

ASSESSMENT OF CAPM'S VALIDITY IN INDIA'S FINANCIAL SERVICE SECTOR USING SECURITY MARKET LINE

Dr. Monika Gupta*
Mrs. Ruchi**

ABSTRACT

The Capital Asset Pricing Model also known as CAPM is a well-known financial theory which proposes a linear association between the risk and the required rate of return of an investment. The model divides risk into systematic and unsystematic components. It is based on the relationship between the beta of the assets and the equity risk premium along with the risk-free rate of return. The current study aims to investigate the applicability of CAPM in the Indian security market using selected Nifty companies. The top five companies from the Nifty financial service index have been selected based on their market capitalization. The relationship between CAPM returns and actual returns is examined for the period of ten years from 2013-2022 using monthly log returns. The current study found that there was a discrepancy between the expected return based on the CAPM and the actual return generated in the market during the time period investigated, which caused the stock to be overvalued and undervalued. The study also demonstrates that for a given company over time, higher beta results in better return.

Keywords: CAPM, Systematic Risk, Beta, SML.

Introduction

The capital market is a crucial component in the field of finance. All different kinds of capital market securities, such as equity shares and long-term debt can be traded in the security market. It is of utmost significance to the functioning of the financial system. When investing in the stock market, it is essential to assign comparable values to various financial assets in order to forecast larger returns. The corporate environment as it exists today is expanding and changing quickly. The nation's economy, as represented by the capital market, also changes in response to economic conditions and investors' willingness to take risks. The main investing ethos is to invest in stocks that offered the highest return with the lowest risk (Dhankar, 2019). It can be very challenging for an investor to select the top stock from a long list of options on the stock market. Investors are interested in determining the price at which they should trade a certain stock in their portfolio. In light of this, the present research investigates the usefulness of the Capital Asset Pricing Model (CAPM) with special reference to the Indian financial services sector. The CAPM is primarily used for investment purposes so that investors may evaluate whether they will be receiving a suitable amount of returns for the risk that they perceive for that particular security. Asset valuation is critical for an investor because it ultimately leads to determining the true profit. The stock market relies heavily on asset pricing. Various methodologies for valuing various types of assets have been developed in the modern financial era to assist investors in making better decisions. In the field of asset pricing, the Capital Asset Pricing Model (CAPM) stands out as an important innovation. Its creation in the early 1960s and continued use ever since make it a standard in the domain of asset valuation. Capital asset pricing models have become increasingly important in the financial literature as modern portfolio theory has evolved (Rabha & Singh, 2022).

* Associate Professor, Department of Commerce, Motilal Nehru College, University of Delhi, Delhi, India.

** Assistant Professor, Department of Commerce, Motilal Nehru College, University of Delhi, Delhi, India.
(Corresponding Author)

Capital Asset Pricing Model (CAPM)

Modern investment theory states that while estimating the future value of a financial asset, enterprises, investors, and portfolio managers must account for both risk and return. The return on financial securities is a significant problem in modern investment theory, and the Capital Asset Pricing Model uses one component (variation in the market rate of return) as a factor that influences asset pricing. In his book "portfolio selection," published in 1952 Harry Markowitz pioneered the study of the association between risk and expected return across a variety of financial instruments. William Sharpe, John Lintner, Jan Mossin, Stephen Ross, and Richard Roll all independently and concurrently created this concept in their papers in 1964, 1965, and 1966, respectively.

According to (Roll, 1977) the CAPM cannot be tested because it only depends on one variable. They created this model for the most readily tested model, the Arbitrage Pricing Theory (APT). (Fama & French, 1993) later developed this model by including two additional CAPM factors— a value risk premium and a size risk premium. As a result, (Carhart, 1997) employed the momentum factor to describe the time series of the variation in returns of the stocks. The theories relating to asset pricing were first formulated by Harry Markowitz (1952, 1959). He calculated the estimated return and risk size on a portfolio of assets. He was the first scholar to discuss the connection between risk and reward. Many researchers looked into the connection between risk and return after this study, including Sharpe (1964); Lintner (1965); and Mossin (1966). The CAPM is used in financial decision-making, such as assessing the cost of capital and measuring portfolio performance (French, 2002).

Assumptions of CAPM

- This model is predicated on certain assumptions.
- Every investor wants to maximize their returns and is risk-averse.
- Stocks and other assets can be divided indefinitely.
- There are no transactional expenses or taxes.
- All investors solely base their decisions on expected values and standard deviations of their portfolio returns.
- The capital market is highly competitive.

Security Market Line

Capital asset pricing model (CAPM) is represented graphically by the Security Market Line (SML), which plots expected market return against systematic risk for various asset classes. The connection between risk and expected return is assumed to follow a linear pattern in the efficient portfolios. In other words, the SML relationship says:

$$\text{Expected return in Security} = \text{Risk-free Return} + \text{Risk Premium}$$

The Security Market Line (SML) can be used to compare the return of a specific security to that of the market as a whole. Investments that yield a greater rate of return are seen as good buying options because of their high rate of return. Securities with returns lower than the market average are deemed to be overpriced and ready for sale. Since SML provides a clear indication of overpriced and underpriced assets, it has been considered to be the ideal technique for conducting a study of the value of financial assets (Murugesan Narayanaswamy, 2013).

Review of Literature

The CAPM Model has been tested periodically since the 1960s because it is a topic of interest for many researchers and academicians.

Liu, (2023) investigated how the CAPM model could be used to analyse the online education industry. In order to perform empirical study on the industry, the study chooses the most recent data for 10 stocks listed in Shanghai and Shenzhen from 2018 to 2020. After applying CAPM to the data it is discovered that non-systematic risks continue to play a larger role in the investment decisions made in China's education sector, whereas the beta only explains a small fraction of the risks in this industry. Consequently, using CAPM to assess the performance of stocks with a connection to education is inappropriate. Based on the findings, it is recommended that investors must use multiple indicators besides beta to assess the overall risk associated with an investment portfolio.

Fatima (2021) examined CAPM to anticipate projected returns and compare those to actual returns for testing the viability of the model in banking sector of the Bank Nifty Index. Since the market for this business is thought to be in alignment with the Bank Nifty Index, it is considered that if the model

does justice to most of the stocks in this index, it will be relevant to most of the companies throughout the industry. The 12 stocks that make up the Bank Nifty Index were highly volatile and subject to wide fluctuations during the chosen era, and as a result, researchers were able to draw conclusions about the market's performance and investors' investing habits at the time between 1st April 2015 and 31st March 2020. This index reflects the most liquid banks in the banking sector, which are essentially large-cap corporations that serve as a starting point for investors when deciding whether to participate in other banks in the sector.

Dhankar (2019) intends to provide evidence for the efficient market hypothesis by analysing the association between return and risk in the Indian stock market. The potential impact of diversification on the risk of portfolio which is made up of the market and non-market risk, is also examined. From June 1996 to May 2005, the study uses the adjusted opening and closing prices of BSE 100 aggregate portfolios on a daily, weekly, and monthly basis. According to the findings, there appears to be a weak relationship between portfolio return and risk, as measured by daily return. The weekly returns are about average. Yet, when using monthly return, a very favorable link between the risk and return of the portfolio emerges.

Choudhary and Bhatnagar (2018) have conducted a study which investigates the Capital Asset Pricing Model (CAPM) in the Security Market in India. They analysed the stock returns of five BSE listed public-sector companies from January 2016 to December 2017 on monthly basis. The primary conclusion of the theory, that increased risk (beta) is connected with higher levels of return, is not supported by the study's data. Theoretically, the slope should be equal to the excess returns on the market portfolio, and the intercept should be zero. The results of the study provide proof against the aforementioned theories as well as evidence that does not support the CAPM. The popularity of CAPM lies in its efficient, uncomplicated, and logical method of forecasting how to evaluate risk and projected return. Bonds, shares, futures, and option prices can all be estimated with the use of this procedure. Research on the connection between risk and return rate was done by Markowitz. Sharpe made the assumption that all investors employ a utility function with an average yield and risk as an independent variable when making decisions based on the portfolio theory.

In their study Bhatt & Lala (2016) analyzed the CAPM's applicability to the Indian securities market with specific reference to a subset of BSE Sensex companies. The top five BSE Sensex companies—SBI, ICICI Bank, Tata Steel, Sun pharma and Maruti Suzuki Ltd. were selected on the basis of their market turnover. The daily closing prices data was considered from 2011 to 2015 to calculate the stock returns. By contrasting the CAPM return with the real returns of financial assets, stock valuation has been investigated. The result demonstrates a discrepancy between CAPM and the actual return seen in the stock market. The results run counter to the fundamental presumption that increased beta will result in higher returns. The study concludes that the CAPM has no statistically meaningful impact on market returns, reaffirming its inapplicability to some securities.

The primary objective of the study published by Bajpai & Sharma (2015) is to investigate how the Capital Asset Pricing Model (CAPM) works in the Indian security market. The research is carried out over a 10-year period from January 2004 to December 2013 and uses daily data throughout. The rolling regression methodology used in this study aids in producing reliable results. A rolling sample of three years is used for rolling regression, where a window of three years moves every quarter. Moreover, the second stage regression model is a constrained model with an assumed zero intercept term. The developed model was then compared to the conventional model have been compared. The findings demonstrate that the CAPM has a considerable impact on the Indian equities market, and the study's model outperforms more conventional models. The influence of stock performance on portfolio return was studied by Parmar et al. (2014). The main goals of their study are to understand expected return, diversification through an effective border of the loan and borrowing curve, and how to lower risk. The website www.bseindia.com is used for secondary data collection. A sample of the study contrasted BSE and SENSEX-listed companies. The study is based on BSE companies that were included in the index from its inception on January 1, 2014, through June 30, 2014. The Sensex was comprised of eight companies representing four industries. There are a variety of sectors, such as banking, construction, FMCG, and pharmaceuticals, among others.

Analyzed by Pacho (2014) as much as the CAPM has been criticized in recent years, studies have shown that it can survive this kind of investigation. Thus CAPM continues to be an extremely helpful tool in the financial management toolset until It is also the best method for determining which types of risk require premiums and, consequently, what excess returns one can expect from different assets.

Consequently, when adopting any arbitrary measure of performance equilibrium models, researchers should proceed with caution. The theoretical implications of the measure should therefore be interpreted in a meaningful way by them. All theoretical models, however, will contain some minor flaws or deviations from reality because they are merely abstract representations of reality.

Objectives of the Study

The present research is an effort to examine the applicability of the CAPM to the Financial Service Sector using Nifty financial service index. In light of this, the objective of the study can be stated as follows:

- To calculate and assess the CAPM of top five stocks under the Financial Services Nifty Index.
- To evaluate whether the individual stocks are undervalued or overvalued based on the CAPM and the calculated returns of the individual security.
- To determine whether the expected rate of return and systematic risk (Beta) of an individual stock are linearly related using Security Market Line.

Data and Methodology

Capital Asset Pricing Model is being examined with respect to enterprises in India's Financial Service Sector, hence the design of the research is both descriptive and analytical. The study is purely based on secondary data obtained from PROWESS Database, the official website of NSE India, and other available sources. Out of 21 companies providing nifty financial services, the top five have been selected based on their market capitalization as mentioned in Table 1.

Table 1: Top Five Companies based on Market Capitalization

Company Code	Company Name	Market Capitalization as on December 2022 (Rs in Lakhs)	Weightage (%)
88297	HDFC Bank Ltd.	90797943	23.62
96379	ICICI Bank Ltd.	62149393	19.41
95632	Housing Development Finance Corp Ltd.	48044948	15.82
236328	State Bank of India	54770342	7.1
28897	Bajaj Finance Ltd	39808183	5.24

Source: Prowess and NSE India

The adjusted closing stock prices of the selected 5 companies and benchmark index are considered for 10 years from December 2012 to December 2022 on monthly basis. Then monthly log returns of the individual security and Nifty Financial Service Index are calculated using the natural log function (i.e. Ln) using the following formula in MS Excel.

$$R_{it} = \ln(P_{it}/P_{it-1})$$

Where, P_{it} = Monthly adjusted closing price of the security i at time t and

P_{it-1} = Monthly adjusted closing price of the security i at time $t-1$

Finally, simple averages are used on 121 log returns to calculate the average returns for each individual stock and for benchmark index.

Beta of the individual stock is calculated using the following formula

$$\beta = \frac{\text{Covariance}(S, M)}{\text{Variance}(M)}$$

The Reserve Bank of India's website is used to collect 91-day T-bill data in order to calculate the risk-free rate of return in order to apply CAPM.

Data Analysis and Findings

Table 2 displays the CAPM returns and actual returns of the top 5 financial services companies.

Table 2: Stock Wise Calculations of Actual Returns, Beta and CAPM returns

Company Name	Actual Return (%)	Beta	Rm	Rf monthly	CAPM Return	Difference	Undervalued/Overvalued	Decision
HDFC Bank Ltd.	0.01307	0.819446	0.010923	0.00568	0.009977	0.003093	Undervalued	Buy

ICICI Bank Ltd.	0.01216	1.179162	0.010923	0.00568	0.011863	0.000301	Undervalued	Buy
Housing Development Finance Corp. Ltd.	0.00965	0.832702	0.010923	0.00568	0.010046	-0.0004	Overvalued	Sell
SBI	0.00787	1.231967	0.010923	0.00568	0.01214	-0.00427	Overvalued	Sell
Bajaj Finance Ltd	0.03261	1.366797	0.010923	0.00568	0.012847	0.019761	Undervalued	Buy
Nifty Financial Service	0.01092	1	0.010923	0.00568	0.010923	0		

Source: Author's Own compilation based on data collected

The following formula was used to calculate the CAPM return:

$$E(R) = R_f + \beta (R_m - R_f)$$

E(R) is the required rate of return on financial assets,

R_f = Risk free rate of return

β = Beta of the specific stock

R_m = Market rate of return

Table 2 also demonstrates whether a stock is overvalued or undervalued based on its expected returns.

Investors should purchase securities if the capital asset pricing model (CAPM) indicates that the asset is underpriced and their required rate of return is higher. If the security's overvalued return, as calculated by the CAPM, is less than the investor's expected return, then the investor should sell the stock.

Security Market Line

The security market line, often known as the SML, is a line that is drawn on a chart in order to serve as a graphical depiction of the capital asset pricing model (CAPM). The CAPM plots the predicted return of a market versus the systematic risk, measured in terms of beta, of a set of capital assets at any given time.

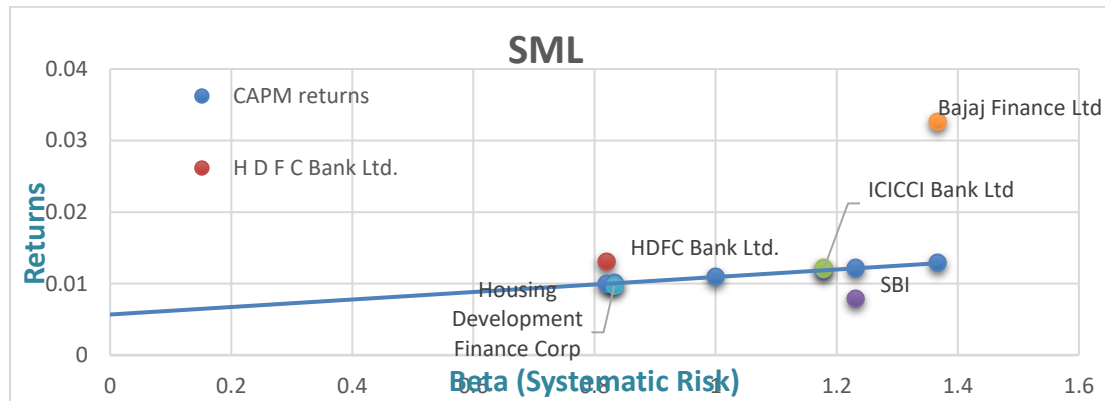


Figure 1: Graphical Presentation of SML

The Security Market Line (SML), which depicts the predicted return-beta relationship of sample companies is drawn and represented in Figure 1. The market risk premium is indicated by the SML's slope in this case. The CAPM return and actual return of five selected companies are plotted in the figure. The graphical representation makes it obvious that the CAPM return and the real return are different. Fairly valued assets map perfectly on the SML. Overpriced securities like SBI and HDFC Ltd. plot below the SML, whilst underpriced securities like HDFC Bank Ltd., ICICI Bank Ltd., and Bajaj Finance Ltd. plot above the SML.

Conclusion

Firms, investors, and portfolio managers use risk and return to estimate the price and return of financial assets in modern investment theory. Furthermore, the return on capital assets is considered as one of the most difficult puzzles in contemporary investment theory. William Sharpe's CAPM model, which overcame the shortcomings of earlier models like the dividend discount model, was a significant development in financial theory. It has been proposed that beta, a measurement of systematic risk, can be used to determine a stock's value, and that a higher beta value will result in a larger return as more risk is assumed. The model was challenged for some of its unreasonable assumptions, though. The current study found that there is a discrepancy between the return predicted by the CAPM and the actual

return earned in the financial service sector during the time period investigated, which caused the stock to be overvalued and undervalued. The study also demonstrates that for a given company over time, higher beta results in a better return. The major limitation of the study is that it is conducted on a small number of firms from one industry. Therefore there is still room to investigate the CAPM's applicability in the Indian security market for a wide range of different industries and time periods.

References

1. B ajpai, S., & Sharma, A. K. (2015). An Empirical Testing of Capital Asset Pricing Model in India. *Procedia - Social and Behavioral Sciences*, 189, 259–265. <https://doi.org/10.1016/j.sbspro.2015.03.221>
2. Bhatt, B. K., & Lala, N. (2016). Sabargam International Journal of Research in Multidiscipline "Examining validity of Capital Asset Pricing Model with reference to selected companies of BSE Sensex." *Sabargam International Journal of Research in Multidiscipline*, 1–10. www.sijrm.com
3. Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance*, 52(1), 57–82. <https://doi.org/10.1111/j.1540-6261.1997.tb03808.x>
4. Choudhary, Bhatnagar Apoorva, & Pravin. (2015). *Elk Asia Pacific Journal Of Finance And Risk Management A Study On Market Return Of Selected Stocks By Applying Capital Asset Pricing Model*. 9, 1. <https://doi.org/10.16962/EAPJFRM/issn>
5. Dhankar, R. S. (2019). *Indian Stock Market and Relevance of Capital Asset Pricing Models* (pp. 19–37). https://doi.org/10.1007/978-81-322-3950-5_2
6. Fama, E. F., & French, K. R. (2004). *The Capital Asset Pricing Model: Theory and Evidence*.
7. Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics*, 116(1), 1–22. <https://doi.org/10.1016/j.jfineco.2014.10.010>
8. Fatima, U. (2021). A Study on testing the Application of CAPM And Comparing the Expected and Actual Returns of the Companies in Indian Bank Nifty Index. In *International Journal of Creative Research Thoughts (IJCRT)* www.ijcrt.org (Vol. 9). www.ijcrt.org
9. French, C. W. (2002). Jack Treynor's "Toward a Theory of Market Value of Risky Assets." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.628187>
10. Liu, S. (2023). *Empirical Research Based on CAPM Model in Online Education Industry*. <https://doi.org/10.4108/eai.18-11-2022.2326931>
11. Murugesan Narayanaswamy. (2013). *Validity of CAPM: Security Market Line (SML) Can Never Predict Required Rate of Return for Equity Even If the Markets are Efficient-A Simple Intuitive Explanation*. <https://www.researchgate.net/publication/256063443>
12. Pacho, F. (2014). Capital Asset Pricing Model (CAPM) Testability and its Validity in Stock Market: Evidence from Previous Literatures. In *Research Journal of Finance and Accounting* www.iiste.org ISSN (Vol. 5, Issue 21). www.iiste.org
13. Parmar, C. T., Gohel, P., Parmar, R., & Parmar, C. (2014). *A Comparative Analysis of Selective Companies: Using Capital Asset Pricing Model*. www.bseindia.com.
14. Rabha, D., & Singh, R. G. (2022). Is CAPM Still Valid in Today's Market Scenario? *Indian Journal of Finance*, 16(5), 57. <https://doi.org/10.17010/ijf/2022/v16i5/169518>
15. Roll, R. (1977). A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory. *Journal of Financial Economics*, 4(2), 129–176. [https://doi.org/10.1016/0304-405X\(77\)90009-5](https://doi.org/10.1016/0304-405X(77)90009-5).

