Risk and Return Analysis of Sectoral Indices in the context of the Bombay Stock Exchange

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Authors' contributions

This work was carried out in collaboration between both authors. Author AA was the supervisor of the paper who gave the idea to perform the risk and return analysis of the selected sectoral indices whose data was available for the considered period. Before making investment decisions, it is important for investors to know about the returns of the stocks and the risk related to it. The risk and return analysis has to be done in order to know what risk has to be taken to get the desired return. The present study evaluates the risk and return analysis of 10 sectoral indices listed in S&P BSE 500 Index. Both authors read and approved the final manuscript.

Original Research Article

Abstract

For an investor, in deciding on the investment, risk and return plays an important role. The risk and return are interrelated. Usually, if the return is small, the bet will also be low and the higher risk will be associated with a higher return. Investments in stock markets are risky, as was observed in the performances of several assets. Therefore, it is up to investors what level of risk could be a beard to getting the desired return. Thus, risk and return analysis should be performed before making investments for more thoughtful decisions. In the present study, an attempt is made to analyze and compare the risk and return relationship in the context of the Bombay Stock Exchange using the data of selected Sectoral Indices listed in the S&P BSE 500 Index. The results revealed that the Indices with higher returns had low risk. In comparison, the Indices with lower

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returns had a higher risk, showing a weak negative linear relationship between the two variables. It was also obtained that there is no significant difference between the Market returns and the monthly returns of the Indices.

1 Introduction

Prices of an asset, fluctuating within minutes, are determined by the supply and demand of an asset which is caused mainly due to the high degree of volatility. To encounter and accomplish the financial objectives, investors and traders trade on various financial securities in the stock market. Investing in the stock market involves upcoming unpredictability, also known as the risk every investor faces in exchange for the expected returns. Thus, in the stock market, an investment consists of risks and returns.

One of the main questions that arise at the time of investment is where to invest. It is upon an investor's desired return and risk tolerance in selecting the investment area as there are various alternatives present such as the stock market, chit fund, insurance, bullion, banks, real estate etc. One of the essential indicators which shows a country's economic performance is the stock market. Thus investing in the stock market occupies a distinct position as it offers an investor the excellent opportunity to earn a higher return quickly. Risk and return are the two crucial aspects associated with the investment. The aftereffects of the global economic crisis from 2007 to 2010, the concept of risk and return gained popularity. The term return refers to the income earned from security after a defined period, whereas the risk relates to the uncertainty over the future to get this return. The two primary forms of risk associated with the investment are systematic and unsystematic risks. Risk and return are highly interrelated concepts in investment. It is assumed that if the return is low, the risk associated is also common, whereas if the return is high, the risk associated will also be increased. Thus, risk and return analysis is performed for better investment decisions, which benefits investors.

India has two main stock markets: the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). BSE, the oldest stock exchange in Asia, is also one of the fastest stock exchanges in the world. The previous studies were mainly based on the performance of different securities/companies in BSE or NSE. However, this study primarily focused on the performance of the Sectoral Indices listed in S&P BSE, emphasizing the monthly return of individual Indices and the associated risk. The S&P BSE 500 (market return) has been used as the benchmark for the study.

2 Literature Review

Vikkraman and Varadharajan [1] examined the risk and return analysis using the historical data of companies listed in NSE from January 2004 to December 2007. They found a high correlation over a long period. Bahl and Rani [2] examined the performance and comparison of the risk and return of selected stocks listed in BSE. They obtained that all the schemes had positive returns and 14 out of 29 schemes performed better than the benchmark return. Sharpe's ratio and Treynor's results showed better performance than the market. Sharma and Bodla [3] examined the risk and return trade-off for South Asian countries like India, Sri Lanka, Bangladesh, Pakistan, Nepal and Maldives and found a complicated relationship between high returns and rational risk. It was also obtained that the Indian stock market emerged as a preferable avenue for global investors, and Bangladesh and Sri Lanka were good choices as investment avenues. Setiawan and Oktariza [4] examined the risk and return relationship between Syariah and conventional stocks listed on Indonesia Stock Exchange from 2009 to 2011. They could not find any significant relationship between risk and returns. Fard et al. [5] examined bullish and bearish markets' risk and return analysis using the 'A-Y Model'. The result of the study did not find any reliable relation between the portfolio's expected return and risk. However, using the 'A-Y Model', the performance reduces risk and increases the portfolio's return. Patjoshi [6] examined the relationship between risk and returns of Sensex and banking stock from January 2001 to December 2015 and found a statistically significant association between Sensex returns and banking stock returns except for Axis Bank.

Poornima and Swathiga [7] examined the relationship between the risk and return of selected stocks listed in NSE and obtained that Healthcare and Pharmaceutical sector showed positive returns with low risk, low returns

with high risk and low returns with low risk. Savsani and Rathod [8] tested the relationship between risk and return of the Sensex and banking stocks listed in BSE using the data for the period from January 2005 to December 2017 and obtained that there is significant difference between returns of Sensex and banking stocks returns. The results of the regression analysis indicated statistically insignificant association between Sensex returns and banking stocks returns. Ashik and Kannan [9] performed the study to forecast the Nifty bank sectors using Autoregressive Integrated Moving Average (ARIMA) model. The Box-Jenkins approach was applied and obtained that the Private Sector Banks had minimum risk as compared to other sector banks. Ashik and Kannan [10] performed the study to predict the national stock price using the data of Nifty 50. The trend was predicted using exponential smoothing (ES) model and ARIMA model. The forecast values and error rated were computed and compared. It was obtained that the ARIMA model gave better results than the ES model. Bantwa and Ansari [11] examined the risk and return profile of selected IT companies listed in IT index of NSE for the period from 2014 to 2019 and obtained that some companies showed highest rate of return while some companies showed higher degree of risk. The ANOVA test result indicated that the beta value of all stocks differ significantly whereas SD, expected return by CAPM, absolute return and alpha value of all stocks didn't differ significantly. Vanaja and Nishok [12] performed the study to analyze the risk and return of selected automobile sector listed in NSE for the period from 2015 to 2020 and obtained that higher risk sectors yield lower returns.

Patjoshi and Nandini [13] studied the risk and return of Sensex and different steel sectors listed in BSE. They obtained that there is a significant difference between the returns of Sensex and steel companies except for one company, i.e. JSW Steel. Lobo and Bhat [14] examined the risk and return analysis of selected financial investment companies listed in the S&P BSE Finance Index from January 2020 to July 2021. They obtained that the higher risk yields higher returns. Suryadi et al. [15] performed a study to analyze the risk and return of Islamic stocks listed in the Jakarta Islamic Index (JII) with the conventional stores listed in the Indonesian Stock Exchange (IDX). They obtained that the performance of Islamic stocks was better than traditional stocks.

The objectives of the present study were to analyze and compare the risk and return in the context of the Bombay Stock Exchange and to check whether the expected rate of return is linearly related to the stock beta, i.e. its systematic risk.

3 Data Description and Methodology

The study used the secondary data listed in the S&P BSE 500 index taken from BSE for ten years, from April 2011 to March 2021. The data of 10 Sectoral Indices represented as Index 1, Index 2, Index 3 etc. (namely S&P Auto, Bankex, Capital Goods, Consumer Durables, Metal, Oil & Gas, Power, PSU's, Realty, Teck) were considered for which the data was available for the entire period.

The monthly returns (R_{it}) of stocks were calculated using the formula:

$$R_{it} = \frac{P_{1t} - P_{0t}}{P_{0t}} \tag{1}$$

where, P_{0t} denotes the previous closing price of a stock, P_{1t} denotes the current closing price.

Similarly, the returns of the market (R_{mt}) were calculated using the formula:

$$R_{mt} = \frac{P_{1t} - P_{0t}}{P_{0t}} \tag{2}$$

The beta(β) of the Indices was obtained using the given model:

$$R_{it} = \hat{\alpha} + \hat{\beta}_i (R_{mt}) + \mu_t \tag{3}$$

where $\hat{\alpha}$ denotes the intercept term, $\hat{\beta}_i$ denotes the estimated beta(β) of index i,

The product moment Karl Pearson's correlation coefficient was used to test whether the two variables, i.e. return and risks, are linearly related. Based on the first objective, we have tested the null hypothesis stating that there is

no statistically significant difference between the market returns and the Sectoral Indices, against the alternative theory stating that there is a statistically significant difference between the market returns and the Sectoral Indices.

4 Results and Discussion

Table 1. Descriptive Statistics of the monthly returns

	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Index 1	0.004	0.214	-0.299	0.082	-0.09	3.99
Index 2	0.007	0.242	-0.323	0.089	0.174	4.193
Index 3	0.009	0.194	-0.22	0.063	0.044	3.765
Index 4	0.013	0.277	-0.211	0.07	0.549	4.732
Index 5	0.0001	0.235	-0.258	0.072	0.289	4.529
Index 6	0.002	0.347	-0.37	0.104	0.099	4.151
Index 7	-0.002	0.239	-0.317	0.071	-0.625	6.298
Index 8	-0.001	0.236	-0.352	0.08	-0.39	5.946
Index 9	0.004	0.191	-0.266	0.07	-0.703	5.011
Index 10	0.008	0.173	-0.158	0.052	0.163	4.176

The results revealed that average monthly returns for all the indices obtained are positive except Index 7 and 8. The highest average monthly return was accepted for Index 4 and the minimum average monthly return for Index 7. The standard deviation (SD) close to 0 (low SD) indicates that the data points are close to the mean (more stable and less volatile). In contrast, SD far from 0 (high SD) suggests that the data points are away from the mean, i.e., more spread out (more fluctuations and more volatile). The SD obtained for all 10 indices is close to 0 relatives to the mean. From Table 1, the SD of Index 10 obtained is 0.052, which is the lowest, which means it is more stable and less volatile, whereas the SD of Index 4 obtained is 0.104, which is the highest, which means more fluctuations and less volatility. The skewness value obtained for Indices 1, 7, 8 and 9 is negative, meaning frequent low returns or high risk. The skewness value obtained for Indices 2, 3, 4, 5, 6 and 10 is positive, indicating low risk and high returns. The kurtosis value of 3 represents the normal distribution. The kurtosis value obtained for all Indices is greater than 3, which means leptokurtic. In finance, the assets/sectors with leptokurtic allocation are considered risky, whereas assets/sectors with mesokurtic funding are deemed to have moderate risk (Table 1).

Considering the returns data with market return as an independent variable, the beta of the individual indices was estimated using Equation 3. The beta range obtained is 1.339, with a minimum value of 0.480 and a maximum of 1.819 (Table 2).

Table 2. Average returns and beta (β) of the selected sectoral indices

Indices	Return	Beta(β)	Rank of Returns	Rank of Beta(β)	Correlation
Index 1	0.004	1.474	6	2	-0.215
Index 2	0.007	1.148	4	6	
Index 3	0.009	1.400	2	3	
Index 4	0.013	0.999	1	9	
Index 5	0.0001	1.119	8	7	
Index 6	0.002	1.013	7	8	
Index 7	-0.002	1.233	10	4	
Index 8	-0.001	1.219	9	5	
Index 9	0.004	1.819	5	1	
Index 10	0.008	0.480	3	10	

The beta value obtained for all Indices is greater than 1 except for Index 4 and 10. A beta value greater than 1 means the asset is more volatile than the market. The beta value of 1 means the investment is as volatile as the market. A beta value less than 1 but greater than 0 (except Index 4 and 10) means the asset is less volatile than the market. The higher the value of beta, the riskier is the investment.

Also, it can be seen that the index having higher returns has a lower beta and lower returns have a higher beta. The correlation coefficient value obtained is -0.215(weak negative relationship), which means that as the value of beta increases, the value of returns decreases and vice-versa (Table 2).
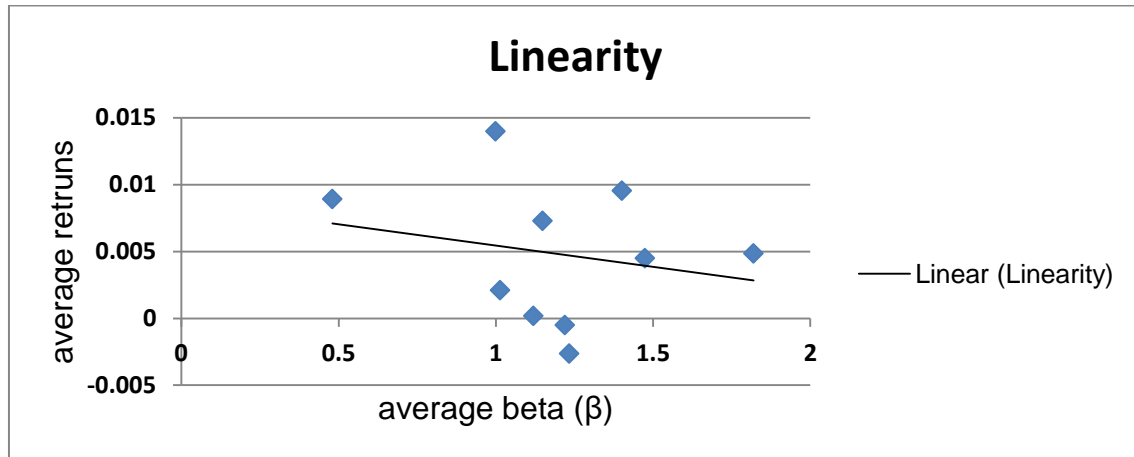

Fig. 1. Plot for average returns against average beta

The plot showed a weak negative linear relationship between the average beta (risk) and average return. The negative slope of the trend line shows a fragile negative relationship as the data points are more scattered about the trend line (Fig. 1).

The average monthly returns of the market obtained are more significant than all the Indices except for Index 10, which means that all the other Indices provided lower returns than the Market Returns. Also, the market variance (0.0027) is less than all the other Indices except for Index 10, which reports that Market returns are more reliable than the Indices (Table 3).

Table 3. T-Test analysis of market returns and Sectoral Indices

	Mean	Variance	t statistic	p-value
Index 1	0.0045	0.0068	-0.305	0.3801
Index 2	0.0073	0.0051	0.009	0.4964
Index 3	0.0095	0.0064	0.2673	0.3947
Index 4	0.013	0.0049	0.8469	0.1989
Index 5	0.0001	0.0079	-0.747	0.2277
Index 6	0.0021	0.004	-0.684	0.2473
Index 7	-0.0021	0.0052	-1.213	0.113
Index 8	-0.0013	0.005	-0.964	0.1678
Index 9	0.0049	0.0108	-0.222	0.412
Index 10	0.0089	0.0026	0.2534	0.4001
Market Returns	0.0072	0.0027		

The p-value obtained for all the Indices is more significant than 0.05. Hence we accept our null hypothesis stating that there is no statistically significant difference between the average monthly market returns and the returns of the selected Sectoral Indices (Table 3).

5 Suggestions

Following are the suggestions from the analysis that an investor should keep in mind:

1. If an investor wants positive returns with lower risk, then those stocks/sectors should be chosen whose beta is less than 1 because the stocks/sectors having a beta value less than 1 are considered to be more defensive.

2. From the study results, it is suggested to investors that investing in Indexes 2, 3, 4, 9, 10 would be suitable as they generated positive returns compared to Indexes 7 and 8 as they generated negative returns.

3. An investor could prefer to invest in positively skewed securities (Index 2, 3, 4, 10) as the higher returns obtained may counterbalance the frequent low risk suffered. However, investors may also invest in negatively skewed securities (Index 1, 7, 8 and 9) if they prefer regular small returns over a few considerable risks.

4. Based on the observations for the period under study, an investor could invest in Index 3, 4, 10 as they generated higher returns while having lower risk.

5. An investor, before investing, should conduct an elementary analysis of risk and returns instead of depending totally on technical analysis.

Availability of data and materials: The data used in the study that support the findings of this study have been downloaded from BSE (https://www.bseindia.com/indices/IndexArchiveData.html) and RBI (https://www.rbi.org.in/Scripts/BS_NSDPDisplay.aspx?param=4) websites which is publically accessible.

6 Conclusion

Risk and return are interrelated concepts and essential before making investment decisions. An investor should perform the risk and return analysis to make the decision better. The present study compared and analyzed the risk and return relationship in the Indian stock market using the data of selected Sectoral Indices listed in the S&P BSE 500 Index. It was concluded that Index 4 obtained the highest return but lower risk. The return received by Index 7 was the softest but higher return. In other words, Index 9, having the highest risk, obtained a lower return and Index 10, having the lowest risk, obtained a higher return. These results contradict the assumption of CAPM. The correlation coefficient between the risk and return obtained was -0.215, indicating a weak negative correlation. As the value of beta increases, the value of return decreases slightly. From the t-test results, it was revealed that there is no significant difference between the market returns and the monthly returns of the Indices.

Competing Interests

Authors have declared that no competing interests exist.

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