

Risk / Return of Major Indian Stock Indices

Uday Kumar Jagannathan¹ and N. Suresh²

¹Assistant-Professor, ²Professor and Head
Faculty of Management and Commerce, M. S. Ramaiah University of Applied Sciences, Bangalore 560 054

Abstract

The Indian Stock Market has several important indices including the BSE Sensex, the CNX Nifty, BSE small cap, BSE mid cap, and BSE500, each offering a different type of risk and return characteristic. The researcher is particularly interested in the behaviour of these five indices as regards their average return and their standard deviation over the time of available data. Also of interest is the co-relation between these indices. By observing the standard deviation of these indices and the number of abnormal observations, the investor can get a sense of which index is more suited for their risk appetite. Also of concern to the investor is the risk adjusted return for each of the indices. The lower the risk adjusted return for any security or asset, the less likely an investor is going to invest in it. For the purpose of studying the historical return, the monthly data of the five indices was obtained from the yahoo finance portal. These data were used to derive average return as well as standard deviation for each of the indices. The average monthly return and standard deviation of monthly return were measured for each index in question. The coefficient of variance was also calculated for each index. Findings indicate that the BSE Sensex is the best in terms of return as well as in coefficient of variance while the BSE Small cap is the lowest in terms of returns as well as coefficient of variance. The indices selected are highly positively correlated when using returns from same time period; therefore diversification across indices would unlikely lead to benefit for the investor.

Key Words: Expected Return, Standard deviation, Coefficient of Variance

1. INTRODUCTION

This study is being carried out to determine average return, risk as well as coefficient of variance of some of the major Indian stock market indices.

1.1 Background

The investor and analyst communities are always interested in knowing historical performance of the major indices and therefore this relevant study focuses on learning what the average return for each of these indices during the specific time period is, as well as the risk adjusted return in the same time period. Also of interest to the investor is the correlation between the different indices, because the benefit of diversification from investing different sums of money in different indices should be given some thought as well.

Indices selected for study represent the broad market and include indices from both the BSE and the NSE. The indices selected are a) BSE Sensex, with monthly data from July 1997 to September 2014, b) CNX Nifty, with monthly data from September 2007 to September 2014, c) BSE Small Cap index with monthly data from September 2010 to September 2014, d) BSE Mid Cap index with monthly data from September 2010 to September 2014 and finally e) BSE 500 with monthly data from September 2010 to September 2014. These indices form the barometer of the stock market and have been used by analysts to comment on the valuation, attractiveness of the equity asset class in India.

Campbell and Viceira (2005)¹ showed that there is a positive relationship between risk and return when they analysed U.S Stocks and Bonds.

Lungblad (2004)² in a comprehensive study over a time period nearly equal to two hundred years, showed that there is a positive relationship between risk and return across every spectrum considered. Lettau and Ludvigson (2003)³, concluded that the conditional expected excess return on the U.S. stock market varies over long horizons and is an important contributor to volatility in the Sharpe ratio. Ghysels, Clara, Valkanov (2006)⁴ found that there is a significantly positive relation between risk and return in the US stock market. In the Indian context, Selvam and Palaniswamy (2011)⁵ found no significant risk and return relationship in a study of mutual funds with dividend option.

1.2 Abbreviations and Acronyms

- BSE: Bombay Stock Exchange
- CNX: Crisil Nifty Exchange
- CV: Coefficient of Variance

1.3 Nomenclature and Symbols

$$R_{jk} = (P_{j,k+1} - P_{j,k}) / P_{j,k}$$

$$E_j(r) = \left(\frac{1}{t}\right) \times \sum_{n=1}^t (R_{j,n})$$

$$\sigma_j(r) = \sqrt{\sum_{n=1}^t ((R_{j,n}) - E_j(r))^2}$$

$$CV = \sigma_j(r) / E_j(r)$$

$$t\text{-stat} = (\bar{x}_1 - \bar{x}_2) / ((S_{x1}^2/n_1) + (S_{x2}^2/n_2))^{1/2}$$

$$df = \frac{((S_{x1}^2/n_1) + (S_{x2}^2/n_2))^2}{((S_{x1}^2/n_1)^2 / (n_1 - 1) + (S_{x2}^2/n_2)^2 / (n_2 - 1))}$$

where, $P_{j,k-1}$ = Price of the j^{th} index in time period $k+1$, $P_{j,k}$ = Price of j^{th} index in time period k , $R_{j,k}$ = Return of j^{th} index in time period k , $E_j(r)$ = Expected (average) return for index j in t time periods (months in our case), $\sigma_j(r)$ = Standard deviation for j^{th} index in t time periods and CV is the risk adjusted measure called the coefficient of Variance, t-statistic is the measure for difference in means, \bar{x}_1 is the mean of sample 1 and \bar{x}_2 for sample 2, S_{x1} = Standard deviation of first sample, S_{x2} = Standard deviation of second sample, n_1 is the number of observations in sample 1 and n_2 is the number of observations in sample 2, df = number of degrees of freedom, rounded to the nearest integer.

2. LITERATURE REVIEW

Campbell and Viceira (2005) showed how to extract the term structure from their parsimonious model of return dynamics, and illustrated their approach using data from the U.S. stock and bond markets. They found that asset return predictability has important effects on the variance and correlation structure of returns on stocks, bonds and T-bills across investment horizon.

Lungblad (2004) did a comprehensive study of risk versus return used data from 1836 – 2003 and found that the estimated relationship between risk and return was positive and statistically significant across every specification considered.

Lettau and Ludvigson (2003), after an extensive review of the statistical issues in return predictability regressions, concluded that the historical behaviour of the U.S. stock market cannot be understood without admitting a degree of predictability in excess returns and that the conditional expected excess return on the U.S. stock market varies over long horizons and is an important contributor to volatility in the Sharpe ratio.

Ghysels, Clara, Valkanov (2006) in their paper studied the intertemporal relation between the conditional mean and the conditional variance of the aggregate US stock market return and found a significantly positive relation between risk and return.

Selvam and Palaniswamy (2011) found out that out of thirty five sample mutual fund schemes in India, eleven showed significant t-values and all other twenty four sample schemes did not prove significant relationship between risk and return.

3. PROBLEM DEFINITION

The aim of this study is to determine the risk and return characteristics of some of the major Indian stock indices.

The objective of this study is to collect data relevant to the indices, calculate the arithmetic and risk adjusted returns for each index, make observations and inferences regarding their risk and return and conclude the findings on which index offers a better risk adjusted return (reward).

4. DATA COLLECTION AND METHODOLOGY

Data was collected from the yahoo finance portal for the five indices being selected for this study. The data included month in question and adjusted closing value. On this data, the returns are computed for each month. In order to determine whether the average returns from the BSE Index are statistically different from each other, the mean values are observed separately for time periods between July 1997 and January 2006 as well as for between September 2010 and September 2014, so as to ascertain there is no significant difference between the means for the three periods. The t-test is used to validate the null hypothesis that there is no difference between the mean values. The values between September 2010 and September 2014 are the only intersecting date values for all five indices and therefore a separate tabulation is made for this time period with the values of mean, standard deviation, coefficient of variance, and number of observations. Further, a hypothesis test is conducted to ascertain whether a difference in mean exists between like indices of BSE Sensex and CNX Nifty.

The Hypotheses being formed are as follows:

- 1a) No difference exists in mean values for BSE Sensex across time periods in question.
- 1b) Alternate Hypothesis: Difference exists in mean values for BSE Sensex across time periods in question.
- 2a) No difference exists in mean values between BSE Sensex and CNX Nifty for the time period September 2007 to September 2014.
- 2b) Alternate Hypothesis: Difference exists between mean values for BSE Sensex and CNX Nifty for the time period September 2007 to September 2014.

Table 1a. Summary of Returns/Risk for all periods

Index	E(r)	(r)	CV	Observations
BSE Sensex	.0116	.073	6.27	206
CNX Nifty	.0087	.076	8.80	84
BSE Small Cap	.0032	.073	22.6	49
BSE Mid Cap	.0057	.065	11.4	49
BSE 500	.0084	.082	9.72	84

Table 1b. Summary of Returns/Risk for 2010- 2014

Index	E(r)	(r)	CV	Observations
BSE Sensex	.0097	.0503	5.18	49
CNX Nifty	.0089	.0530	5.95	49
BSE Small Cap	.0032	.0732	22.6	49
BSE Mid Cap	.0084	.0645	7.64	49
BSE 500	.0079	.0538	6.84	49

Table 2. Correlation between indices

Index	BSE Sensex	CNX Nifty	BSE Small Cap	BSE Mid Cap	BSE 500
BSE Sensex	1.00				
CNX Nifty	0.99	1.00			
BSE Small Cap	0.81	0.82	1.00		
BSE Mid Cap	0.87	0.88	0.97	1.00	
BSE 500	0.98	0.98	0.90	0.94	1.00

Table 1a above captures the summary of the observation on average returns per month and risk adjusted returns on the five selected indices. The first column is the average monthly return, the second column is the risk (standard deviation) for the observation period, the third column is the coefficient of variance and the fourth column is the number of observations. Table 1b above is the same set of observations however, the time periods of analysis and number of observations are both the same (Sept 2010 – Sept 2014). This is being done so as to remove any bias that non overlapping time periods may create in measurement of returns or risk.

Table 2 above captures the correlation of monthly returns between the indices for the time period of September 2010 and September 2014. This period is the minimum period or intersecting time periods and the number of observations has been limited to 49 months, owing to limited data availability for the BSE Small Cap and BSE Mid Cap indices.

Hypothesis 1 (no difference exists between time periods for BSE Sensex) is accepted for all three combinations of time periods

- i) When comparing time period July 1997 to September 2014 and July 1997 to January 2006 the t-statistic, degrees of freedom and cutoff values for the t-statistic are 0.75, 198 and 1.65 respectively

- ii) When comparing time period July 1997 to September 2014 and September 2010 to September 2014 the t-statistic, degrees of freedom and cutoff values for the t-statistic are 0.221, 102 and 1.66 respectively

- iii) When comparing time period July 1997 to September 2006 and September 2010 to September 2014 the t-statistic, degrees of freedom and cutoff values for the t-statistic are 0.124, 132 and 1.66 respectively

Hypothesis 2 (no difference exists between mean for BSE Sensex and CNX Nifty) is accepted for the time period September 2007 to September 2014 with a t-statistic of 0.0778 and number of degrees of freedom = 166 the cut –off value for the t-statistic is 1.66

Figure 1 below is a plot of the average returns versus the number of months on which that value of average returns is observed for the five indices selected.

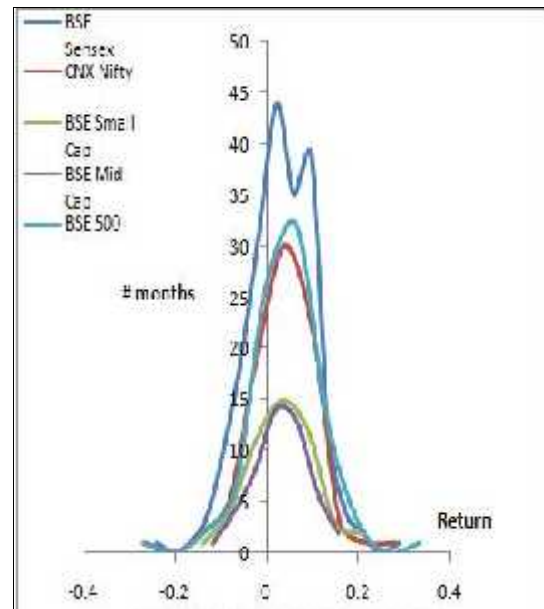


Fig1. Return of Indian Stock Market Indices

5. CONCLUSION

a) The BSE Sensex has shown highest return and lowest coefficient of variance for both sets of observations i.e. overlapping as well as non-overlapping time periods. In addition, it has among the lowest risk among the five indices thus making it the most attractive index of all.

b) The BSE Small Cap Index has the least return as well as the highest risk among all the indices, in both overlapping and non overlapping time periods, making it the least attractive index of all for the investor.

c) There is no statistically significant difference (at the .05 level) between the means obtained for the average returns for the BSE Sensex for the three different time periods selected.

d) The five indices selected are strongly correlated with each other therefore any benefits from diversification are likely to be minimal.

5.1 Further Study

The BSE Sensex consistently delivering a high return and at the same time a low risk and low coefficient of variance should be analysed further, as it challenges the basic risk return relationship paradigm.

In addition, the BSE Small Cap Index consistently offering a low return at the same time high risk and high coefficient of variance when compared to other indices is also a matter which needs to be further analysed in a separate study. The possibility of the constitution of the index giving a risk and return profile which is dependent covariance of stocks within that index may be the cause, as can be identified by more research.

REFERENCES

1. Campbell, John Y., and Viceira, L. (2005), The term structure of the risk-return tradeoff. No. w11115. National Bureau of Economic Research.
2. Lundblad, Christia. (2007), "The risk-return tradeoff in the long run: 1836–2003." *Journal of Financial Economics* 85.1:123-150.
3. Lettau, Martin, and Sydney Ludvigson. (2003). "Measuring and modeling variation in the risk-return tradeoff." *Handbook of Financial Econometrics* 1:617-690
4. Ghysels, Eric, Pedro Santa-Clara, and Rossen Valkanov. (2005). "There is a risk-return trade-off after all." *Journal of Financial Economics* 76.3:509-548
5. Selvam, M. and Palanisamy, Bhuvanewari. (2011), Analysis of Risk and Return Relationship of Indian Equity (Dividend) Mutual Fund Schemes. Available at SSRN: <http://ssrn.com/abstract=1862214>, accessed on 26/9/2014