oct23	0.42	2.67	4.15	6.06	16.17
Sep23	8.59	6.33	3.55	1.65	10.42
Aug23	4.26	6.51	3.34	1.44	9.38
Jul23	1.13	1.13	4.94	3.04	3.42
Jun23	4.87	2.62	5.82	3.92	10.25
May23	6.20	3.95	5.67	3.77	14.91
Apr23	5.87	3.62	5.28	3.38	12.23
Mar23	0.89	1.36	0.49	2.39	3.26
Feb23	4.34	6.59	2.64	4.54	29.96
Jan23	4.46	6.71	3.02	4.92	33.00
Dec22	5.50	7.75	2.15	4.05	31.41
Nov22	2.51	0.25	1.59	0.31	0.08
Oct22	3.56	1.31	2.48	0.58	0.75
Sep22	10.10	7.85	1.93	3.83	30.06
Aug22	7.18	4.92	5.67	3.77	18.57
Jul22	1.01	3.26	12.44	10.53	34.33
Jun22	2.37	4.62	6.68	8.58	39.62
May22	4.60	6.86	4.64	6.55	44.88
Apr22	2.74	4.99	0.49	1.41	7.04

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Impact Factor: 7.53
Volume 4, Issue 1, August 2024

COVARIANCE = $COV_{A,B} = \frac{\sum_{i=1}^{n}(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{N}$

$= \frac{303.83}{24} = 12.66$

The covariance of 12.66 between Bharti Airtel and the Index suggests a positive relationship. This indicates that as the Index's returns increase, Bharti Airtel's returns tend to increase as well, showing a moderate level of co-movement between the two.

CORRELATION COEFFICIENT $(P_{AB}) = \frac{COV_{AB}}{(Std.A)(Std.B)}$

$= \frac{12.66}{(5.804)(4.82)} = \frac{12.66}{27.975} = 0.452546$

The correlation coefficient of 0.453 between Bharti Airtel and the Index indicates a moderate positive correlation. This means that Bharti Airtel's returns tend to move in the same direction as the Index's returns, though the relationship is not very strong.

Table 7 Calculation of beta for Vodafone idea and index (sensex)

VI		SENSEX		X2	XY
Mar24	4.68	Mar24	1.03	1.1	4.8
Feb24	5.21	Feb24	0.80	0.6	4.2
Jan24	11.42	Jan24	4.81	23.1	54.9
Dec23	20.30	Dec23	7.01	49.2	142.4
Nov23	9.66	Nov23	10.07	101.4	97.3
Oct23	0.85	Oct23	4.15	17.3	3.5
Sep23	27.32	Sep23	3.55	12.6	96.9
Aug23	8.38	Aug23	3.34	11.2	28.0
Jul23	10.67	Jul23	4.94	24.4	52.7
Jun23	3.47	Jun23	5.82	33.9	20.2
May23	2.86	May23	5.67	32.2	16.2
Apr23	18.80	Apr23	5.28	27.9	99.4
Mar23	15.33	Mar23	0.49	0.2	7.5
Feb23	4.90	Feb23	2.64	7.0	12.9
Jan23	10.76	Jan23	3.02	9.1	32.5
Dec22	4.82	Dec22	2.15	4.6	10.4
Nov22	4.07	Nov22	1.59	2.5	6.5
Oct22	3.39	Oct22	2.48	6.1	8.4
Sep22	1.68	Sep22	1.93	3.7	3.2
Aug22	3.43	Aug22	5.67	32.2	19.4
Jul22	4.79	Jul22	12.44	154.6	59.6
Jun22	12.04	Jun22	6.68	44.6	80.4
May22	1.59	May22	4.64	21.6	7.4
Apr22	1.55	Apr22	0.49	0.2	0.8

CALCULATION OF BETA FOR VI AND SENSEX

$$\beta = \frac{n\sum XY - (\sum X)(\sum Y)}{n\sum X^2 - (\sum X)^2}$$

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, August 2024

$$= \frac{(12\times706.5)-(45.63\times32.29)}{(12\times621.4)-(2082.325)}$$

$$= \frac{8478-1473.3927}{7456.8-2082.325}$$

$$= \frac{7004.60}{5374.475}$$

= 1.3033

The beta value of 1.3033 for Vodafone Idea relative to the Sensex indicates that Vodafone Idea's returns are expected to be 30.33% more volatile than the market. This suggests a higher risk and potential for higher returns compared to the overall market.

Table 8 Calculation of beta for bharti airtel and index (sensex)

BHARTI AIRTEL		INDEX			
DATE	**RETURN**	**DATE**	**RETURN**	X^2	**XY**
Mar24	8.92	Mar24	1.03	1.1	9.2
Feb24	3.58	Feb24	0.80	0.6	2.9
Jan24	13.45	Jan24	4.81	23.1	64.7
Dec23	1.69	Dec23	7.01	49.2	11.9
Nov23	12.37	Nov23	10.07	101.4	124.6
Oct23	0.42	Oct23	4.15	17.3	1.7
Sep23	8.59	Sep23	3.55	12.6	30.5
Aug23	4.26	Aug23	3.34	11.2	14.2
Jul23	1.13	Jul23	4.94	24.4	5.6
Jun23	4.87	Jun23	5.82	33.9	28.3
May23	6.20	May23	5.67	32.2	35.2
Apr23	5.87	Apr23	5.28	27.9	31.0
Mar23	0.89	Mar23	0.49	0.2	0.4
Feb23	4.34	Feb23	2.64	7.0	11.5
Jan23	4.46	Jan23	3.02	9.1	13.5
Dec22	5.50	Dec22	2.15	4.6	11.8
Nov22	2.51	Nov22	1.59	2.5	4.0
Oct22	3.56	Oct22	2.48	6.1	8.8
Sep22	10.10	Sep22	1.93	3.7	19.5
Aug22	7.18	Aug22	5.67	32.2	40.7
Jul22	1.01	Jul22	12.44	154.6	12.5
Jun22	2.37	Jun22	6.68	44.6	15.8
May22	4.60	May22	4.64	21.6	21.4
Apr22	2.74	Apr22	0.49	0.2	1.3

CALCULATION OF BETA FOR BA AND SENSEX

$$\beta = \frac{n\sum XY - (\sum X)(\sum Y)}{n\sum X^2 - (\sum X)^2}$$

$$\beta = \frac{(12\times406.6)-(45.63\times54.04)}{(12\times621.4)-(2082.325)}$$

$$\beta = \frac{4879.2-2465.8452}{7456.8-2082.325}$$

IJARSCT
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$$\beta = \frac{2413.3548}{5374.475}$$

$$\beta = 0.449$$

The beta value of 0.449 for Bharti Airtel relative to the Sensex indicates that Bharti Airtel's returns are expected to be 44.9% less volatile than the market. This suggests Bharti Airtel is less risky and less sensitive to market movements compared to the overall market.

V. FINDINGS

- Vodafone Idea has the lowest average return at 1.35%, followed by the CNX Midcap Index at 1.90%, and Bharti Airtel with the highest average return of 2.25%.
- Vodafone Idea exhibits the highest volatility with a standard deviation of 10.55%.
- Bharti Airtel shows moderate volatility with a standard deviation of 5.804%.
- The CNX Midcap Index demonstrates lower volatility compared to individual stocks, with a standard deviation of 4.82%.
- The covariance between Vodafone Idea and Bharti Airtel is 14.49971, indicating a positive relationship in their returns.
- The correlation coefficient (P_AB) between Vodafone Idea and Bharti Airtel is 0.23680, suggesting a positive but weak correlation between the two stocks.
- Assuming an equal investment in Vodafone Idea and Bharti Airtel (50% each), the expected return of the portfolio is calculated to be 1.8%.
- The portfolio variance is determined to be 43.496, with a standard deviation of 6.595.

VI. CONCLUSION

In conclusion, Vodafone Idea exhibits higher volatility and a lower average return relative to Bharti Airtel, which is characterized by greater stability and superior returns. The moderate to weak correlation between these stocks and the index indicates that incorporating them into a portfolio could enhance diversification. This diversification effect is evident in the combined portfolio's risk profile, which is lower than that of the individual stocks, highlighting the risk-mitigating advantages of blending these investments. Therefore, strategically combining Vodafone Idea and Bharti Airtel in a portfolio can offer improved stability and potentially better risk-adjusted returns through effective diversification.

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