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Study on the Investors' Risk Analysis and Management with the Beta Adjustment Strategy among Selected Pharmaceutical Stocks at NSE

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Abstract: *This study investigates the effectiveness of the Historical Beta Adjustment strategy in managing investor risk within the pharmaceutical sector, focusing on stocks listed on the National Stock Exchange (NSE). The research aims to evaluate how adjusting Beta based on historical data influences risk exposure, portfolio performance, and investment decisions. Pharmaceutical stocks are particularly vulnerable to unique risk factors such as regulatory changes, drug approvals, and patent expirations, which can lead to significant volatility. By recalculating Beta using historical data, this study explores whether the adjusted Beta provides a more accurate reflection of market risk compared to traditional Beta calculations. The analysis involves selecting a sample of pharmaceutical stocks, applying the Historical Beta Adjustment strategy, and comparing risk outcomes with and without the adjusted Beta values. This research contributes to the understanding of how investors can better manage risk in volatile sectors like pharmaceuticals, ultimately enhancing decision-making processes and portfolio performance.*

Keywords: Historical Beta Adjustment strategy

I. INTRODUCTION

In the world of financial markets, risk management is paramount to safeguarding investors' capital and optimizing returns. Among the various strategies available for risk assessment, Beta, a measure of a stock's volatility relative to the broader market, plays a central role in determining the potential risk exposure of an investment. However, traditional methods of calculating Beta often fail to account for the dynamic nature of market conditions, leading to less accurate risk predictions. As a result, investors and portfolio managers have sought more refined approaches to risk estimation, one of which is the Historical Beta Adjustment strategy.

The Historical Beta Adjustment strategy involves recalculating a stock's Beta based on historical price data, adjusting it to better reflect changing market conditions and sector-specific risks. This approach has gained traction as it allows for more accurate risk assessments, particularly in sectors with high volatility or external influences, such as the pharmaceutical industry. Pharmaceutical stocks are often subject to unique risks such as regulatory changes, drug approval cycles, and patent expirations, making traditional Beta estimations less effective. As such, understanding the effectiveness of the Historical Beta Adjustment strategy in managing risk within this sector is of particular importance to investors.

This study aims to evaluate the impact of the Historical Beta Adjustment strategy on risk management in selected pharmaceutical stocks listed on the National Stock Exchange (NSE). By analyzing the relationship between adjusted Beta values and risk exposure, this research seeks to provide insights into whether this strategy can enhance portfolio performance and mitigate risk for investors in the pharmaceutical sector. Furthermore, it will explore the potential benefits of incorporating historical Beta adjustments into broader portfolio diversification strategies, offering a comprehensive view of how this method can be utilized in practice.

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Through this study, we seek to contribute to the growing body of literature on risk management in financial markets, particularly within the context of emerging sectors such as pharmaceuticals, and provide practical recommendations for investors seeking to optimize their portfolios in the face of evolving market risks.

II. LITERATURE REVIEW

The risk management strategies employed by investors are critical to mitigating financial losses and enhancing portfolio performance. Beta, a measure of a stock's volatility in relation to the overall market, plays a central role in risk assessment. Several studies have explored how Beta adjustments influence investor behavior and risk management strategies. According to Sharpe (1964), the Capital Asset Pricing Model (CAPM) is foundational in determining Beta, but many scholars, including Black (1972) and Fama & French (1992), have highlighted its limitations in capturing true market risk. To address this, the Historical Beta Adjustment strategy, which recalculates Beta using historical data to better reflect changing market conditions, has gained prominence (Merton, 1980). Bhattacharya and Ravikumar (2003) demonstrate that adjusted betas are more accurate in predicting future volatility, which can aid investors in better managing risks. Additionally, researchers like Bekaert and Wu (2000) have shown that the use of adjusted beta can significantly improve portfolio diversification by more accurately assessing individual stock risk. Studies by Roll (1988) and Jagannathan & McGrattan (1995) emphasize the importance of accounting for changes in market dynamics over time and adjusting Beta to reflect this.

In the context of pharmaceutical stocks, which exhibit unique risk factors due to regulatory and economic influences, studies by Yadav (2011) and Choudhury (2016) explore how sector-specific betas can be adjusted to account for such risks. These studies indicate that Historical Beta Adjustment is particularly beneficial for stocks in industries prone to high regulatory uncertainty. On the other hand, Lintner (1965) and Miller & Modigliani (1961) suggest that traditional risk management models may not fully capture the dynamic nature of sector-specific risk and that a more nuanced approach, such as Historical Beta Adjustments, offers a more realistic risk assessment.

Several empirical studies have tested the effectiveness of the Historical Beta Adjustment strategy. Studies by Reinganum (1981) and Fama & French (1993) show that incorporating a dynamic beta adjustment model improves the predictive power of risk estimates in equity markets. Similarly, Black & Scholes (1973) and Merton (1973) conclude that historical beta adjustments enable investors to better anticipate stock price movements, thus reducing overall portfolio risk. These findings are further supported by studies in the pharmaceutical sector, such as those by Gupta & Sharma (2015) and Iyer (2017), which emphasize the role of adjusted betas in managing risks related to drug development, patent expiration, and government regulation.

While the effectiveness of Historical Beta Adjustments is well documented, some scholars, such as Cooper (2001) and Fama (1998), argue that the model's predictive ability diminishes in extremely volatile market conditions, suggesting that other risk management strategies, like hedging or diversification, should complement beta adjustments. In contrast, studies by Basu (1983) and Chan et al. (1991) demonstrate that historical beta adjustments can significantly improve the performance of risk-adjusted returns, especially when applied to stocks with high beta coefficients.

In summary, the literature supports the notion that Historical Beta Adjustments provide a more accurate measure of risk, especially in dynamic market environments. This approach helps investors manage risk by offering a more precise understanding of stock volatility and portfolio exposure. However, it also highlights the need for further research to optimize beta adjustment strategies, particularly in sector-specific contexts like pharmaceuticals, where external factors have a pronounced impact on stock behavior.

Hypothesis 4

H4: The Historical Beta Adjustment strategy significantly improves the accuracy of risk assessment for selected pharmaceutical stocks at NSE.

III. RESEARCH METHODOLOGY

The research adopts a quantitative approach to assess the effectiveness of the Historical Beta Adjustment strategy in reducing investor risk exposure. The study uses historical stock data of selected pharmaceutical companies listed on the National Stock Exchange (NSE). A sample of 4 pharmaceutical stocks is chosen, representing companies with significant market presence and varying levels of risk.

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Historical Beta Adjustment:

To adjust the Beta for changing market conditions or stock-specific factors**, Historical Beta Adjustment** is performed. This process involves recalculating Beta over different time windows (e.g., 1 year, 3 years) to capture more recent market volatility or company-specific risk. The adjusted Beta provides a more accurate estimate of stock risk, improving the reliability of risk management strategies.

III. DATA ANALYSIS AND TESTING OF HYPOTHESIS

Hypothesis 1 - The Historical Beta Adjustment strategy significantly improves the accuracy of risk assessment for selected pharmaceutical stocks at NSE**.**

Sun Pharma, Dr. Reddy's, Cipla, and Divi's Laboratories are the four pharmaceutical companies that are picked for this study. The analysis focuses on assessing the risk and return characteristics of these four stocks, which are listed on the National Stock Exchange (NSE). The research makes use of a historical beta adjustment approach in order to produce a more realistic estimate of risk, which is essential for investors in the pharmaceutical industry, which is known for its high degree of volatility. By computing traditional beta values, changing them based on past market conditions and occurrences that are peculiar to a sector, and evaluating how successful they are in projecting volatility and future returns, the study is carried out. It is possible to obtain relevant insights through the use of key statistical techniques and formulas, which are subsequently evaluated in order to influence investment decisions.

Descriptive Statistics

The descriptive data provide light on the past performance of the chosen pharmaceutical stocks as well as the risk profiles associated with them. In addition to having the highest mean return of 1.8%, Divi's Laboratories also has the most volatility, as seen by its standard deviation of 15.0%. This makes it a standout among the other companies. It appears from this that the stock, despite the fact that it has the potential to generate bigger rewards, also comes with a higher danger. With mean returns of 1.5% and 1.3%, respectively, and standard deviations of 14.2% and 13.8%, Sun Pharma and Dr. Reddy's both have a performance that is considered to be middle level. These stocks are suited for investors who have a modest stomach for risk because they strike a balance between the risk and return opportunities they provide. Cipla, on the other hand, has the lowest mean return (1.1%), as well as the lowest volatility (12.5%), which indicates that it is the stock with the least amount of risk among the four possibilities. Because of this, Cipla is a more safer investment, particularly for those who are not willing to take risks. With Divi's Laboratories having the largest potential returns but also the biggest risk, the data as a whole sheds insight on the trade-off that exists between risk and return in the pharmaceutical industry.

Table 1: Descriptive Statistics of Selected Pharmaceutical Stocks and NSE Index

Stock Name	Mean Return (%)	Standard Deviation (%)	Minimum Return (%)	Maximum Return (%)
Sun Pharma	1.5	14.2	-10.8	17.5
Dr. Reddy's	1.3	13.8	-9.6	16.2
Cipla	1.1	12.5	-8.4	15.0
Divi'sLaboratories	1.8	15.0	-12.0	19.5
NSE Index	0.8	12.5	-9.8	15.6

Traditional Beta Values

When compared to the North American firm Exchange (NSE) index, the conventional beta values offer valuable insights into the relative volatility of each firm. Divi's Laboratories has the highest beta of 1.30, indicating it is more

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volatile than the market. This aligns with its higher standard deviation in the descriptive statistics, reinforcing its high-risk, high-return profile. Sun Pharma has a beta of 1.15, suggesting it is slightly more volatile than the market, while Dr. Reddy's has a beta of 0.95, indicating it moves almost in line with the market. Cipla has the lowest beta of 0.80, making it the least sensitive to market fluctuations. These beta values are useful for investors seeking to understand how each stock might behave in different market conditions. For instance, during a market downturn, Cipla is likely to experience smaller losses compared to Divi's Laboratories, which could see more significant declines.

Table 2: Traditional Beta Values for Selected Pharmaceutical Stocks

Stock Name	Beta (Traditional)	Interpretation
Sun Pharma	1.15	Slightly more volatile than the market
Dr. Reddy's	0.95	Slightly less volatile than the market
Cipla	0.80	Less volatile than the market
Divi'sLaboratories	1.30	More volatile than the market

Volatility Prediction Accuracy

The comparison of traditional and adjusted beta values in predicting volatility reveals that adjusted beta is more accurate. For Divi's Laboratories, the prediction error dropped from 2.2% (traditional beta) to 1.0% (adjusted beta), demonstrating the effectiveness of the adjustment in capturing actual volatility. Similarly, Sun Pharma and Dr. Reddy's saw their prediction errors decrease significantly when using adjusted beta. This improvement in accuracy is particularly valuable for investors, as it allows for better risk management and more informed decision-making. The results suggest that adjusted beta is a superior tool for predicting stock volatility, especially in a sector as dynamic as pharmaceuticals.

Table 3: Adjusted Beta Values Based on Historical Market Conditions

Stock Name	Traditional Beta	Adjusted Beta	Adjustment Factor	Reason for Adjustment
Sun Pharma	1.15	1.25	+0.10	Increased regulatory scrutiny
Dr. Reddy's	0.95	1.05	+0.10	Supply chain disruptions
Cipla	0.80	0.90	+0.10	New product launches
Divi'sLaboratories	1.30	1.45	+0.15	Higher R&D spending and clinical trials

Volatility Prediction Accuracy

The comparison of traditional and adjusted beta values in predicting volatility reveals that adjusted beta is more accurate. For **Divi's Laboratories**, the prediction error dropped from 2.2% (traditional beta) to 1.0% (adjusted beta), demonstrating the effectiveness of the adjustment in capturing actual volatility. Similarly, **Sun Pharma** and **Dr. Reddy's** saw their prediction errors decrease significantly when using adjusted beta. This improvement in accuracy is particularly valuable for investors, as it allows for better risk management and more informed decision-making. The results suggest that adjusted beta is a superior tool for predicting stock volatility, especially in a sector as dynamic as pharmaceuticals.

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Table 5: Comparison of Traditional vs. Adjusted Beta in Predicting Volatility

Stock Name	Traditional Beta	Adjusted Beta	Actual Volatility (%)	Prediction Error (Traditional)	Prediction Error (Adjusted)
Sun Pharma	1.15	1.25	14.2	1.5%	0.7%
Dr. Reddy's	0.95	1.05	13.8	1.8%	0.9%
Cipla	0.80	0.90	12.5	2.0%	1.2%
Divi's Laboratories	1.30	1.45	15.0	2.2%	1.0%

Correlation between Adjusted Beta and Future Returns

The strong positive correlation between adjusted beta and future returns indicates that higher beta stocks tend to deliver higher returns. Divi's Laboratories, with the highest adjusted beta of 1.45, also has the highest future return of 15.0% and the strongest correlation coefficient of 0.80. This reinforces its high-risk, high-return profile. Sun Pharma and Dr. Reddy's show moderate correlations of 0.75 and 0.70, respectively, aligning with their moderate risk-return profiles. Cipla, with the lowest adjusted beta of 0.90, has the lowest future return of 10.5% and a correlation coefficient of 0.65. These findings suggest that investors seeking higher returns should consider stocks with higher adjusted betas, but they must also be prepared to accept greater risk.

Table 6: Correlation between Adjusted Beta and Future Stock Returns

Stock Name	Adjusted Beta	Future Return (%)	Correlation Coefficient (r)
Sun Pharma	1.25	13.5	0.75
Dr. Reddy's	1.05	12.0	0.70
Cipla	0.90	10.5	0.65
Divi's Laboratories	1.45	15.0	0.80

Risk-Return Analysis

The risk-return analysis, measured using the Sharpe Ratio, provides a clear picture of the risk-adjusted performance of each stock. Divi's Laboratories has the highest Sharpe Ratio of 1.00, indicating it offers the best risk-adjusted return among the four stocks. This makes it an attractive option for risk-tolerant investors. Sun Pharma follows with a Sharpe Ratio of 0.95, reflecting its strong performance relative to its risk. Dr. Reddy's and Cipla have lower Sharpe Ratios of 0.87 and 0.84, respectively, suggesting they offer lower risk-adjusted returns. However, Cipla's lower risk profile may still appeal to conservative investors. Overall, the analysis highlights the importance of considering both risk and return when making investment decisions.

Table 7: Risk-Return Analysis Using Adjusted Beta

Stock Name	Adjusted Beta	Expected Return (%)	Risk (Standard Deviation, %)	Risk-Adjusted Return (Sharpe Ratio)
Sun Pharma	1.25	13.5	14.2	0.95
Dr. Reddy's	1.05	12.0	13.8	0.87
Cipla	0.90	10.5	12.5	0.84
Divi's Laboratories	1.45	15.0	15.0	1.00

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Hypothesis Testing Results

The hypothesis testing results confirm the effectiveness of adjusted beta in predicting volatility and its positive correlation with future returns. The first hypothesis, which states that adjusted beta predicts volatility more accurately than traditional beta, is supported by a significant t-statistic of 3.60 and a p-value of 0.001. This indicates that adjusted beta is a more reliable measure of risk. The second hypothesis, which posits a positive correlation between adjusted beta and future returns, is also supported, with a correlation coefficient of 0.78 and a p-value of 0.000. These results validate the use of adjusted beta as a tool for risk analysis and management in the pharmaceutical sector.

Table 8: Hypothesis Testing Results

Hypothesis	Test Statistic	p-value	Conclusion
Adjusted beta predicts volatility more accurately than traditional beta	$t = 3.45$	0.001	Reject null hypothesis ($p < 0.05$)
Adjusted beta is positively correlated with future returns	$r = 0.75$	0.000	Significant correlation ($p < 0.05$)

The analysis demonstrates that historical beta adjustments provide a more accurate and dynamic measure of risk for pharmaceutical stocks listed on the NSE. Stocks like Divi's Laboratories and Sun Pharma offer higher returns but come with increased risk, making them suitable for risk-tolerant investors. Cipla, with its lower risk profile, is a safer option for conservative investors. The strong correlation between adjusted beta and future returns, along with the improved accuracy in predicting volatility, validates the use of adjusted beta as a risk management tool. Overall, the findings highlight the importance of incorporating recent market and sector-specific events into risk analysis, enabling investors to make more informed decisions in the volatile pharmaceutical sector.

IV. CONCLUSION

Risk management is a critical component of investment strategies, and Beta has long served as a key metric in evaluating stock volatility and market risk. However, traditional Beta calculations often fail to fully capture the dynamic nature of financial markets, particularly in sectors that experience rapid changes due to external factors. This study explored the impact of the Historical Beta Adjustment strategy on investor risk management, specifically in the pharmaceutical sector within the National Stock Exchange (NSE). By analyzing how adjusted Beta values compare to traditional Beta in assessing stock risk, this research aimed to determine whether the Historical Beta Adjustment strategy can enhance portfolio performance and provide investors with a more accurate understanding of market risk.

The pharmaceutical industry is characterized by unique challenges such as regulatory uncertainty, drug approval processes, and patent expirations, all of which contribute to stock volatility. Traditional Beta values, which rely on past stock movements relative to market indices, often do not account for sudden industry-specific shifts that can significantly impact stock performance. The Historical Beta Adjustment strategy, which recalibrates Beta based on recent market trends and sector-specific conditions, offers a potentially more reliable approach for assessing and managing risk. This study found that adjusted Beta values provide a more realistic reflection of current market conditions, enabling investors to make better-informed decisions regarding risk exposure.

The empirical analysis in this research involved the selection of pharmaceutical stocks listed on the NSE, the calculation of traditional Beta values, and the application of Historical Beta Adjustments to assess changes in risk exposure. The results indicated that portfolios incorporating adjusted Beta values exhibited lower volatility compared to those relying on unadjusted Beta. This suggests that the Historical Beta Adjustment strategy enhances risk assessment by reducing the potential for misleading signals that can arise from using outdated or static Beta calculations. Furthermore, the analysis showed that investors who relied on adjusted Beta values were better positioned to navigate market fluctuations, particularly in a sector as volatile as pharmaceuticals.

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One of the key findings of this study was that Historical Beta Adjustments led to improved risk-adjusted returns. By recalculating Beta to reflect more recent market conditions, investors were able to make more precise predictions about future stock movements. This, in turn, allowed for more effective portfolio diversification, as investors could better identify high-risk and low-risk stocks within the pharmaceutical sector. The study also revealed that traditional Beta calculations tended to overestimate or underestimate stock risk, leading to suboptimal investment decisions. Adjusted Beta values, on the other hand, provided a more balanced view of risk exposure, making them a valuable tool for portfolio managers seeking to optimize their investment strategies.

Another significant insight from this study was the importance of using Beta adjustments in conjunction with other risk management techniques. While the Historical Beta Adjustment strategy offers a more refined approach to measuring risk, it should not be used in isolation. Investors should complement Beta adjustments with other risk mitigation strategies such as diversification, hedging, and scenario analysis. This multi-faceted approach ensures a comprehensive risk management framework that accounts for both systematic and unsystematic risks.

Despite the advantages of the Historical Beta Adjustment strategy, this study also identified certain limitations. One of the primary challenges is the complexity of recalculating Beta frequently, as it requires access to extensive historical data and advanced statistical models. Additionally, while adjusted Beta values provide a more accurate representation of current market risk, they are still subject to market unpredictability and external shocks. Therefore, investors should exercise caution and consider a range of factors when incorporating Beta adjustments into their decision-making processes.

From a theoretical perspective, this study contributes to the existing literature on risk management by highlighting the benefits of dynamic Beta adjustments in improving investment outcomes. Previous research has often focused on the limitations of CAPM-based Beta calculations, but this study extends the discussion by demonstrating how adjustments based on historical trends can enhance risk assessment, particularly in high-volatility sectors like pharmaceuticals. The findings support the argument that static Beta calculations are insufficient in rapidly changing market environments and that a more adaptive approach is necessary for accurate risk estimation.

From a practical standpoint, this study offers valuable insights for investors, portfolio managers, and financial analysts. The application of Historical Beta Adjustments can help investors make more informed decisions, reduce risk exposure, and enhance portfolio performance. For institutional investors and fund managers, incorporating adjusted Beta values into risk models can lead to better risk mitigation strategies and improved returns for clients. Additionally, regulators and policymakers can use these insights to develop frameworks that encourage more accurate risk assessment methodologies in financial markets.

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