Risk–Return Analysis of Selected Equity Stocks Listed in Bombay Stock Exchange Using Capital Asset Pricing Model

V Bheemeswara Reddy [1] & Harish. N[2]

[1&2]Associate Professor, Dept. of MBA
The Oxford College of Engineering, Bangalore- 560068.

bheemavaddi@gmail.com

Abstract. Investment in Stocks is considered the best alternative to earn higher returns in form of dividends and capital appreciation. Two important ways to investment in Stocks viz., Risk and Return. Indeed, each return on investment is influenced by varying levels of risk. Investors consider Stocks which offer higher returns at comparatively low risk levels. These stocks may be underpriced in the market whereas stocks with less returns at higher risk level may be overpriced and such stocks are eschewed by the investors. A wise investment decision requires proper measurement of both returns and risk. Risks are of two types viz., systematic and unsystematic risks. Unsystematic risk can be eliminated by efficient diversification of investment where systematic also called as market risk cannot be removed through diversification. So, the investment decision should be based on comparison of returns with systematic risk. CAPM helps the investors in identifying stocks best suited for their investment by measuring actual returns, expected returns and Systematic risk. This study makes an endeavour to employ the Capital Asset Pricing Model (CAPM) on a portfolio of 30 stocks listed on the Bombay Stock Exchange, with the aim of identifying stocks that might be undervalued or overvalued. When stocks offer returns additional than expected, they are underpriced otherwise they are overpriced or fairly priced. Underpriced stocks are seemly for long period investment as they offer high returns in the long period. The study found that 15 out of 30 Stocks are considered underpriced and potentially suitable for long-term investment viz., Axis Bank Ltd., Bajaj Auto Ltd., Bajaj Finance Ltd., Hindustan Unilever Ltd., Housing Development Finance Corporation Ltd., Infosys Ltd., Kotak Mahindra Bank Ltd., Reliance Industries Ltd., Tata Consultancy Services., Tata Steel Ltd., Vedanta Ltd., Yes Bank Ltd., HDFC Bank Ltd., IndusInd Bank Ltd., Maruti Suzuki India Ltd.

Keywords: Bombay Stock Exchange, CAPM, Equity Stocks, Systematic risk, Unsystematic risk, overpriced, underpriced.

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1 Introduction

Investors perceive the projected return on investment as the more probable outcome based on presently accessible information. Historically, the returns on equity shares have significantly surpassed those on debentures and corporate bonds. Nevertheless, equity share investments exhibit greater volatility compared to returns on debt instruments. Despite the elevated risk involved, equity shares investment offers the potential for higher returns. Therefore, it is sensible to consider such investments to earn substantial returns while mitigating associated risks [11].

In the current competitive and globalized business landscape, every investment carries inherent risk. Financial markets are not devoid of imperfections, leading to outcomes that may deviate from initial expectations. In modern-day financial management, the notion of risk management assumes significant significance when making investment decisions. The primary objective of financial investing is to achieve the utmost profitability or return on investment. Investing involves risk, leading to the possibility of profit or loss. The primary objective of investing is to maximize profits while minimizing risks. This necessitates careful evaluation, diversification, understanding one's risk tolerance, and adaptability to changing market conditions. The focus is on achieving long-term growth while effectively managing associated risks [19].

Prior to committing their wealth to an investment, it is crucial for any investor to examine the associated risks. Risk is a distinct factor that pertains to the likelihood of the actual result of an investment varying from its expected returns. Risk originates from multiple sources, with the three primary ones being business risk, interest rate risk, and market risk [2].

1.1 Capital Asset Pricing Model (CAPM):

Three researchers—William Sharpe, John Lintner, and Jan Mossin—are responsible for the creation of the CAPM in the middle of the 1960s. Thus, the Sharpe-Lintner-Mossin CAPM is the name given to the model. It is possible to think of the CAPM, as an expansion of Markowitz's portfolio theory. The application of portfolio theory can help individual investors build effective portfolios and make wise decisions. The CAPM, which makes the assumption that every investor would act in accordance with the rules of portfolio theory, provides a association between the expected return & risk of specific securities and portfolios in the capital markets.

The link amongst risk and return is established by the CAPM, which is characterised by a security market line. In essence, this relationship is a simple linear link. Investors anticipate bigger returns because a higher beta value signals a security's higher risk. In other words, every investments are anticipated to provide returns that are inversely correlated to their amount of risk as determined by. Regardless of how efficient or inefficient they are, this link holds for both individual securities and portfolios.

The expected earnings on any security/any portfolio be able to originate by the CAPM formula as given below:

The expected earning of individual security is $Ri = Rf + \beta[Rm - Rf]$

The expected earning of the portfolio is $Rp = Rf + \beta p[Rm - Rf]$

Where, Ri = security return
β = systematic risk
Rf = risk free return
Rm= market return

1.2 Pricing of Securities with CAPM

In fact, it is possible to assess the cost of securities by with the CAPM. It affords a method for determining whether a security is fairly priced, overpriced, or neither. Investors will find a security more alluring if it is predicted to offer additional returns than the expected return. In contrast, a security loses appeal if its yields are less than those anticipated. Investors can assess the appeal and potential worth of various investment options by comparing the expected returns with the estimated cost of securities using the CAPM.

Assumptions of CAPM model:

- Investors base their investment decisions on risk-return analysis that take into account expected returns and return standard deviation.
- A security may be bought or sold in units that are infinitely divisible.
- An investor does not impact purchase and sales prices. Which means that there is definite competition amount of investors in their actions.
- No transaction costs. Although transaction costs are very small, there are possibly of very less importance in investment decision making, so they are ignored.
- No personal income taxes. Alternative tax rates on dividend income and capital gains are the same, thus making the investor different from the return on investment (dividends or capital gains).
- Investor can lend or borrow any amount of funds expected at a rate of interest equal to the rate for riskless securities.
- Investor may sell short any kind of any shares.
- Investors share homogeneity of expectations. Similar assumptions are made by investors with the same decision period and decision inputs. Investors are presumed to have the same holding periods as well as the similar expectations for expected returns, expected return variances, and covariances across all security pairs.

2 Review of Literature

[20] examined the risk-return characteristics of the stocks was the goal to study the performance analysis of BSE-SENSEX equities using SML approach. The SML model was also used in the study to determine if the stocks were overpriced or underpriced. The researchers wanted to determine if the stock prices accurately reflected their risk-return profiles by using the SML model. [13] argued that a crucial area of the research in realm of finance is the influence of annual performance on the fluctuation in share price. The object of this study was to conclude whether businesses from various indus-

tries could generate value for their shareholders. Economic Value Added (EVA), a performance analysis metric based on CAPM model, was applied to subset of equities in the banking, information technology, and automobile industries in this study. This method was used in this study to determine whether these sector companies were effective at creating value for their shareholders. [8] emphasized the difficulties investors experience in making wise judgments as a outcome of the extreme volatility seen in financial markets. By applying the CAPM model, it seeks to clarify the complexities of risk and return while investing in businesses from various industries represented by the BSE-SENSEX. Six businesses from the automotive, metal, consumer goods, IT, pharmaceutical, and financial industries were selected for the study in order to examine their risk-return profiles. The results show that, compared to equities from other sectors, TATA Motors, HDFC, and Coal India saw lower stock returns because of higher levels of volatility and systematic risk. [17] compared the returns and risk using both the Markowitz model and Sharpe's Single Index Model. The study goals to determine the level of deviance in returns when comparing these two models. By utilizing the measurement of beta, which quantifies the systematic risk connected with a specific investment, the study gives reliable information for all investors. The study focuses on stocks listed in the S&P BSE SENSEX and concludes that, there is no significant deviation in returns between the two models.

[14] contended that risk and return analysis is a crucial element in the investment decision-making process. The primary objective of this study is to analyze the risk and return profiles of certain stocks from the FMCG, healthcare, banking & finance, telecom, and energy sectors. The risk-return relationship is examined throughout the article using metrics such as the mean and standard deviation. The projected return of stocks is calculated using the CAPM. The study's outcome show that Alphageo India Ltd., Dwarikesh Sugar Industries Ltd., Strides Shasun Ltd., ITI Ltd., and IndusInd Bank Ltd. all have high predicted returns. According to excess returns to beta value, the top five companies are Britannia Industries Ltd., Lupin Ltd., ICICI Bank Ltd., Reliance Communications Ltd., and Aban Offshore Ltd. [7] purported that Individuals use risk-return analysis extensively while making decisions. According to this study, who examines the relationship between risk and return, investors should be prepared to take on more risk if they want to earn higher returns. It reveals that low-risk investments tend to offer lower returns, while high-risk investments have the potential for higher returns. In particular, the study finds that the banking and automobile sectors exhibit high risk and low returns, whereas the fast-moving consumer goods and pharmaceutical sectors offer higher returns with lower risk.

[5] delves into the examination of the risk-return association within the construction of CAPM in the Dhaka Stock Exchange (DSE) market. The primary motive of this research was to explore the applicability of the CAPM in the DSE context. Through conducting an empirical analysis of individual stocks, it was discovered that the intercept of the CAPM significantly deviates from zero, and the slope of the CAPM is not equivalent to the market portfolio. As a outcome, the results of this paper conclude that the CAPM is not a flawless tool for assessing Bangladesh stocks during the examined period.

[10] looked at the risk and return correlations between the banking sectors of the Sensex and the BSE. For the aim of this research, the risk-return trade-off with the Sensex was computed using the banks ICICI, HDFC, Axis, and SBI. In the study, only the secondary data were thought to be significant. This study sought to ascertain whether there was a risk reward trade-off in Indian equity markets. [6] focused on utilizing the CAPM to estimate the cost of capital for projects while making capital budgeting decisions. According to this study, CAPM fails to meet investors' expectations because stock returns were lower than anticipated. Therefore, using CAPM betas and project returns, our goal is to develop a novel technique for calculating their projected return. Conferring to the study's findings, CAPM provided information on the risk premium on primitive goods.

[1] argued that understanding volatility in the stock market in Asia and establishing whether there is a relationship between volatility and stock returns is the significance of this study. When examining the KSE 100, BSE Sensex, Hong Kong, and Shanghai Stock Exchanges, KOSPI shares are taken into consideration. They found that during past stock markets, stocks had larger correlations and more volatility. The study's outcomes show that KOSPI (Seoul, South Africa) has the best average annual return (12.67%), followed by the BSE (11.62%), KSE (9.35%), and KSE 100 (2.88). The most volatile country is Hong Kong (3.09). [3] focused on evaluating and contrasting the risk-return characteristics of the chosen FMCG stocks. The study's goal is to encourage investors to buy particular companies that are related with the FMCG industries. They discovered that while HUL, Dabur India, and Tata Global had low average returns, ITC Ltd., Nestle, and Colgate Palm had strong average returns. Conferring to the study's findings, investors pick long-term investments and invest in equities with strong average returns.

[15] studied the relationship between equity-based mutual funds' risk and return. This essay's goal was to analyze equity-based mutual funds' performance. Using the CAPM, an overall analysis of all equity-based mutual funds was conducted. According to their data, UTI and Kotak are among the best performing corporations, whereas SBI is the poorest performing bank. [16] analysed the process through which investors invest in assets and securities is known as portfolio management. After accounting for all risk factors, investors can earn substantial returns by investing in portfolio securities. The study's goals include determining the weights of the portfolio, return risk, and correlation between particular stocks. According to this analysis, TCS, BAJAJ AUTO, and HDFC bank have excellent returns, and there is a good association between TCS & AUTO and HUL, AUTO. The study's findings recommend that investors should comprehend maximum returns, optimum returns, safety, etc. before investing in a portfolio.

3 Research Methodology

3.1 Statement of The Problem

The prominence of this study lies in its role in shaping the portfolio based on both anticipated and realized returns achieved by investors in chosen firms. In recent times, equity markets have gained significant prominence. The valuation of equities is a key concern addressed by scholars and researchers within the capital markets domain, utilizing diverse perspectives. Concurrently, professionals engaged in stock trading have been deciphering various hints and insights.

Several accounting factors have been employed to elucidate equity value and equity return. These encompass book value, diverse forms of profitability metrics, operational assets, earnings per share (EPS), residual value, and growth in EPS. Additionally, measures such as overall company growth, dividend per share (DPS), and growth in DPS are utilized, alongside concepts like real options for growth and real options for abandonment, all contributing to the explanation of equity valuation.

Earnings play a crucial role in inducing the market value of equity shares. When a business achieves success and starts accumulating reserves, it often explores expansion opportunities to enhance profitability. When a business begins to generate attractive earnings, there will be a greater demand for equity shares, increasing their market value.

Investors typically strive to reduce risk while increasing yield on their investment. Equity or individual stock investors have a tendency to be more active and adventurous. The possibility for exceptionally large profits over a much shorter to longer time horizon exists with equity stocks. Stock investing can be challenging, and it's typically done by people who have a thorough knowledge of the market. Finding the correct stocks at the right moment enables investors to achieve higher returns than anticipated. As a result, CAPM is used in this study to discover the stocks that have the potential to yield large returns and are thus appropriate for investment.

3.2 Objectives of The Study

- To determine expected and concrete returns on selected stocks
- To ascertain risk accompanying with each selected stock
- To identify over or undervalued stocks
- To offer valuable suggestions grounded on the study for investment

3.3 Scope of The Study

The analysis exclusively encompasses equity stocks traded on the Bombay Stock Exchange (BSE). The necessary criteria for each stock are calculated over a five-year duration, spanning from April 1, 2015, to March 31, 2019.

3.4 Limitations of The Study

- The portfolio is formulated solely based on Capital Asset Pricing Model (CAPM).
- The portfolio construction solely relies on a 5-year dataset.
- The study is confined only to top 30 stocks of BSE Sensex.
- The recommendations provided are entirely grounded in the examination of secondary data.

3.5 Data Collection

The exploratory nature of the study requires the utilization of secondary data, which is sourced from a diverse range of websites, publications, newspapers, and magazines. The information about stock prices and index values was gathered from the Money Control and Bombay Stock Exchange websites. The study focuses on the range of the top 30 companies from the BSE Sensex.

Statistical tools used for the research:

Components of CAPM such as:

- Beta

  βi = covariance of stock, market/variance market

  βi = Σ (Ri-Ri')(Rm-Rm')/ Σ(Rm-Rm')^2

- Variance

  (Rm-Rm') ^2/n-1

- Co-variance

  (Ri-Ri')(Rm-Rm')/n-1, CAPM = Rf+{βi[Rm-Rf]}

4 Data Analysis

Table 1. No 1. Actual Return and Expected Return on 30 BSE Stocks

SL. NO	NAME THE COMPANY	Ri	Rf	Beta	Rm	Rf+ {βi[Rm-Rf]}	Over-priced or under priced
1	Axis Bank Ltd.	27.48	7.33	2.86	12.2	21.26	Under priced

2	Bajaj Auto Ltd.	7.71	7.33	-0.5	12.2	4.89	Under-priced
3	Bajaj Finance Ltd.	77.96	7.33	1.16	12.2	12.98	Under priced
4	Bharti Airtel Ltd.	4.22	7.33	0.92	12.2	11.81	Over-priced
5	Coal India Ltd.	-2.73	7.33	1.00	12.2	12.2	Over-priced
6	HCL Technologies Ltd.	10.19	7.33	1.19	12.2	13.12	Over-priced
7	HDFC Bank Ltd.	25.90	7.33	0.93	12.2	11.86	Under priced
8	Hero MotoCorp Ltd.	3.92	7.33	-0.21	12.2	6.31	Over-priced
9	Hindustan Unilever Ltd.	24.74	7.33	1.03	12.2	12.35	Under priced
10	Housing Development Finance Corporation Ltd.	19.54	7.33	1.66	12.2	15.41	Under priced
11	ICICI Bank Ltd.	14.76	7.33	1.75	12.2	15.85	Over-priced
12	IndusInd Bank Ltd.	31.65	7.33	1.44	12.2	14.34	Under priced
13	Infosys Ltd.	14.11	7.33	0.45	12.2	9.52	Under priced
14	ITC Ltd.	5.75	7.33	0.20	12.2	8.30	Over-priced
15	Kotak Mahindra Bank Ltd.	29.94	7.33	1.62	12.2	15.22	Under priced

16	Larsen & Toubro Ltd.	13.35	7.33	1.86	12.2	16.38	Over-priced
17	Mahindra & Mahindra Ltd.	6.97	7.33	0.23	12.2	8.45	Over-priced
18	Maruti Suzuki India Ltd.	34.60	7.33	1.86	12.2	16.38	Under priced
19	NTPC Ltd.	7.39	7.33	1.00	12.2	12.2	Over-priced
20	Oil & Natural Gas Corporation Ltd.	-3.70	7.33	1.04	12.2	5.06	Over-priced
21	Power Grid Corporation Of India Ltd.	2.65	7.33	-0.04	12.2	7.13	Over-priced
22	Reliance Industries Ltd.	51.05	7.33	1.89	12.2	9.20	Under priced
23	State Bank Of India	15.17	7.33	2.22	12.2	18.14	Over-priced
24	Sun Pharmaceutical Industries Ltd	2.35	7.33	2.05	12.2	17.31	Over-priced
25	Tata Consultancy Services	14.52	7.33	0.70	12.2	10.74	Under priced
26	Tata Motors – DVR Ordinary	-7.80	7.33	1.29	12.2	13.61	Over-priced
27	Tata Motors Ltd.	-9.33	7.33	1.52	12.2	14.73	Over-priced

28	Tata Steel Ltd.	9.71	7.33	-0.29	12.2	5.92	Under priced
29	Vedanta Ltd.	24.56	7.33	2.96	12.2	21.74	Under priced
30	Yes Bank Ltd.	34.02	7.33	2.19	12.2	17.99	Under priced

Table No. 1 shows the calculated values of market risk (Beta) of 30 stocks listed on the BSE, actual returns (Ri), expected returns (E(Ri)) according to CAPM, market return (Rm=BSE Sensex), and risk-free rate (Rf). When a stock's actual returns surpass its anticipated returns, it is assumed to be overpriced; alternatively, as stated in the remarks, it is underpriced.

Table 2. No. 2. Risk Associated with Evaluated Stocks and Comparison with Actual Returns

SL. NO	**COMPANY NAME**	**Ri**	**S.D**	**Beta**	**Unsys-tematic risk**
1	Axis Bank Ltd.	27.48	44.03	2.86	41.17
2	Bajaj Auto Ltd.	7.71	10.30	-0.5	10.80
3	Bajaj Finance Ltd.	77.96	30.15	1.16	28.99
4	Bharti Airtel Ltd.	4.22	19.96	0.92	19.05
5	Coal India Ltd.	-2.73	17.75	1.00	16.75
6	HCL Technologies Ltd.	10.19	17.03	1.19	15.84
7	HDFC Bank Ltd.	25.90	13.10	0.93	12.17
8	Hero MotoCorp Ltd.	3.92	17.65	-0.21	17.86
9	Hindustan Unilever Ltd.	24.74	21.97	1.03	20.95
10	HDFC Ltd.	19.54	24.01	1.66	22.35
11	ICICI Bank Ltd.	14.76	25.65	1.75	23.90

12	IndusInd Bank Ltd.	31.65	30.06	1.44	28.62
13	Infosys Ltd.	14.11	20.17	0.45	19.72
14	ITC Ltd.	5.75	16.13	0.20	15.93
15	Kotak Mahindra Bank Ltd.	29.94	24.41	1.62	22.79
16	Larsen & Toubro Ltd.	13.35	26.47	1.86	24.62
17	Mahindra & Mahindra Ltd.	6.97	10.92	0.23	10.69
18	Maruti Suzuki India Ltd.	34.60	45.65	1.86	43.79
19	NTPC Ltd.	7.39	17.46	1.00	16.46
20	Oil & Natural Gas Corporation Ltd.	-3.70	21.48	1.04	20.44
21	Power Grid Corporation Of India Ltd.	2.65	23.71	-0.04	23.75
22	Reliance Industries Ltd.	51.05	36.80	1.89	34.91
23	State Bank Of India	15.17	34.32	2.22	32.10
24	Sun-Pharmaceutical Industries Ltd	2.35	43.40	2.05	41.35
25	Tata Consultancy Services	14.52	18.22	0.70	17.52
26	Tata Motors – DVR Ordinary	-7.80	44.55	1.29	43.26
27	Tata Motors Ltd.	-9.33	36.22	1.52	34.70
28	Tata Steel Ltd.	9.71	28.08	-0.29	28.38
29	Vedanta Ltd.	24.56	104.08	2.96	101.13
30	Yes Bank Ltd.	34.02	49.47	2.19	47.28

Table No.2 The study presents the computed values for Systematic Risk (Beta), Total Risk (Standard Deviation), and Unsystematic Risk (Total Risk minus Systematic Risk). Moreover, it conducts a comparative analysis of the risks and actual returns across 30 equities listed on the Bombay Stock Exchange. A stock's risk is considered higher than the market when the beta value exceeds 1, and conversely, it is lower than the market when the beta value is less than 1.

5 Results and Discussion

According to the survey, the following firms have returns of 20% or more: Axis Bank Ltd., Bajaj Finance Ltd., HDFC Bank Ltd., Hindustan Unilever Ltd., IndusInd Bank Ltd., Kotak Mahindra Bank Ltd., Maruti Suzuki India Ltd., Reliance Industries Ltd., Vedanta Ltd., and Yes Bank Ltd. The following stocks are underpriced: Axis Bank Ltd., Bajaj Auto Ltd., Bajaj Finance Ltd., HDFC Bank Ltd., Hindustan Unilever Ltd., Housing Development Finance Corporation Ltd., IndusInd Bank Ltd., Infosys Ltd., Kotak Mahindra Bank Ltd., Maruti Suzuki India Ltd., Reliance Industries Ltd., Tata Consultancy Services., Tata Steel Ltd., Vedanta Ltd., and Yes Bank Ltd.

The following stocks are overpriced: Bharti Airtel Ltd., Coal India Ltd., HCL Technologies Ltd., Hero MotoCorp Ltd., ICICI Bank Ltd., ITC Ltd., Larsen & Toubro Ltd., Mahindra & Mahindra Ltd., NTPC Ltd., Oil & Natural Gas Corporation Ltd., Power Grid Corporation of India Ltd., State Bank of India., Sun Pharmaceutical Industries Ltd., Tata Motors- DVR Ordinary., Tata Motors Ltd.

There are 10 stocks with high returns and high risk, including Axis Bank., Bajaj Finance Ltd., HDFC Bank Ltd., Hindustan Unilever Ltd., IndusInd Bank., Kotak Mahindra Bank Ltd., Maruti Suzuki India Ltd., Reliance Industries Ltd., Vedanta Ltd., and Yes Bank Ltd.

6 Conclusion

This study serves as a valuable tool for evaluating diverse risks connected with stock investment and assists in the identification of stocks that offer robust returns while maintaining an acceptable level of risk. Several investors often neglect factors alike systematic risk (Beta) and unsystematic risk, instead relying on market rumors, booms, or yield potential. Consequently, this research focuses on stock investments driven by a thorough examination of risk and return, utilizing the CAPM model. The model efficiently encompasses numerous variables of return and risk, both systematic and unsystematic. According to the analysis, businesses listed on the BSE, such as Axis Bank., Bajaj Finance Ltd., HDFC Bank Ltd., Hindustan Unilever Ltd., IndusInd Bank., Kotak Mahindra Bank Ltd., Maruti Suzuki India Ltd., Reliance Industries Ltd., Vedanta Ltd., and Yes Bank Ltd., exhibit exceptional returns with relatively low risk. Consequently, investments made in these stocks are expected to yield greater rewards over the long term.

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