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## Performance Evaluation of Select Index Funds in India

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### ABSTRACT

An index fund is an investment vehicle which aims to mimic performance of the select market index by constructing a portfolio which replicates the market index portfolio. This paper examines the performance of select index mutual funds in India based on tracking error and Jensen's alpha, and rank these funds based on their performance. The study reveals that Franklin India index fund has a lower tracking error followed by Birla Sun Life index fund. Rankings using Sharpe and Treynor's ratio reveal that Franklin India index fund and SBI Nifty index fund respectively are the best performing funds from the selected index funds.

### 1. Introduction

Mutual Funds have played an immensely significant role in India, channelizing household savings into stock market thereby sustaining and boosting economic growth of the country. Unit Trust of India was the first mutual fund introduced in India in the year 1963, presently the industry consists of 44 mutual funds covering a total of Rs. 14.90 trillion as on June 2016. Assets managed by Indian mutual fund industry have grown from Rs. 12.65 trillion in June 2015 to Rs. 14.90 trillion in June 2016; that represents a 18% growth in assets over June 2015. Latest innovation in the sector, which has gained popularity and thriving worldwide, is the Index fund, which is necessarily a passive investment strategy; unlike active mutual funds which attempts to outperform the market relying

on the expert services of its fund manager for which funds charge very high expenses. Unlike active mutual funds, index funds aim to mimic performance of the select market index by constructing a portfolio which mimics the market index portfolio. Index funds are necessarily either Index mutual funds or Exchange traded funds, which mirrors performance of the chosen Index to provide returns similar to that of Index before expenses.

Unlike an active mutual fund, an index fund follows passive investment strategy, and comprises of a portfolio, which constitutes a market index in the same proportion, with an intention to mimic the performance of the chosen market index. This form of investing gives investors an opportunity to achieve returns similar to that of the chosen market index.

The origin of Index fund, as a tool of investment vehicle, can be traced back to 1970s. At the global level, Index funds have done exceedingly well by offering whole new opportunities to retail and institutional investors. The first index fund was introduced in the year 1972, in the U.S. Since then it has escalated to sizable portion through-out the world market. Although the growth of index funds was sluggish initially, the

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subsequent growth has been phenomenal. The worldwide asset of regulated open-end funds as at the end of first quarter of 2016 was U.S. \$ 41.74 trillion.

Indexing is a passive investment strategy, which has gained immense momentum in, both, Indian and overseas markets. Worldwide, passive investments have seen a 73 percent increase over a six year period to 2015. The global AUM share of traditional active products has fallen sharply over the past decade, from 60 percent in 2003 to 40 percent at the end of 2014. Popularity of index funds has substantially increased mostly on account of poor performance of actively managed mutual funds due to efficient capital market as well as higher expense ratio that deteriorates its returns (Elton et al., 1995), (Carhart, 1997), (Goel et al., 2012), (Muruganandan, 2014).

An index mutual fund provides broad market exposure, low operating expenses and low portfolio turnover compared to actively managed mutual funds. Index funds are ideal for investors who prefer to take only market risk and not a fund manager risk. The investment objective of an index fund is to provide returns which are equivalent to that of the target index.

The fund manager attempts to mimic the investment result of the chosen index by holding all the securities in the index and ensuring that the returns of the index fund do not stray far from the returns of the chosen index. The difference in the returns of the index fund and the target index is known as tracking error; less the tracking error better is the index fund performance. In this study we have made an attempt to examine how well index funds in India track their target index. Risk adjusted returns are calculated to see the returns based on the risk associated to the selected index funds. Alpha, beta and r square are calculated using Jensen's alpha by considering an equation using regression analysis, and based on the performance the ranking of selected index funds are done by using Jensen's alpha and Sharpe's ratio.

## Literature Review

Index funds were introduced with intent to mimic the performance of a market index. The earliest research work of Richard C. Burgess and Bruce T. O'Dell (1978), suggested the matching of all mutual funds or pension funds to an index. The study was conducted using the mean-variance and stochastic dominance rules on 7 indexes, 40 randomly selected common stocks and 4 mean-variance efficient portfolios. Initially researchers like James M. Poterba and John B. Shoven (2002) and Edwin J. Elton, Martin J. Gruber, George Comer and Kai Li (2002) were the first few to examine performance of Index funds. For examination, returns on index funds were compared with returns on index. Sheng-hung, Hui-Cheng Wang et al. (2009) examined the performance of equity index funds in Taiwan using time-varying Jensen's  $\alpha$  and  $\beta$  risk, indicating that it is comparatively easier for the fund manager to replicate performance of the small index portfolio than those larger ones. Kshama Fernandes (2003) studied index fund implementation in India. The study focused on tracking error for the four longest existing index funds in India and concludes that while some

funds show periods of unacceptably high tracking error, the consistency in performance of the better run funds suggests that it is possible to attain fairly low levels of tracking error under Indian conditions. Subha M.V., Jaya Bharathi. S.,(2007) and Mohamed Zaheeruddin, Pinniti Sivakumar, K. Srinivas Reddy (2013) examined the performance of select open end mutual fund schemes using various statistical measures like Sharpe ratio, Treynor ratio, and Jensen's Differential measure and also analysing the risk-return relationships of the select open ended mutual fund schemes. David Blitz, Joop Huij and Laurens Swinkles (2012) examined the performance of European index mutual funds and ETFs by comparing the return of index funds and their benchmark indexes. Similar studies were conducted in India by Swati Garg and Y. P. Singh (2013) and S. Narend and M. Thenmozhi (2014).The index funds were evaluated using parameters such as NAV, risk, return, expense ratio, tracking error and returns to variability.

## 2. Data and Methodology

In this paper we examine the performance of select index mutual funds (growth) in India based on tracking error and Jensen's Alpha and rank these funds based on their performance. Secondary data from Yahoo Finance, Blue Chip India and National Stock Exchange were used to examine the performance of index growth funds that track CNX NIFTY 50 index. The criterion left us with Birla Sun Life Index Fund (G), SBI Nifty Index Fund (G), HDFC Index Fund (G), Franklin India Index Fund (G) and TATA Nifty Index Fund (G). The data were collected for a period of five years beginning from April 2010 to March 2015. Analysis is based upon the daily closing prices of CNX NIFTY 50 and NAV prices of the selected index funds. Return on Treasury bills are selected as a risk free rate of return.

Tracking error of the select index funds was analysed to examine how closely index funds track their underlying index. Tracking errors are reported as a standard deviation percentage difference. Jensen's Alpha was used to measure the risk adjusted returns of the select index funds, the excess returns of a fund were regressed against the excess returns of its underlying index as shown below:

$$RP - RF = \alpha_i + \beta (RM - RF) + ET$$

Where RP is the return of an index fund; RF is the risk-free return;  $\alpha_i$  is the Jensen's alpha;  $\beta$  is the beta of the fund; and ET is the error term. Jensen's alpha was calculated for index funds tracking the CNX Nifty index based on the following null hypothesis:

**H<sub>0</sub>** – There is no significant difference between NAV of the fund and closing price of CNX Nifty 50.

Where in NAV of the index mutual funds is dependent variable and closing prices of CNX Nifty is independent variable, we have used Regression analysis to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships. When the data are in the nature of time series, a unit root test is used

to check for stationary. An augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic is used in the test. The more negative it is, the stronger the rejections of the hypothesis that there is a unit root at some level of confidence. The Durbin–Watson statistic test is used to detect the presence of auto correlation in the residuals from a regression analysis. A test that the residuals from a linear regression or multiple regression are independent. The Durbin–Watson statistic is always between 0 and 4, a value of 2 means that there is no autocorrelation in the sample. Values approaching 0 indicate positive autocorrelation and values toward 4 indicate negative autocorrelation.

**Analysis and Performance**

**Table-1: Tracking Error of Select Index Mutual Funds**

Index Mutual Funds	No. of Observations	Tracking Error
HDFC Index Fund-Growth	1218	0.5481
SBI Nifty Index Fund-Growth	1202	0.54115
TATA Nifty Index Fund-Growth	1218	0.50091
Birla Sun Life Index Fund-Growth	1219	0.50081
Franklin India Index Fund-Growth	1219	0.50026

When tracking error is low between portfolio return and benchmark return it means that the fund portfolio is closely following its benchmark. The tracking error of Franklin India index fund is very low as compared to other index funds which mean returns achieved by Franklin India index fund are adjacent to the benchmark returns, where it means manager of a passively managed fund aims at keeping the differential return as low as possible. Tracking error for HDFC index fund is higher than the other index fund, indicating existence of greater deviation between HDFC index fund and nifty index. When the fund portfolio underperforms the benchmark, the tracking error is greater indicating that fund manager takes higher risk and also have to pay other expenses and costs. Lower tracking error indicates better performance of the fund as visible in the case of Franklin India index fund.

**Table-2: Risk-Adjusted Returns of Index Funds Using Jensen’s Alpha**

Index funds tracking CNX Nifty	Alpha (%)	Beta	R <sup>2</sup>
Birla Sun Life Index Fund-Growth	-0.29% (-4.12)*	0.7391 (117.20)*	0.91
HDFC Index Fund-Growth	-0.30% (-3.95)*	0.7276 (106.11)*	0.88

TATA Nifty Index Fund-Growth	-0.31% (-4.44)*	0.7282 (116.3)*	0.89
SBI Nifty Index Fund-Growth	-0.36% (-4.70)*	0.7270 (105.9)*	0.90
Franklin India Index Fund-Growth	-0.36% (-4.30)*	0.7338 (116.66)*	0.92

Jensen alpha is calculated by considering an equation of  $RP - RF = \alpha + \beta (RM - RF) + \epsilon_t$

Where  $RP - RF$  is considered as dependent variable and  $RM - RF$  is considered as independent variable.

By using this equation regression analysis is done to find out the alpha, beta, r-square and t-statistics to find out the significance at 5% level. Risk adjusted return is a measure to find how much return an investment will provide given the level of risk associated with it. The risk associated to most of the selected index funds is very less which means that alpha value is negative. Most of the time the alpha value of index funds is zero, yet many index funds have negative alphas. All the selected index funds have negative alpha indicating that they are underperforming and it also indicates that the investments are not optimally diversified. Among the all selected index funds the least underperforming fund is Franklin India index fund with alpha value of -0.36%. The high R-squared lends further credibility to the accuracy of the fund's alpha and beta, for the funds to outperform its tracking index the value of alpha should be positive. The beta value represents the measure of volatility or risk of the portfolio. When beta value is more than 1 it means the fund price will be more volatile than the market price and when beta value is less than 1 it means the fund price is less volatile than the index price. The above study provides empirical evidence that almost all beta values of the selected index mutual funds are less than 1 which means there is less volatility between fund prices and index prices and also indicates that the index funds move in same direction as that of tracking index. T-statistics represents the significance level at 5% level in the study. Since the P-value for all the selected index funds are less than 0.005 signifying significance between the  $RP - RF$  and  $RM - RF$  which means that t-statistics shows the significance level for all the selected index mutual funds.

**Table-3: Unit Root Test of Selected Index Mutual Funds**

**Null Hypothesis: LN\_NAV\_ has a unit root**

Index Funds	Augmented Dickey - Fuller Test Statistic	
	T-Statistics	Probability
Franklin India Index Fund-Growth	-32.65321	0.0000
HDFC Index Fund-Growth	-32.79699	0.0000
TATA Nifty Index Fund-Growth	-32.45987	0.0000
Birla Sun Life Index Fund-Growth	-32.68855	0.0000

SBI Nifty Index Fund-Growth	-32.17695	0.0000
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The above unit root test table depicts that Augmented Dickey-Fuller Test Statistic has the probability value of 0.0000 for all the selected index mutual funds which explains that the log normal returns of the index funds does not have unit root which means that the data are stationary. So we reject the null hypothesis which means there is no unit root.

**Table-4: Descriptive Statistics of Benchmark Index**

Index	Mean	Standard Deviation	Skewness	Kurtosis
CNX Nifty	0.000428	0.010665	0.025548	4.012329

From the above table, The Nifty index has a mean value of 0.000428 which refers to the average mean returns, whereas standard deviation is 0.0106. Nifty has a positive distribution which means it lies on right side. Since the kurtosis distribution is more than 3 it means distribution is leptokurtic.

**Table-5: Descriptive Statistics of Index Funds in India**

Index Mutual Funds	Mean	Standard Deviation	Skewness	Kurtosis
Franklin India Index Fund-Growth	0.000392	0.010665	-0.11793	4.212529
HDFC Index Fund-Growth	0.000487	0.011414	1.124623	4.348433
TATA Nifty Index Fund-Growth	0.000386	0.010791	-0.10237	4.266397
Birla Sun Life Index Fund-Growth	0.000378	0.010807	-0.09294	4.282839
SBI Nifty Index Fund-Growth	0.000376	0.010729	-0.07203	4.188389

Table 5 shows the mean, standard deviation, skewness and kurtosis of the selected index mutual funds. Mean refers to the average of the fund returns. HDFC Index fund has higher value of mean which is 0.000487, signifying the mean returns are closer to higher returns of the fund and high returns are expected. Mean of the SBI nifty index fund is low with value of 0.000376 signifying that the returns are lower and are closer to

the lower returns. Overall it shows that higher mean returns are better than lower mean returns. Standard Deviation refers to how much the value deviates from its mean value. The standard deviation of Franklin India index fund is 0.010665 which is low compared to other funds so lower the value means it deviates less from its mean value and HDFC index fund has higher standard deviation value of 0.011414 which shows that it deviates more from its mean value. When the distribution lies on the right hand side it is positively skewed and when it lies on left hand side it is negatively skewed. Since all the distributions of the selected index funds are negative they are negatively skewed whereas only for HDFC index fund it is positively skewed as it has positive distribution. Kurtosis refers to the peakedness of the distribution. Distributions with kurtosis less than 3 are said to be platykurtic. Distributions with kurtosis more than 3 are said to be leptokurtic and it has fatter tails. In the above study of all the selected index mutual funds kurtosis value more than 3 which means that the distribution is leptokurtic.

**Table-6: Durbin-Watson Test of Selected Index Mutual Funds**

Index Mutual Funds	R-Squared	Durbin-Watson Test
Franklin India Index Fund-Growth	0.67	1.867053
HDFC Index Fund-Growth	0.59	1.877903
TATA Nifty Index Fund-Growth	0.49	1.846223
Birla Sun Life Index Fund-Growth	0.52	1.868448
SBI Nifty Index Fund-Growth	0.66	1.855906

Table 6 shows that the Durbin-Watson test has a value higher than the R-square value which means the regression is non-spurious regression and it does not have an autocorrelation. When the Durbin-Watson value is close to 2 there is no autocorrelation and it means regression is not a spurious regression.

**Table-7.1: Regression analysis of Franklin India index fund and Nifty**

Franklin India Index Fund-Growth	Coefficient	P-value
Intercept	-3.74	0.0000
Nifty	0.008	0.0000
R-square – 93%		

**H<sub>0</sub>**– There is no significant difference between NAV of franklin India index fund and CNX Nifty 50.

The coefficient of nifty which is the independent variable with value of 0.008 explains that 1 unit change in nifty leads to 0.008 unit change in NAV of Franklin India index fund. Due to less than 5% p-value the study rejects the null hypothesis that there is no significant relationship between NAV of Franklin India Index fund and Nifty. R-squared at 0.93 shows that 0.93 unit

change in NAV of Franklin India index fund is explained by 1 unit change in CNX Nifty 50 index.

**Table-7.2: Regression Analysis of HDFC Index Fund and Nifty**

HDFC Index Fund-Growth	Coefficient	P-value
Intercept	-18.31	0.0000
Nifty	0.012	0.0000
R-square - 89%		

$H_0$  – There is no significant difference between NAV of HDFC index fund and CNX Nifty 50.

The above table indicates that the coefficient of CNX Nifty 50 which is the independent variable with value of 0.012 explains that 1 unit change in nifty leads to 0.012 unit change in NAV of HDFC index fund. The study also shows less than 5% p-value which leads to conclude that there is a significant difference and long run relationship between the NAV of HDFC index fund and CNX Nifty 50 index. R-squared at 0.89 shows that 0.89 unit change in NAV of HDFC index fund is explained by 1 unit change in CNX Nifty 50 index.

**Table-7.3: Regression Analysis of TATA Nifty Index Fund and Nifty**

TATA Nifty Index Fund-Growth	Coefficient	P-value
Intercept	-2.58	0.0000
Nifty	0.006	0.0000
R-square - 93%		

$H_0$  – There is no significance difference between NAV of TATA Nifty index fund and CNX Nifty 50.

In the above table the coefficient of nifty which is the independent variable with value of 0.006 explains that 1 unit change in nifty leads to 0.006 unit change in NAV of Franklin India index fund. Due to less than 5% p-value the study rejects the null hypothesis that there is no significant difference between NAV of TATA Nifty Index fund and Nifty. R-squared at 0.93 shows that 0.93 unit change in NAV of TATA Nifty Index fund is explained by 1 unit change in CNX Nifty 50 index.

**Table-7.4: Regression Analysis of Birla Sun Life Index Fund and Nifty**

Birla Sun Life Index Fund-Growth	Coefficient	P-value
Intercept	-3.74	0.0000
Nifty	0.008	0.0000
R-square - 93%		

$H_0$  – There is no significant difference between NAV of Birla Sun Life index fund and CNX Nifty 50.

In the above table the coefficient of nifty which is the independent variable with value of 0.008 explains that 1 unit change in nifty leads to 0.008 unit change in NAV of Birla Sun Life index fund. The study also shows less than 5% p-value which leads to conclude that there is a significant difference

and long run relationship between the NAV of Birla Sun Life index fund and CNX Nifty 50 index. R-squared at 0.93 shows that 0.93 unit change in NAV of Birla Sun Life index fund is explained by 1 unit change in CNX Nifty 50 index.

**Table-7.5: Regression Analysis of SBI Nifty Index Fund and Nifty**

SBI Nifty Index Fund-Growth	Coefficient	P-value
Intercept	-4.59	0.0000
Nifty	0.009	0.0000
R-square - 90%		

$H_0$  – There is no significant difference between SBI nifty index fund and Nifty

In the above table the coefficient of nifty which is the independent variable with value of 0.009 explains that 1 unit change in nifty leads to 0.009 unit change in NAV of SBI nifty index fund. The p-value of SBI nifty index fund and Nifty is less than 0.05 rejecting the null hypothesis that there is no significant difference between the NAV of SBI nifty index fund and Nifty.

**Table-8 Ranking of Selected Index Mutual Funds According to Sharpe Ratio and Treynor Ratio**

Index Funds	Sharpe Ratio	Rank	Treynor Ratio	Rank
Franklin India Index Fund-Growth	5.39	1	0.08	3
HDFC Index Fund-Growth	2.21	4	-0.10	5
TATA Nifty Index Fund-Growth	0.05	5	0.07	4
Birla Sun Life Index Fund-Growth	4.95	3	1.08	2
SBI Nifty Index Fund-Growth	5.36	2	1.11	1

In table 8 index funds are ranked based on their performance by using Sharpe Ratio and Treynor Ratio. They are ranked from 1<sup>st</sup> to 5<sup>th</sup> which means that best performing fund is ranked as 1<sup>st</sup> and least performing as 5<sup>th</sup>. Sharpe's ratio measures the risk-adjusted financial performance of investment portfolios or mutual funds; higher the Sharpe ratio better is the fund performance. Franklin India index fund which has value of (5.39) is ranked 1<sup>st</sup> as it is the best performing fund and its risk-adjusted performance over the period of time. Tata Nifty index fund which has value (0.05) is ranked 5<sup>th</sup> as it is least performing fund over the period of time. According to Treynor's ratio higher the Treynor's ratio better is the performance of the fund. SBI Nifty index fund is the best performing index fund over the period of time which has value of (1.11), ranked as 1<sup>st</sup>. HDFC index fund which has value of (-0.10) is the least performing fund over the period of time. According to overall performance of the index mutual funds, Franklin India index fund is the best risk adjusted financial

performing fund as per the Sharpe ratio and SBI nifty index fund is the best performing fund according to the Treynor's ratio.

### Conclusion

Index funds are the funds which replicate the benchmark index. A good index fund is one which closely tracks the performance of the index and therefore exhibiting a very low tracking Error. Where it was found that Franklin India index fund has a lower tracking error than the other four index funds. The study was conducted to see if the data are stationary so unit root test is conducted to see the stationary for all the selected index funds and benchmark Nifty. Descriptive statistic is used to see the basic features of the data in a study. The autocorrelation test was conducted to see if there is autocorrelation among the funds. It was found that there is no autocorrelation as the Durbin-Watson value is more than r-square. The regression analysis revealed that there exists a statistical significance between index funds and CNX Nifty 50. Ranking of the funds is done using Sharpe and Treynor ratio and found that Franklin India index fund and SBI Nifty index fund are the best performing funds, respectively from the selected index mutual funds.

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