



Rolling Returns: A better measure of volatility and returns with reference to Sensex

Aparna Puranik, Ph.D. Scholar - SLS-PanditDeendayal Petroleum University, aparnapuranik92@gmail.com
Dr.Ashvin Dave, Ph.D. - SLS-PanditDeendayal Petroleum University, ashvin_dave25@yahoo.co.in

Abstract- The Bombay Stock Exchange's (BSE) Sensitive Index popularly known as Sensex is market weighted index of 30 financially sound and established companies. It started its journey in year 1979 with base value of 100. Equity being a volatile asset tends to deliver positive as well as negative returns. The main aim of this research paper is to check the volatility of BSE Sensex vis-à-vis to the returns variation over various periods with rolling returns performance of 1 to 40 years. The study considered the daily closing of S&P BSE Sensex and calculated the returns on a daily basis for various time frames. The study checks the highest, lowest and mean returns across each span in last 41 years with respect to the volatility in returns. We also checked the frequency of negative returns and subsequently the probability of loss in each time frame. The result of the study indicates that in shorter periods like 1, 3, 5 and 7 years the volatility is higher and variation of returns also ranges from very low negative to very high returns. It has also been observed that volatility also reduces with increasing rolled returns of holding periods. It has also been observed that if an investor invested for more than 15 years period at any day without looking at Sensex he had not had a single instance of negative return. The returns for 25 to 40 years rolled period had a very low deviation from the mean returns and the average returns delivered are in the range of 14.5% to 15.3% which were impressive.

Key Words: Performance, volatility, Sensex, Index, Daily Returns, rolling returns, long term, standard deviation

I. INTRODUCTION

There are various ways of measuring the performance of equity market like compounding annual growth rate (CAGR), internal rate of return (IRR), year to date returns (YTD), absolute returns, rolling returns etc. Rolling returns are also depicted as rolling time periods or rolling period returns. Rolling returns are annualized average returns over a time, which ends on a specific time frame. Rolling returns are imperative in finding out the characteristics of returns over a holding period. This is comparable with the ones received by investors. Studying a index or portfolios rolling returns will throw light on the historical performance over a given timeframe. This data often gives more accurate details to investors which are much needed. Rolling returns can be made use to smoothen the historical performance to numerous time periods in place of just one. Rather going by the calendar year rolling returns look at every one, three, five-year, etc. time period beginning anew every month over the historical time line selected. For example, a five year rolling returns can be calculated as 7th Dec 2015 to 7th Dec 2020 and 8th Dec 15 to 8th Dec 20 and so on. Specifically, rolling return calculations measure how equity scrip, index or other security delivers the performance each day, week, month or year from the time frame's starting to end dates. This makes it fairly easy to custom-built the rolling returns computations when evaluating investments. One could use rolling returns calculations to impersonate the typical holding period for a stock or an index. For example, if one typically holds individual investments for 5 years then he might be interested in isolating rolling returns for the same time frame. When comparing investments, one may also spot trailing returns mentioned but they are not the same as rolling returns. Trailing returns constitute returns generated over a given time frame, For example 1 year, 5 years, 10 years etc. For that reason, they're usually called as point-to-point returns. Trailing returns can be helpful if one is looking forward to getting a snapshot look at an investment's past performance. That's useful if someone want to know precisely how an asset has performed at any given time. Trailing returns can be tricky since it's difficult to use them to gauge how an asset might perform in the future.

Rolling returns can make it simple to set the expectations of the return of an investment, based on its worst and best past performance. Calculating rolling returns is not difficult to do, and it's something to consider if an investor's concentration is on the long term investment strategy. We can use rolling returns as part of an index investing strategy.

II. REVIEW OF LITERATURE

G. Shanmugasundram & D. John Benedict (2013) in their research paper have tried providing an empirical analysis to reckon the factors indicating risk factors in various sectoral indices and Nifty index and to check relationship with risk in various time intervals. The sectoral indices selected were CNX FMCG index, CNX Nifty, Bank Index, Auto index, Infrastructure and Information technology index between 2004 to 2012. The results showed that there is no difference in standard deviation of various indices. Also results showed that there is much difference if the study was done on various time intervals.

Udaykumar and Suresh (2014) have tried to evaluate the risk return connection in Indian Equity markets between year 2007 to 2014. The study focused on understanding the behavioural pattern of major equity indices and their correlation coefficient between the respective indices. The results exhibited that BSE Sensex is the most superior index with respect to risk returns connection. The hypothesis indicated that the mean values calculated for Sensex did not vary across time period.

Pramod Kumar (2016) demonstrated a comparison of risk & return of Bombay stock exchange with select banking equity stocks in India. This work examines the correlation coefficient between risk and delivered return of Bombay Stock Exchange's Sensex and banking stocks. The analysis indicated that equity market returns of Sensex bears positive correlation with the returns of all banking stocks except ICICI bank stock. Values of beta indicated that ICICI bank was highly defensive stock as the sensitivity had negative variations in Sensex return.

BalaKalyan (2018) showcased an analysis on risk return parameter of selected scrips in India with an aim to provide investors an initial idea of investing. The study was done in accordance of mean returns and coefficient of variation and standard deviation. Among other findings the analysis revealed that February 2017 was the most advantageous month for the investors. The research emphasized the fluctuations of markets by providing helpful data for selecting up good stocks for investment.

Mallikarjunappa T (2012) evaluates the association between the risk return parameters of commodity futures market in India. The large emphasis of the research was on futures contracts of various commodities and 4 indices. The results exhibited that refined sunflower oil and platinum commodities delivered superior returns alongwith the highest risk associated. The analysis shows that there was a positive and high correlation between the risk and returns in the commodities futures market in the country.

RuchiNithyanadPrabhu (2018) conducted the research with respect to the analysis of risk and return of Nifty equity stocks in India. The core objective of the research was to collate the performance of nifty 50 stocks in view of risk and return. The researcher found that few stocks moved in same direction of that of the market whereas a few other scrips moved in opposite direction. The outcome also showed volatility of individual stocks vis-à-vis NSE Nifty was very much varying.

Yu-Ling-lin (2012) scrutinized into default risk and returns of equity in Taiwanese stock markets. The prime goal of the analysis was to analyze the correlation between default risk, size, book to market value and stock returns. The outcome revealed that book to market values and size had impact on portfolios that defaulted. The regression analysis showed that the two factors mentioned exercised major influence on returns and systemic risk.

Gorbunova (2016) explores the equity stocks in Russia with respect to the risk and return relationship. He gave special focus to analyze the risks and returns involved in stock market investment which would help unfold a rating mechanism in these investment options. The study of systematic risk shows that the returns of the stocks were originally driven by the market risks than the stock specific risk. The inquests are highly useful in terms of understanding and selecting the yielding stocks for the investment.

NEED FOR THE STUDY

There are many instances that different investors invest on different days and dates and rolling returns provides a clear analysis of historical returns through which an investor can get an average past performance of an underlying asset at periodical entry points. From this data one can get a fair idea of future expectation of returns if there is not much variation in market conditions and the tenure of investment is similar. Investors fear the loss of capital while investing in equity and refrain from it and park in options which yield lower returns in long term which is unable to beat inflation. The study is being

conducted to analyze if there is any correlation between volatility and tenure. In other words, the study aims to find the impact of probability of loss if money is invested in Bombay stock exchange's index i.e. Sensex for various time durations and returns are calculated on a daily basis which covers bullish, bearish and side-ways markets. This will help investors to understand the risk their capital may bear if invested for a particular horizon.

RESEARCH DESIGN

The study involves daily closing value of BSE Sensex since Inception till 28th February 2021 and returns are calculated on a daily basis for specific time duration i.e. 1, 3, 5, 7, 10, 15, 20, 25, 30, 35 and 40 years tenure.

SAMPLING

The sampling involves data points of Sensex closing on every business day spread across 41 years span from year 1979 to 2021.

Appendix 1

Duration	No of Observations
1 Year	9423
3 Years	9063
5 Years	8678
7 Years	8272
10 Years	7639
15 Years	6609
20 Years	5416
25 Years	4161
30 Years	2917
35 Years	1669
40 Years	436

III. RESEARCH DESIGN

A. *Research Variables*

Independent Variables: Daily closing value of BSE Sensex, returns of rolled data for studied tenure from 1 to 35 years

Dependent Variables: Probability of Negative returns, Returns above 8% value, Minimum returns across tenures, Maximum Returns across tenures, Average Returns, Probability of loss calculation.

B. *Research Objective*

1. To understand the relationship between performance of Sensex in context of various tenures.
2. To understand the range of average returns on upper and lower end of the spectrum of various analyzed tenures.
3. To understand the probability of loss across various durations.
4. To check the quantum of instances of negative returns in various time frames.

C. *Research techniques and tools*

In the stated independent variables and data of Sensex for last 41 years, association of independent variables with dependent variables and the extent of influence independent variables exert over the

dependent variable(s) were examined by using Mean test to assess the data and compare the performance.

IV. EMPIRICAL RESULTS

Table - 1

Variables	1 Year	3 Years	5 Years	7 Years	10 Years
Total Observations	9423	9063	8678	8272	7639
Negative Instances	2708	1097	696	483	72
Probability of loss	28.74	12.10	8.02	5.84	0.94
Maximum Returns	266.88	83.20	55.33	65.77	35.08
Minimum Returns	-56.45	-18.52	-7.92	-10.42	-2.81
Average Returns	18.51	15.64	15.40	22.20	15.18
% Count less than 8% returns	3893	3519	2714	1076	1509
% Probability of returns less than 8%	41.31	38.83	31.27	13.01	19.75
Standard Deviation	33.37	16.33	12.40	14.21	7.53

Table - 2

Variables	15 Years	20 Years	25 Years	30 Years	35 Years	40 Years
Total Observations	6609	5416	4161	2917	1669	436
Negative Instances	0	0	0	0	0	0
Probability of loss	0.00	0.00	0.00	0.00	0.00	0.00
Maximum Returns	27.78	21.61	19.76	18.49	17.08	15.83
Minimum Returns	5.07	6.94	7.87	11.40	12.91	14.18
Average Returns	14.96	14.10	14.62	15.38	15.32	15.36
% Count less than 8% returns	120	34	4	0	0	0
% Probability of returns less than 8%	1.82	0.63	0.10	0.00	0.00	0.00
Standard Deviation	4.19	3.27	3.05	1.50	0.97	0.32

1.) *Negative Instances goes down substantially goes down with duration*

The instances of negative returns are very high if the money is invested for shorter duration like 1 to 5 years in Sensex. It means that if an investor is looking for investing in short term, he may face negative returns and erosion of capital can also be seen in the Table 1. Also in durations like 7 and 10 year there is a chance of negative returns. If we see Table 2, the 15 years and charts, there has been no instance of negative return in the index which means if one invest for 15 years and above he may not receive negative returns.

2.) *Probability of making a loss in investment goes down dramatically with increased tenure*

As we can see from Table 1 if one looks at investing in the underlying asset for a period of 5, 7 and 10 years the probability of loss can be seen at 8.02%, 5.84% and 0.94% respectively which is way below

28.74% and 12.10% in 1 and 3 years periods respectively which is evident that if an investor is investing in equities, in this case Sensex, he should consider investing for longer term rather than short term which will give a chance to get better returns.

3.) *The huge range of returns consolidates as time progresses*

The maximum and minimum returns has much high range in shorter duration. For 1 year returns, out of 9423 data observations, the highest return given by Sensex was 266.88% between period 31st March 1991 and 31st March 1992 which means if an investor invested Rs 1,00,000 in Sensex he would have received a gain of Rs 2,66,880 which is huge and at the same time Rs. 1 Lakh would have reduced to Rs. 43,550 if invested between 13th January 2008 and 13th January 2009 where Sensex delivered lowest 1 year rolling return of -56.45%. As time progressed the market saw bull and bear phases and the difference between minimum and maximum returns hovered near the mean return of the asset. As we can see in 35 years span the minimum and maximum returns are at 17.08% and 12.91% where both are positive returns.

4.) *Investor has to look at market condition for short term but not long term*

As we see the huge range of maximum and minimum returns the investor has to look at market conditions if investing for 1 to 7 years. If the market is at expensive valuations he may expect volatility in returns as the term is not long. Whereas if one is looking to invest for long tenure like 20 years and more, he can invest today as well but market may surprise by delivering less than expected returns of 6.94% and 7.87% in 20 and 25 years respectively which may not be palatable for an investor.

5.) *Probability of returns in 8% and less*

There is a psychological conception of an investor to receive a return in excess of 8% in lieu of the risk he is taking by investing in equities rather than in fixed deposits. Evidence from Table 1 and 2 suggests that although the chances of receiving returns less than 8% reduces over a period of time, still in 20 and 25 years there are 34 and 4 rolled periods where the returns are less than 8% which makes a probability of 0.63% and 0.10% respectively for the same. In 30, 35 and 40 years periods in each rolled cycle the minimum returns are 11.40%, 12.91% and 14.18% which is way above 8% mark.

6.) *Standard Deviation is lowering with increasing tenure*

The volatility represented by standard deviation is decreasing with increasing time frame. 1 year being highest at 33% and gradually reducing to 0.32% in 40 years. As can be seen by Minimum and maximum returns vis-à-vis to average returns, although the mean return is 18.51% for 1 year but the highest and lowest returns are far from mean exhibiting higher standard deviation. For 35 years the mean return is 15.32% is close to top and bottom returns showing lower standard deviation.

V. FINDINGS

In the research work of rolling returns analysis of Sensex in last 41 years, it gives us multiple faceted perspective in reference to the investors:

- 1.) Investor should have a higher risk appetite if they are investing for 1-7 years (Chart 1 to 4) perspective as there may be corrections in market leading to losses.
- 2.) Investor should be in a position to extend the tenure of investment as market may surprise with lower than expected returns.
- 3.) We can see in Table 1 and 2 that highest returns are reducing gradually as the time frame increases but investor should understand that highest returns of 83% with standard deviation of 16 is far riskier than average returns of 14.62% in 25 years.
- 4.) Many investors have a conception that average CAGR reduces over a period of time but this is not true as we can see that money compounding at 14% over a longer period is better than short term returns of 25% and the falling due to market volatility.
- 5.) Probability of losses has become zero for any investment period more than 15 years hence long term investor should not look at current Sensex level and can invest the funds on any given day.

I. FUTURE RESEARCH DIRECTIONS

- 1.) The study is conducted on BSE Sensex and similar study can be done with other indices as well to establish the facts for the same.
- 2.) The analysis was conducted for the tenures of 1, 3, 5, 7, 10 etc. Analysis can be done for every year rolled returns hence a researcher can interpolate the data for rest of the time frames as well.

VI. CONCLUSIONS

The study has analyzed the data of daily closing value of Sensex for last 41 years period rolled over for various time frames and found that volatility reduces as the number of years increases for investment and investor can trust the equities and not worry about the volatility if investing for longer time horizons. However caution is advised if looking for short term as they need to stomach the volatility in the form of sharp negative returns sustained periods of low markets.

APPENDIX

Chart 1

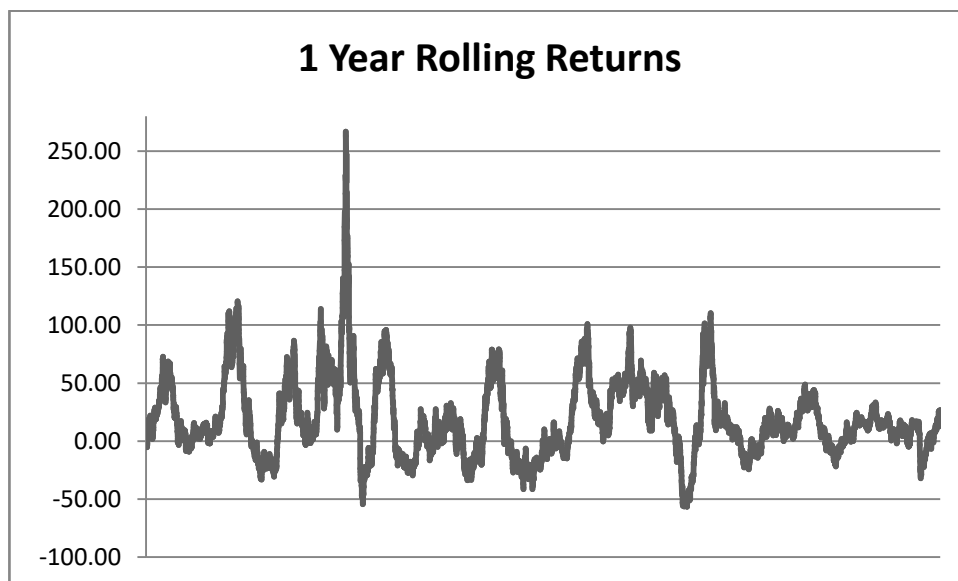


Chart 2



Chart 3



Chart 4



Chart 5



Chart 6



Chart 7



Chart 8



Chart 9



Chart 10



Chart 11



REFERENCES

1. G. Shanmugasundram & D. John Benedict (2013). Volatility of the Indian sectoral indices – A Study with reference to national stock exchange. *International Journal of Marketing, Financial Services & Management Research*. ISSN 2277- 3622 Vol.2, No. 8
2. Jagannathan, Uday Kumar, & N, Suresh. (2013). Risk/Return of major Indian Stock Indices. *MSRUAS/Journal of management and commerce*, 4.
3. Patjoshi, Pramod Kumar (2016). Comparative risk return analysis of Bombay Stock Market with selected banking stocks in India. *IRA-International journal of management and Social Sciences*, vol.04, Issue 01, 9.
4. Nalla, BalaKalyan (2018). A Study on risk and return analysis of selected securities in India. *International journal of engineering technologies and management research*, vol.5, Issue.4, 79-86.
5. T, Mallikarjunappa (2012). *An analysis of the risk returns relationships of Indian futures market. Anveshana*, 2:1, 3-41.
6. Prabhu, RuchiNityanand (March 2018). Risk and return analysis of nifty stock in Indian capital market. *International Journal of multi-disciplinary research and development*, vol.5, Issue3, 8-12.
7. Lin, Yu Ling, Chang, T. C., & Yeh, S. J. (2012). Default risk and equity returns: Evidence from Taiwan Equity Market. *Asia-Pacific finance markets*, 181-204.
8. N.A, Gorbunova (2016). Methods of analysis of equity securities risk and return: Issues and prospects. *European research studies*, vol. XIX, special issue3, Part A, 228-249.