AN EMPIRICAL INVESTIGATION OF THE CAPITAL ASSET PRICING MODEL: ASSESSING ITS VALIDITY IN CONTEMPORARY FINANCIAL MARKETS.

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Abstract

Empirical analysis and CAPM model testing for the top 5 companies listed on the NSE. A model that explains the connection between the expected Return and risk of investing in security is called the Capital Asset Pricing Model (CAPM). This study aids in understanding that a security's expected Return equals its risk-free Return plus a risk premium determined by the security's beta. The two components of covariance and variance can be used to determine the systematic beta for each security of the chosen firms. The goal is to highlight investors' shortcomings when evaluating the CAPM of particular companies listed on the NSE. The expected returns of an asset are calculated using the CAPM algorithm. It is based on the premise of systematic risk (otherwise known as non-diversifiable risk) that investors need to be rewarded for in the form of a risk premium. A rate of Return higher than the risk-free rate is known as a risk premium. According to research, investors want a more considerable risk premium when making riskier investments.

In this empirical analysis of the Capital Asset Pricing Model (CAPM), a sample of equities is used to evaluate the relationship between expected returns and systematic risk. The study examines data collected over several years and uses statistical techniques to evaluate the CAPM's reliability. According to the study's findings, the CAPM can be a valuable tool for describing how expected returns and systematic risk relate to the sample of stocks under examination. The paper also explores how the results may be applied to portfolio management and investment choices.

Keywords: *risk, returns, beta, covariance, market risk premium, stocks, securities*

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INTRODUCTION

The expected Return and risk of investing in security are determined using the capital asset pricing model, which makes several assumptions and only considers specific criteria. Although the CAPM's assumptions allow it to concentrate on the connection between Return and systemic risk, the idealized world they generate differs from the real one in which businesses and individuals make investment decisions. A more fundamental difficulty is that investors cannot borrow in the real world at a risk-free rate (for which the yield on short-dated government debt is used as a proxy). The risk involved with private investors is significantly greater than that involved with the government, which explains why. Because of this inability to borrow at the risk-free rate, the slope of the SML is shallower in reality than it is in principle. This model is used by businesses and investors alike to determine the expected returns for a specific systematic risk over the risk-free rate and to comprehend the risk involved with specific investments.

CAPM ASSUMPTIONS

- The perfect market means securities are easily divisible, and transaction costs are not involved.
- Investors have homogeneous expectations.
- Investors can borrow and lend freely at the risk-free plus rate of Return.
- Investments are made over a single period planning horizon.
- Investors are risk-averse.

NEED OF THE STUDY

The CAPM model is frequently attacked for its presumptions and the criteria it considers to determine if an investment is feasible during a single period. This study aims to pinpoint investors' shortcomings while utilizing the CAPM model to make investments.

LITERATURE REVIEW

Joseph Chen & Andrew Ang, (2007). The 2007 Journal of Empirical Finance paper "CAPM Over the Long Run: 1926-2001" by Ang and Chen investigates the reliability of the Capital Asset Pricing Model (CAPM) across 75 years. The authors discuss the model's main features, briefly explaining the CAPM and its underlying assumptions, such as the efficient market hypothesis and the presumption of homogenous expectations. They then talk about some of the model's critiques, like how it cannot account for size and value impacts in financial markets. The empirical examination of the CAPM performed by the authors utilizing data from 1926 to 2001 is then presented in the publication. They look at the connection between stock returns and beta and returns' connection to returns.

Stephen A Ross, (1978). The 1978 article "The Current Status of the Capital Asset Pricing Model (CAPM)" by Ross, which appeared in The Journal of Finance, summarizes the state of the research at the time on the CAPM and its effects on financial theory and practice. The article starts by going through the fundamental ideas behind the CAPM, including the underlying presumptions and the method for determining the expected Return on an asset. The author addresses several of the model's shortcomings, including its Reliance on the efficient market hypothesis and the presumption of homogenous expectations. The article also provides some empirical data acquired to support the CAPM's validity, such as research.

Blume, M. E., & Friend, I (1973). The essay "A new look at the capital asset pricing model" in Finance is considered a classic. The Capital Asset Pricing Model (CAPM), first proposed by William Sharpe in 1964, quickly became the most central concept in modern financial theory. Blume and Friend proposed a revised CAPM in their piece and challenged several of the model's fundamental assumptions. According to the authors, the initial CAPM falsely assumed that investors had similar expectations and equal access to investment opportunities. They proposed a new version of the CAPM that takes into account the fact that there are numerous investment options and investor expectations.

Perold, A. F. (2004). Gives a thorough examination of the CAPM and its development over time. The website extensively details the model's history, underlying assumptions, and limitations. Perold discusses the accurate data supporting and contradicting the CAPM and the suggested replacement models. Perold's study's findings have impacted how academics view the CAPM and its limitations. His analysis of market frictions and investor conduct has rekindled interest in developing models that more fully account for the available empirical evidence. Perold's work has significantly increased the knowledge of the CAPM, and financial academics and practitioners continue to find value in it.

Brown, P., & Walter, T. S. (2013). In "The CAPM: Theoretical Validity, Empirical Intractability, and Practical Applications," the

CAPM is scrutinized in light of modern Finance. The paper argues that despite the theoretical viability of the CAPM, it is experimentally intractable and has only a limited number of applications. The essay also examines empirical evidence that both supports and contradicts the CAPM, such as the existence of anomalies that the model cannot explain. According to Brown and Walter, these anomalies show that the CAPM is not a complete asset pricing theory and that additional models would be needed to explain market behavior. The CAPM and its relevance to modern Finance are examined fairly and critically in the essay by Brown and Walter. The essay is a helpful resource for academics.

Bollerslev, T., Engle, R. F., & Wooldridge, J. M. (1988). The seminal work, "A capital asset pricing model with time-varying covariances," is where econometric models for asset pricing first emerged. The study proposes a novel version of the CAPM that considers the potential for changing covariances between asset returns. According to the authors, the covariances between asset returns are supposed to stay constant over time, although this is an unjustified assumption made by the original CAPM. They propose a novel version of the model called the conditional CAPM, which allows for time-varying covariances. The CAPM is based on the assumption that "stochastic volatility," an unobservable component, can be measured using econometric methods and is what causes the covariances. The article's usage of the CCAPM as an asset pricing model in finance research is highlighted.

Jagannathan, R., & McGrattan, E. R. (1995). The Federal Reserve Bank of Minneapolis Quarterly Review article "The CAPM Debate" by Jagannathan and McGrattan discusses the debate around the Capital Asset Pricing Model (CAPM) in the financial literature. The authors start by outlining the fundamental ideas behind the CAPM, its underlying presumptions, and the method for determining the expected Return on an asset. After that, they talk about some of the model's shortcomings, like its Reliance on the efficient market hypothesis and the presumption of homogenous expectations. The article also discusses some competing models suggested as possible replacements for the CAPM in the literature, such as the Arbitrage Pricing Theory and the Fama-French model.

Talwar, P., & Gopinathan, R. (2022). Empirical testing of capital asset pricing model on top 10 companies in NSE India. ***Academy of Marketing Studies Journal, 26*****(S1), pp. 1–10.**
"Empirical testing of capital asset pricing model on top 10 companies listed in NSE India" by Talwar and Gopinathan (2022) appears to be a study that examines the application and validity of the Capital Asset Pricing Model (CAPM) on the top 10 companies listed on the National Stock Exchange (NSE) in India. The article likely focuses on empirical research conducted by Talwar and Gopinathan, testing whether the CAPM accurately predicts the expected returns of the selected companies in the Indian market. It may analyze factors such as the risk-free rate, market risk premium, and beta coefficients of these companies to assess the effectiveness of the CAPM in estimating their expected returns.

OBJECTIVES OF THE STUDY

1. To comprehend how risk and Return interact in the financial markets. Examining how shifts in risk impact predicted returns and vice versa is required.
2. To determine whether the CAPM is legitimate, it must be determined whether the model's basic assumptions hold in actual financial markets and whether it correctly forecasts the link between risk and Return.
3. To determine the model's limitations as well as the CAPM's limitations. This entails looking at instances where the model fails to anticipate the connection between risk and return effectively and looking into the causes of these failures.
4. Another goal of CAPM research is to identify alternative models that can more clearly describe the relationship between risk and Return
5. To help the investors develop more effective risk-management strategies.

RESEARCH METHODOLOGY

- **SECONDARY DATA**

The data collected to analyze the top 10 listed companies' CAPM is secondary.
By referring to the historical prices of all the 10 listed companies through various websites, an analysis of CAPM is done.

- **QUANTITATIVE DATA.**

The research mainly includes quantitative aspects, as the primary motive is to look into different prices over different periods.
To make an analysis, different mathematical functions are used. Such as,

- ✓ Calculation of risk and returns using standard deviation and average function.
- ✓ Calculation of beta using the 'SLOPE' function.
- ✓ Calculation of variance and covariance.

Null hypothesis (H0): The average returns generated by the Nifty 50 and the company are significantly different.
Alternative hypothesis (Ha): The average returns generated by the Nifty 50 company are not significantly different.
The prices of various stocks were collected from the Internet. The above calculations are done through the information collected from 'yahoo finance.' To calculate risk and returns, the prices play a vital role. Prices of the identified companies over a different time horizon are taken into consideration.
The below-given data addresses the company, industry, and market capitalization.
Investigation and analysis of the CAPM model of the top 5 companies in India by Market capitalization.

ANALYSIS AND INTERPRETATION

Nifty 50: The market capitalization of the member firms is used to establish the index value for the Nifty 50, with greater market capitalizations being given more weight. This process is known as free-float market capitalization weighting.
The Nifty 50 index serves as a comprehensive representation of the Indian equities market. It is frequently used as a benchmark for assessing the performance of investment portfolios by investors, traders, and fund managers. It includes
various economic areas in India, including Finance, information technology, energy, transportation, etc. Numerous variables, including corporate earnings, economic indicators, global market trends, political happenings, and investor attitude, have an impact on the value of the Nifty 50 index. It serves as a proxy for assessing the state and trend of the Indian stock market.

AVERAGE EXPECTED MARKET RETURN OVER 5 YEARS.

Nifty 50	
E(rm) monthly	**0.82%**
E(rm) yearly	**10.28%**

Company	**Industry**	**Market capitalization**
Reliance Industries Ltd	Refineries	**16,07,014 Cr**
Tata Consultancy Ltd	IT- Software	**11,61,858 Cr**
HDFC Bank Ltd	Bank- Private	**9,28,407 Cr**
Infosys Ltd	IT- Software	**5,08,045 Cr**
Hindustan Unilever Ltd	Household & Personal Products	**5,85,048 Cr**

CAPM Analysis for top 5 companies listed under nifty 50.
The risk-free rate calculated by considering the historical data of 5-year Indian bond yield is,
R_f= 6.98%
The formula calculates CAPM,
$R_e = R_f + \text{Beta}\ (R_m - R_f)$
CALCULATION OF BETA
BETA= COVARIANCE/VARIANCE

Why adjusting the inflation rate is important?

Inflation rate	4.55%
govt bond yield	6.98%
beta	1
E(rm)	10.28%
risk-free rate	2.32%

Because they directly impact the long-term buying power of money, inflation rates must be considered when determining the risk-free rate. The risk-free rate is the benchmark used to quantify the minimal Return an investor anticipates without taking any risks. The value of money gradually declines when there is inflation. As a result, a given amount of money will buy fewer products and services in the future than it does today. In order to guarantee that the investment return appropriately protects the investor's buying power, it is necessary to consider inflation while determining the risk-free rate.
The risk-free rate is often presented in real terms, which indicates that it has been adjusted for inflation. The market rate is the nominal risk-free rate, while the real risk-free rate is the nominal rate less the anticipated inflation rate. You may calculate the real Return required to retain the buying power of your investment by subtracting the anticipated inflation rate.
Investors can better make educated judgments and properly estimate the prospective returns of various investments when inflation rates are considered in the risk-free rate calculation. It enables users to assess if the predicted Return justifies taking on more risk or if the investment is indeed risk-free by comparing the returns of investments with different degrees of risk.

The average inflation rate over five years is given below.

Year	Inflation Rate (%)
2021	5.13%
2020	6.62%
2019	3.73%
2018	3.94%
2017	3.33%

CAPM ANALYSIS FOR ALL THE TOP FIVE COMPANIES LISTED UNDER NIFTY 50.

1. Reliance Industries Ltd: One of the giant corporations in India, Reliance Industries, which is frequently referred to as Reliance, operates in several industries, including petrochemicals, refining, oil and gas exploration, telecommunications, retail, and more. Reliance's returns and risks are examined by considering past performance, industry dynamics, market circumstances, and particular hazards to the firm.

Average returns generated by reliance industries over a period of five years.

E(rm) monthly	**1.27%**
E(rm) yearly	**16%**

Reliance industry returns typically range from 16% to 18% annually. However, because the risk factor isn't considered when determining the average Return yearly, this is not the actual Return an investor may anticipate.

The CAPM model should be used by investors in order to have a realistic grasp of the Expected Return. If Reliance Industries' CAPM is 10.049%, it means that stockholders anticipate receiving a 10.049% return in exchange for the risk they are taking on by purchasing the company's shares. The commonly used CAPM model calculates the expected Return on investment by taking into account the risk-free rate, the stock's beta, and the anticipated market return.

The formula for CAPM is as follows:

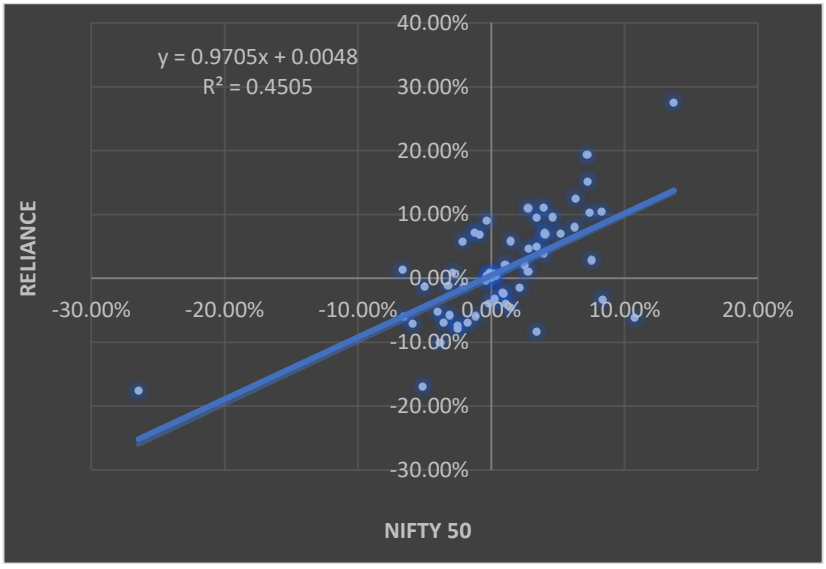
Expected Return = Risk-Free Rate + Beta * (Expected Market Return - Risk-Free Rate)

Reliance's market returns are 10.28%. This shows the typical Return of the market as a whole or a relevant market index (like the stock market) over a specific time frame. It indicates the market's overall performance and is used to evaluate the performance of specific equities. Reliance's risk-free interest rate is 2.32%. Based on an investment's beta and the risk-free rate, the CAPM is a financial model used to calculate the expected Return on investment. In this instance, the CAPM shows that considering Reliance's beta and the risk-free rate, the expected Return is 10.049%. The compensation an investor would need in exchange for accepting the systematic risk involved in purchasing Reliance's shares is represented by this projected Return.

It acts as a standard against which to compare the prospective returns of other investments.

The stock of Reliance is at a systematic risk of 0.9705 compared to the market as a whole. While a beta of larger than 1 implies increased volatility, one less than one signals that the stock is less volatile than the market. The volatility of Reliance's stock, in this instance, is somewhat lower than that of the market.

The number 10.049% represents the expected result in this instance. It is crucial to remember that this sum is an assessment rather than a promise of profit. The CAPM offers a framework for figuring out what compensation investors need to get for taking on systematic risk, or market risk, which is the risk entailed with the whole market.



Investors should interpret a CAPM of 10.049% for Reliance Industries as an indication that the stock is expected to provide a return slightly above the risk-free rate.

However, before making investing selections, it is crucial to conduct further research and consider other considerations. To make a well-informed investment choice, it is essential to consider other aspects of the firm, like its financial health, the state of the industry, the level of competition, and managerial competence.

Independent variable: returns generated by nifty 50.

Dependent variable: returns generated by companies selected for CAPM analysis.

The null hypothesis that the average returns provided by Reliance about Nifty are not substantially different at a 95% confidence level is not supported by the data, as shown by the significance value of 4.38901 for Reliance and the p-value of 0.54925.

If the null hypothesis is true, the p-value indicates the likelihood of getting the observed result (or a more extreme outcome). The p-value in this instance is 0.54925, which is higher than the standard significance threshold of 0.05 for a 95% confidence interval. This indicates that assuming that the average returns of Reliance and Nifty are not considerably different, the likelihood of witnessing such a result (or a more severe one) is around 0.54925.

As a result, the likelihood that the average returns provided by Reliance are substantially different from those generated by Nifty is about equal to (1 - p-value), or 0.45075 (1 - 0.54925 = 0.45075). This indicates a 45% likelihood that there is no discernible difference between the average returns of Reliance and Nifty.

Two variables, y, and x, are shown to be linearly related by the equation $y = 0.9705x + 0.0048$. The dependent variable in this equation is denoted by y, while the independent variable is denoted by x.

The formula for the equation is $y = mx + c$, where m is the line's slope in this case (0.9705), and c is the y-intercept in this case (0.0048). The y-intercept shows the value of y when x is zero, and the slope shows the rate of change of y concerning x. The linear relationship between the dependent variable y and the independent variable x is shown by the equation $y = 0.9705x + 0.0048$. According to the x coefficient of 0.9705, one unit of x is predicted to cause around 0.9705 units of y to grow. The value of y, when x is zero, is represented by the constant term 0.0048.

In this instance, R2 is 0.4505, indicating that this linear equation can account for around 45.05% of the variation in y. This suggests the equation has some predictive ability because it can explain a sizeable chunk of the data fluctuation. It also implies that the remaining 54.95% of the variance in y is explained by other factors not accounted for in the model.

2. Tata Consultancy Services: One of the biggest and most well-known corporations on the Indian stock market is Tata Consultancy Services (TCS). It is a conglomerate within the Tata Group and offers IT consulting and services. TCS is traded on the Bombay Stock Exchange (BSE) and the National Stock Exchange of India (NSE).

Average returns generated by reliance industries over five years.

TCS generates an annual return that is, on average, around 12.76%. Nevertheless, it misses the risk factor connected to the market return. Consequently, the above-average yearly Return over five years does not promise future returns. The CAPM is required to calculate the expected Return considering the risk component.

TCS stock's anticipated Return is 6.14%, greater than the risk-free rate. Usually, a low-risk investment, like government bonds, serves as the benchmark for the risk-free rate.

The systematic risk of TCS stock concerning the general market is quantified by its beta rating of 0.47. When the stock's beta value is below 1, it is considered less volatile than the market, while a beta value above one indicates greater volatility.

TCS is seen as having a lower systematic risk than the market due to its beta of 0.47. Therefore, given its reduced risk, the CAPM predicts that TCS would offer a lower return than the market.

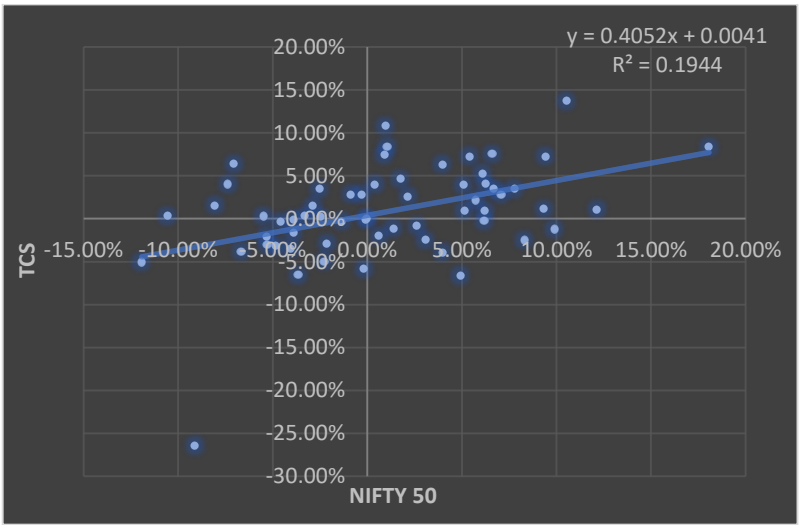
The theoretical Return, an investor might anticipate from a risk-free investment, such as a government bond or a savings account, is represented by the risk-free rate of 2.32%. It acts as a standard against which to compare the returns of other investments with varying degrees of risk. Given the cumulative performance of all investments made inside that market, the expected market return of 10.28% is the average Return that investors expect from the market as a whole. The stock of TCS has a beta rating of 0.4797, which compares its systematic

risk to the market as a whole. The expectation is that TCS's stock will be less volatile or involve less systematic risk

E(rm) monthly	1.01%
E(rm) yearly	**12.76%**

than the market if the beta is less than 1. The predicted Return on TCS's stock based on its beta and the risk-free rate is represented by the CAPM rate of 6.14%.

The coefficient of determination (R2) for the equation y = 0.4052x + 0.0041 is 0.1944. In a linear regression model, the



coefficient of determination quantifies the percentage of variation in the dependent variable (y) that can be explained by the independent variable (x).

TCS's significance F-value of 0.00042194 and p-value of 0.53874 show insufficient evidence to rule out the null hypothesis that TCS's average returns are not substantially different from Nifty's at a 95% confidence level.

If the null hypothesis is true, the p-value indicates the likelihood of getting the observed result (or a more extreme outcome). The p-value in this instance is 0.53874, which is higher than the conventional significance threshold of 0.05 for a 95% confidence interval. Assuming that the average returns of TCS and Nifty are not considerably different, the likelihood of witnessing such a result (or a more severe one) is around 0.53874.

As a result, the likelihood that the average returns produced by TCS and Nifty are substantially different is about equal to 1 - p-value, or 0.46126 (1 - 0.53874 = 0.46126). This indicates that there is a roughly 46% chance that the average returns for TCS and Nifty are similar to one another.

An R2 value of 0.1944 from this instance indicates that the independent variable (x) in the proposed linear regression model can account for around 19.44% of the dependent variable (y) variation. In other words, 19.44% of the variations or changes in the dependent variable (y) may be accounted for by the independent variable (x). Other variables or random variability, the model does not account for the remaining 80.56% of the variation.

3. HDFC Bank: One of the top banks in India, HDFC Bank is listed on the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE), two of the country's stock markets. Due to its solid financial performance and steady growth throughout the years, HDFC Bank was a well-liked option among investors as of my knowledge cutoff in September 2021. One of India's top home financing businesses, home Development Financing Corporation Limited (HDFC Ltd.), is the parent company of HDFC Bank Limited. Retail banking, corporate banking, and treasury operations, among other services, are among the many banking and financial services offered by HDFC Bank.

Average annual returns generated by HDFC Bank.

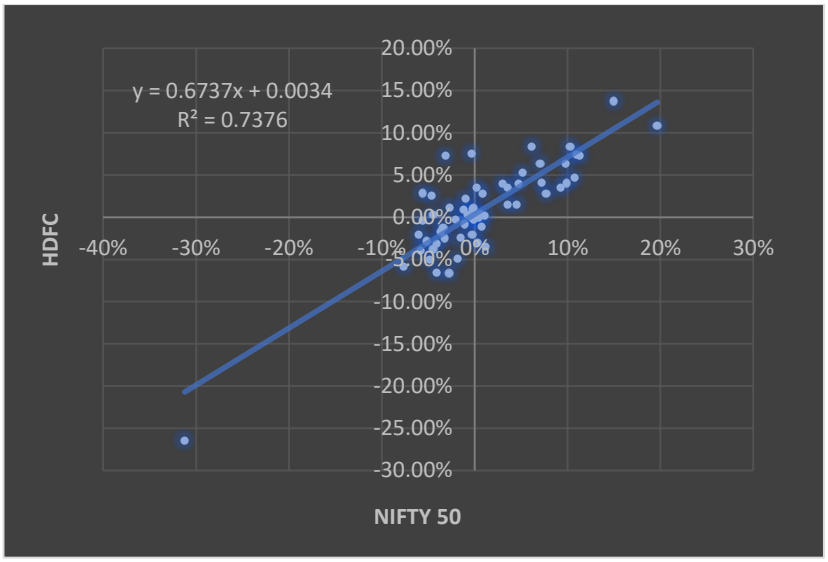
E(rm) monthly	**0.711%**
E(rm) yearly	**8.87%**

Without considering systematic risk, HDFC Bank's average annual Return over the last five years is 8.87%.

The Return, a shareholder, may expect from an investment in a risk-free asset, such as government

bonds, is represented by the risk-free rate. The risk-free rate in this scenario is considered to be 2.32%. Investors are compensated for the time value of money and the lack of risk by using it as their benchmark return. With a beta of 1.09, HDFC Bank's stock tends to fluctuate more than the market as a whole.

A beta value larger than 1 indicates that the stock will likely experience more price swings than the overall market. The market risk premium represents the additional profit that investors want in exchange for accepting the systemic risk connected with the entire market. The market risk premium in this situation is computed at 7.96%, representing the additional return investors anticipate for assuming market risk. According to the estimated expected Return, investors may anticipate a total return of 11.04% on their investment in HDFC Bank's shares. It considers both the risk-free rate and the extra Return required for accepting the market risk associated with the stock, as determined by its beta.



With a 95% confidence interval, the null hypothesis that the average returns provided by HDFC Bank concerning Nifty are not substantially different is not supported by the significance F-value of 1.7079 for HDFC Bank and the p-value of 0.3700.

If the null hypothesis is true, the p-value indicates the likelihood of getting the observed result (or a more extreme outcome). The p-value in this instance, 0.3700, is higher than the usual 0.05 significance level for a 95% confidence interval. This suggests that assuming that the average returns of HDFC Bank and Nifty are not considerably different, the likelihood of witnessing such a result (or a more severe one) is around 0.3700.

As a result, the likelihood that the average returns produced by HDFC Bank and Nifty are significantly different is about equal to 1 - p-value, or 0.6300 (1 - 0.3700 = 0.6300). Accordingly, there is a 63% chance that there is no discernible difference between the HDFC Bank and Nifty average return rates.

The line has a slope of 0.6737. This shows that the dependent variable (y) is anticipated to rise by 0.6737 units for every unit increase in the independent variable (x). According to the positive slope, there is a positive correlation between x and y, which means that when x rises, y tends to follow. The line's y-intercept is 0.0034. When x is 0, it represents the value of y. In this scenario, y is predicted to be around 0.0034 when x is zero. The quality of fit of the regression line to the data points is measured by the coefficient of determination, often known as R-squared (R2). In this instance, the dependent variable (y)'s variability, as indicated by the R2 value of 0.7376, accounts for around 73.76% of the total variance.

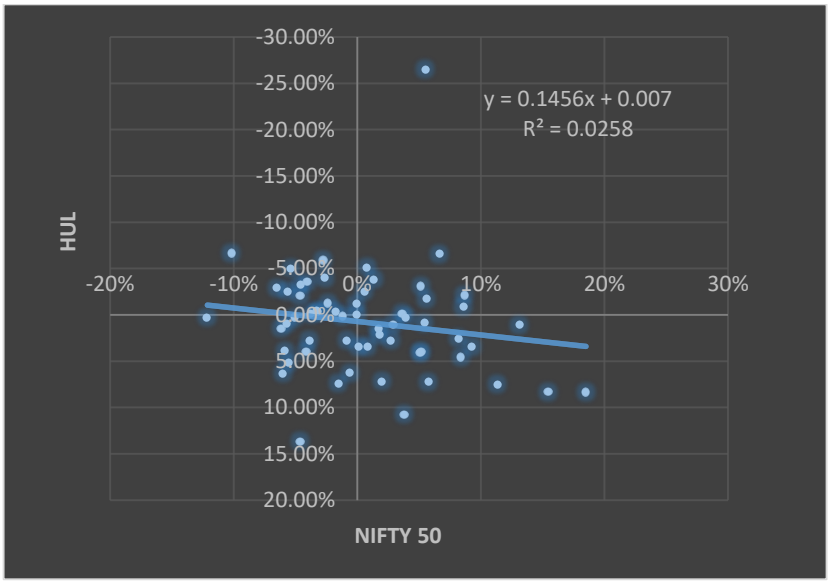
4. Hindustan Unilever Limited: One of India's top fast-moving consumer goods (FMCG) corporations is HUL or Hindustan Unilever Limited. It is traded on the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE), two stock markets in India. On Indian stock markets, HUL's stock is traded under the ticker "HINDUNILVR."

The average annual Return of HUL over the last five years is given below.

E(rm) monthly	1%
E(rm) yearly	**10.33%**

Based on an asset's beta and market return, the CAPM determines the predicted Return of HUL in

this situation. HUL is anticipated to yield 3.73%. Thus, based on the CAPM, investors may anticipate receiving an average return of 3.73% on their HUL investment. The risk-free rate is the Return an investor would anticipate from a risk-free investment. It is 2.32%. In this instance, the predicted Return is contrasted with the risk-free rate as a baseline. The additional Return over the risk-free rate investors should anticipate earning in exchange for accepting the systematic risk associated with HUL is represented by the anticipated Return of 3.73% for HUL. The susceptibility of an asset to market fluctuations is measured by its beta. With a beta of 0.177092, HUL's returns are predicted to be somewhat less erratic than the market as a whole. In other words, compared to an average stock, HUL's stock price is anticipated to be less impacted by market changes. The fact that HUL has a low beta means it is a generally safe and low-risk investment. The susceptibility of an asset to market fluctuations is measured by its beta. With a beta of 0.177092, HUL's returns are predicted to be somewhat less erratic than the market as a whole. In other words, compared to an average stock, HUL's stock price is anticipated to be less impacted by market changes. The fact that HUL has a low beta means it is a generally safe and low-risk investment.



The null hypothesis that there is insufficient evidence to disprove the null hypothesis that the average returns generated by HUL concerning Nifty are not substantially different at a 95% confidence level is supported by the significance F-value of 0.2202 for HUL and the p-value of 0.3411. If the null hypothesis is true, the p-value indicates the likelihood of getting the observed result (or a more extreme outcome). The p-value in this instance is 0.3411, which is above the usual 0.05 significance level for a 95% confidence interval. This suggests that assuming that the average returns of HUL and Nifty are not considerably different, the likelihood of witnessing such a result (or a more severe outcome) is around 0.3411.

Thus, the likelihood that the average returns produced by HUL and Nifty are substantially different from one another is about equal to 1 - p-value, or 0.6589 (1 - 0.3411 = 0.6589). This indicates a roughly 66% chance that there is no discernible difference between the average returns of HUL and Nifty.

The slope shows how much faster the dependent variable (y) changes as the independent variable (x) increases by one unit. In this scenario, " y " is anticipated to rise by 0.1456 for every unit increase in "x." This shows that the independent and dependent variables have a favorable connection. The value of the dependent variable (y), when the independent variable (x) is zero is known as the y-intercept. In this instance, "y" is anticipated to be 0.007 when "x" is zero. How effectively the independent variable (x) accounts for variance in the dependent variable (y) is shown by the R2 value. A low R2 score of 0.0258 indicates that the independent variable explains a mere fraction (2.58%) of the variance in the dependent variable.

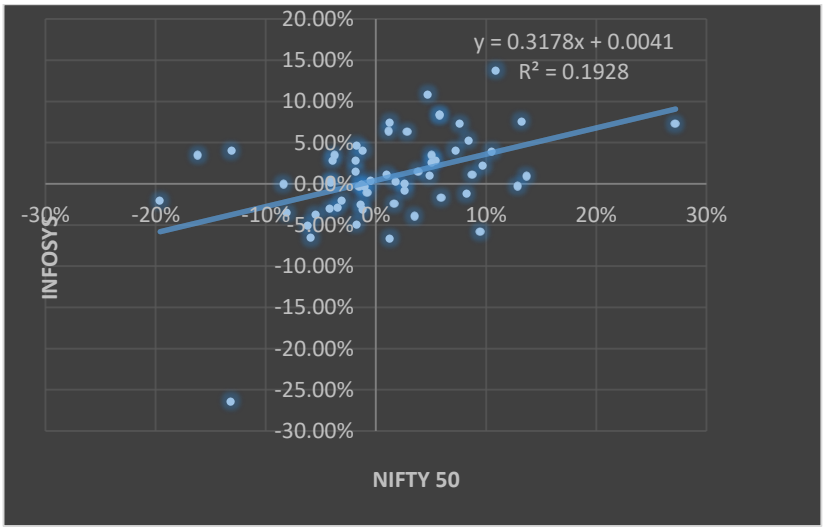
5. Infosys: An international technology consulting and support services provider, Infosys Limited is located in India. It is traded on some stock markets, including the New York Stock Exchange (NYSE) in the US and the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) in India. On the stock markets where it is listed, Infosys is

known by the ticker symbol "INFY." Using this symbol, investors may trade shares and keep track of the company's stock price.

The average annual Return of Infosys over the last five years is given below.

Investors should anticipate an average return of 7.15% on their Infosys investment based on the CAPM calculation. Investors receive this Return as compensation for the systematic risk of owning Infosys stock. The risk-free rate is the Return an investor would anticipate from a risk-free investment. It is 2.32% in this instance. Investors can anticipate an extra return for taking on the systematic risk associated with Infosys, which is represented by the expected Return for Infosys of 7.15% over the risk-free rate. The susceptibility of an asset to market fluctuations is measured by its beta. The stock returns of Infosys are predicted to have a modest correlation with the market, according to a beta of 0.6067. Infosys' stock price will likely fluctuate less than the market as a whole, pointing to lower volatility than the overall market. The susceptibility of an asset to market fluctuations is measured by its beta. The stock returns of Infosys are predicted to have a modest correlation with the market, according to a beta of 0.6067. Infosys' stock price will likely fluctuate less than the market as a whole, pointing to lower volatility than the overall market.

E(rm)	**1.27%**
E(rm) yearly	**16.37%**



The null hypothesis that there is insufficient evidence to disprove the null hypothesis that the average returns generated by Infosys with regard to Nifty are not substantially different at a 95% confidence level is supported by the significance F-value of 0.0004477 for Infosys and the p-value of 0.535901.

If the null hypothesis is true, the p-value indicates the likelihood of getting the observed result (or a more extreme outcome). The p-value in this instance is 0.535901, which is above the usual 0.05 significance level for a 95% confidence interval. This shows that the likelihood of seeing such an outcome (or a more severe one) is around 0.535901 under the supposition that Infosys and Nifty's average returns are not considerably different.
In light of this, the likelihood that Infosys' average returns and Nifty's average returns are significantly different is about equal to 1 minus the p-value, or 0.464099 (1 minus 0.535901). This indicates that there is a roughly 46% chance that there is no discernible difference between the average returns of Infosys and Nifty.

The slope shows how much faster the dependent variable (y) changes as the independent variable (x) increases by one unit. In this instance, "y" is anticipated to rise by 0.3178 for every unit increase in "x." This shows that the independent and dependent variables have a favorable connection. The value of the dependent variable (y) when the independent variable (x) is zero, is known as the y-intercept. In this instance, "y" is anticipated to be 0.0041 when "x" is zero. How effectively the independent variable (x) accounts for variance in the dependent variable (y) is shown by the R2 value. The independent variable accounts for 19.28% of the variation in the dependent variable, according to a fair R2 value of 0.1928. This indicates that additional variables have a substantial impact on the dependent variable but are not considered in the model.

Several other models have been developed as alternatives to the Capital Asset Pricing Model (CAPM). These models are meant to address some of CAPM's constraints and presumptions. Here are some noteworthy substitute models:

▪ **Fama-French Three-Factor Model:** The CAPM is expanded by the Fama-French Three-Factor Model by including other factors besides beta. It consists of three components: the size factor (which gauges the impact of a company's size on returns), the value factor (which gauges the impact of the book-to-market ratio on returns), and the market risk factor (beta). This model acknowledges the possibility of value and small-cap stocks outperforming the market.

▪ **Carhart Four-Factor Model:** The Carhart Four-element Model expands upon the Fama-French Three-Factor Model. Momentum is the propensity for assets that have recently performed well (or poorly) to continue doing favorably. The market risk factor, size factor, value factor, and momentum component are all taken into account by this model.

▪ **Arbitrage Pricing Theory (APT):** APT is a CAPM substitute model that considers more than simply the market risk component. APT implies that several macroeconomic and other pertinent factors impact an asset's predicted Return.

FINDINGS

- Positive returns imply an excellent investment plan since they show that the investments make more money than the risk-free asset.
- According to the positive beta, the investment may have a favorable association with the market as a whole. This suggests that investment performs better than average when the market performs well.
- All of the top 5 corporations fall within the null hypothesis.

SUGGESTIONS

1. Higher returns are desirable, but it is also essential to consider the assets' risk-adjusted returns. This may be done by taking into account measurements like the Treynor ratio or the Sharpe ratio, which combine risk elements like beta and volatility. These ratios make it easier to compare the returns received per unit of risk.
2. By integrating assets with various betas and risk characteristics in their portfolios, investors should consider diversifying their holdings. By distributing assets among different asset classes, diversification helps to lower total portfolio risk.
3. It is crucial to assess the current economic and market conditions that can affect how well the investments perform in the future. Changes in market trends, interest rates, or sector-specific factor might impact the returns and risk of investments.
4. The initial estimates of expected returns may have been too optimistic if the actual returns are regularly lower than the average projected returns. Investors should reevaluate their goals and revise their investment plans as required. To predict more realistic projected returns, consider recent information and market circumstances.
5. The CAPM assumes that beta is the only variable affecting expected returns. However, reviewing the CAPM model assumptions can be important if the actual returns repeatedly differ from the predicted returns. Consider using more variables or other models that more accurately reflect the risk-return connection unique to the assets you are considering.

Risk Management Strategies for the investors using the CAPM model

- Diversification: A key risk management tactic is diversifying the investing portfolio. Investors can lessen their exposure to particular risks related to individual securities by diversifying their assets across several asset classes, sectors, and geographical areas. Diversification lowers the portfolio's total risk without reducing the possibility of gains.
- Asset allocation: Choosing the right asset mix is essential for risk management. The distribution of investments among various asset classes, such as stocks, bonds, and cash equivalents, is called asset allocation. The investor's time horizon, financial objectives, and risk tolerance must determine the allocation. Investors can lessen the effects of negative moves in any one asset class by keeping a balanced asset allocation.
- Risk-adjusted return analysis: The projected excess Return is a risk-adjusted return metric offered by CAPM. Investors may use this metric to compare the predicted rewards of various investment possibilities to their level of risk. Investors can find assets with greater projected returns for a specific degree of risk by comparing the risk-adjusted returns of various investments.
- Regular portfolio rebalancing: Rebalancing entails regularly changing the portfolio's asset allocation to return it to the intended target allocation. This method keeps the portfolio in line with the investor's investing goals and risk

tolerance. The danger of being overexposed to specific asset classes, which may have done well previously but have higher risks going forward, is decreased with regular rebalancing.

- Risk management through hedging: Hedging methods are a tool investors may employ to reduce certain risks in their holdings. For instance, if a stock's downside risk worries an investor, they can buy put options to hedge against a possible decrease in the stock's value. In order to lower total risk exposure, hedging methods entail having opposing positions in comparable assets.
- Continuous monitoring and evaluation: Continuous portfolio monitoring and review are necessary for effective risk management. Investors should keep up-to-date on any changes in the market, the economy, or industry trends that can affect their assets. Investors can change risk management tactics by routinely assessing the portfolio's performance and risk factors.

CONCLUSION

According to CAPM, an asset's sensitivity to systematic market risk is represented by its beta, a linear function of its expected Return. More tremendous beta assets are anticipated to have greater projected returns to make up for increased risk taken on by investors. The risk-free rate is incorporated into CAPM as a baseline return that compensates investors for the time value of money and risklessness. The risk-free rate is used as a benchmark to evaluate the extra Return produced by a hazardous asset. Combining assets with various betas can create efficient portfolios using the CAPM framework. Investors can optimize the risk-return trade-off in their portfolio by diversifying among assets with different degrees of systematic risk.

Rational investor conduct, efficient markets, and a linear connection between beta and projected returns are among the assumptions and restrictions of CAPM. Due to the model's simplicity, there may be differences between predicted and actual returns since it needs to adequately account for real-world markets' intricacies.

To overcome some of the shortcomings of CAPM and integrate extra risk variables, researchers have created alternative models such as the Fama-French Three-Factor Model, Carhart Four-Factor Model, Arbitrage Pricing Theory (APT), and different multi-factor models.

Investors should consider additional considerations while investing, even if CAPM offers a valuable framework. These elements include risk-adjusted returns, diversification, market analysis, re-evaluation of predicted returns, and sometimes the incorporation of alternative models that more accurately reflect specific investment characteristics.

In conclusion, CAPM research advances our knowledge of the risk-return relationship and aids investors in making wise choices by examining the trade-off between projected profits and systematic risk. To improve decision-making processes, it is crucial to be aware of the model's limits and to supplement it with further research and models.

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