# Performance and Tracking Efficiency of Exchange Traded Funds : An Analysis of Indian Equity Index Funds

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## Abstract

**This research, using daily closing values of five leading Nifty exchange traded funds (ETFs), sought empirical evidence for the efficiency of equity ETFs in India to track their benchmark index. The study computed 'standard deviation of differential returns' and 'standard error in regressing the fund return against the Nifty return' to assess the tracking efficiency of funds. The analysis found underperformance of Nifty ETFs relative to their benchmark index coupled with higher level of tracking errors during market downturns. In contrast, I found significant improvement in tracking ability and most funds outperformed the benchmark with lower tracking errors under reverse market conditions. The research ultimately suggested that preferring ETFs to index portfolio investing offered greater opportunities for arbitrage to the investors of emerging markets like India, particularly during the times of market buoyancy.**

***Keywords :*** **exchange traded funds, benchmark index, tracking efficiency**

**JEL Classification : C3, G1, G11**

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The world economies have been moving ahead with the financial innovation and engineering for the past many years (Dahlman, 2008). Responding positively to such advancements, the Indian financial market has started trading in exchange traded funds (ETFs). The benefits of diversification through index based portfolio investment, coupled with the option of ready and continuous trading has attracted a significant number of investors to the scheme (Blocher & Whaley, 2015). Within a short span of time, ETF became accepted among both retail and institutional investors. Of course, like shares, ETFs are permissible for short selling that help investors to capitalize during market downturns.

Tracking error constitutes the prime concern of ETF investors from the beginning (Hassine & Roncalli, 2013). Tracking error, stating simply, denotes the difference between the ETF return and the benchmark index return during a specific period. Many factors contribute to tracking error that include transaction and rebalancing costs, cash drug, differing dividend reinvestment assumptions, dividend taxation, and operational risks. The ability of the fund managers to track their portfolios with the changes in benchmark index determines the tracking error efficiency of the funds they manage (Kostovetsky, 2003). Studies like the ones conducted by Edwin, Gruber, Comer, and Li (2002) and Poterba and Shoven (2002) suggested that ETF pricing did not differ from their net asset values.

The stated investment objective of most ETFs is to track the performance of a specific index. If an ETF's performance deviates from its target index and consequently, from its stated objectives, it is no longer a viable and reliable investment. Tracking error is critical to exchange traded funds because it measures the performance of an ETF relative to its stated investment objective. Exchange-traded funds (ETFs) are, with the exception of certain

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actively managed products, designed to track the performance of an index. While this concept is easy to understand, putting it into practice is far more difficult than it seems. While indices are typically replicable in theory, index returns are at an unattainable ideal, as they ignore the practicalities of portfolio construction and ongoing management. Investors need to be aware of these realities and manage their expectations accordingly. There will always be factors involved in the replication process that will cause tracking failures.

## Review of Literature

ETF is an innovative investment alternative with a benchmark index which aims to return the performance of that index to investors (Bas & Sarioglu, 2015). Many prior studies examined the pricing efficiency of ETFs wherein they assessed the fund managers' ability to track the benchmark index. Gallagher and Segara (2005) observed that classical ETFs pay off investors with returns before expenses in proportion to their benchmark performance. Tracking error volatility, along with other parameters such as performance difference and liquidity spread could guide investors in their fund selection process (Hassine & Roncalli, 2013). Marshall, Nguyen, and Visaltanachoti (2013) provided evidence for the mispricing between two liquid ETFs that tracked the S & P 500 in the U.S. market. With regard to market efficiency, Hrazdil and Chung (2013) empirically proved for the immediate adjustments of new information to prices in ETF markets.

The size of investment and length of time decided the benefits from investing in ETFs (Kostovetsky, 2003). Large investors normally benefitted from investing in ETFs and their amount of investment should be reciprocal to the length of time for maximizing the scale efficiency. Gastineau (2004) suggested that the pretax return of benchmark index ETFs generally displayed inferior records in comparison to the index mutual funds that put its base on same indices. Moreover, frequent liquidating of assets eliminated the tax and cost advantage of ETFs. Dolvin (2009) analyzed the price differences between two most popular ETFs in U.S. market and found that on an average, both funds traded at a premium relative to the benchmark index. The research claimed that the levels of daily premium had sufficient scope for arbitrage and the current day pricing of the ETF influenced the next day market behavior. However, ETFs showed higher volatility than their benchmarks (Valle, Meade, & Beasley, 2014).

Hryciw (2011) examined the relationship between tracking error and market beta in multiple market segments. His research found that ETFs produced excess returns than the benchmark index during market downturns and ETF performance was independent of market beta. Moreover, the tracking error was lowest in the broad market segments and higher in the emerging markets and commodities' segments. Kayali and Ozcan (2012) observed statistically significant mispricing in the Turkish market. According to Chu (2011), tracking error had a positive relation with expense ratio of a fund and negative relation with fund size. Accumulated tracking error significantly affected the long term performance of ETFs (Charupat & Miu, 2013). Cash holdings, dividend yield, and cash distributions from ETFs could significantly affect the tracking error that considerably depended upon the liquidity of underlying assets (Osterhoff & Kaserer, 2016). Frino and Gallagher (2011) found dividend payments as the factor critical in determining the tracking error in passive funds.

In the Indian context, Prasanna (2012) compared the performance of equity ETFs with gold ETFs and found that gold ETFs provided superior returns compared to ETFs in the equity market. Gold ETF market in India showed that random walk behavior and the use of technical trading strategies in earning excess return from markets was dubious (Saji, 2014). In his study, Narend (2014) showed that, in terms of active returns, ETFs outperformed their benchmark indices of BSE SENSEX and CNX Nifty. Singh and Kaur (2016) revealed that ETFs showed significant tracking error in India and the assets under management and volume positively impacted their tracking ability. Using CAPM, Garg and Singh (2013) compared the performance of Indian mutual funds with ETFs and their research found that ETFs showed low tracking error compared to index mutual funds, and they delivered better returns to investors than the index based mutual funds did. The in-kind creation and

redemption mechanism allowed arbitrage opportunities to ETF investors whenever unit prices deviated from the value of the underlying portfolio (Dharani & Natarajan, 2011). Shanmugham (2012) examined the pricing efficiency of Nifty based ETFs during two distinct market conditions (bullish and bearish) in India, and the study identified higher tracking error in bearish conditions with higher risk premium and larger volatility.

Studies on the tracking error performance of ETFs are not quite extensive in India. Moreover, the previous studies have produced mixed results. While some studies found the tracking error of ETFs was lower to that of traditional index funds due to the redemption facility and the low expense ratio, others held opposite views. However, most studies observed fund wise difference in tracking error performance of ETFs in different country contexts. Hence, this research aims to analyze the tracking error performance of Nifty based ETFs in India.

## Data and Methodology

**(1) Sample and Data :** In this research, I examine the efficiency of ETFs that track the CNX Nifty, the benchmark index of India. The study covers a period of 5 years starting from 1st April 2011 to 31st March 2014. ETFs traded in NSE since the inception of this scheme and that have been in operation at least for the last 5 years constitute the rationale for the sample selection. However, data continuity and their accessibility compelled me to focus on five ETFs in the final sample that include BSL Nifty, IFL Nifty, Kotak Nifty, Nifty Bees, and Q-Nifty. The daily closing values of the select funds provide the data inputs and I accessed the same from NSE web sources.

**(2) Methodology :** I measure the performance of ETFs and Nifty was mainly measured by computing daily returns and market volatility. The tracking error of ETFs and index funds is analyzed to examine how closely the ETFs track their underlying indices.

**(i) Return :** Return is the gain from the investments. Return here means the price difference relative to the beginning price. Mathematically, it is expressed as :

$$R = \frac{(P_{t-1} - P_t)}{P_t} \quad \text{x } 100 \quad \text{--------} \quad (1)$$

$P_{t-1}$= closing value as on day ($t$-1),
$P_t$ = closing value as on day *(t)*.

**(ii) Risk :** Risk refers to dispersion of the returns from ETFs. The study used standard deviation to measure the risk.

$$\textit{Variance } \sigma^2 = \frac{\Sigma^{N}_{i=0} (ri - \bar{r})^2}{N-1} \quad \text{--------} (2)$$

$ri$ = return from the ETF in period ($I$=1,2…..$n$),
$\bar{r}$ = Arithmetic return,
$n$ = number of observations.

**(iii) Tracking Error :** I have used two approaches to estimate tracking error :

**Approach 1 :** Typically, the tracking error is expressed in the form of the standard deviation between the portfolio's returns and the benchmark's returns. In other sense, standard deviation of the differential return, that is, the difference between fund return and benchmark return.

$$x = \sqrt{\frac{1}{n\text{-}1}\Sigma (D - D)^2} \quad \text{--------} (3)$$

where, $D$ is the differential return.

**Approach 2 :** Standard error of the regression that regress fund returns against the benchmark index return :

$$\acute{r} = \mu + \beta Rm + ei \quad \text{-------} (4)$$

$$\sigma_{est} = \frac{\Sigma (r - \acute{r})^2}{n} \quad \text{---------} (5)$$

$\sigma_{est}$ is the standard error of the estimate, $r$ is the actual return, *'ŕ'* is a predicted return, and *'n'* is the number of pairs of returns.

## Results and Discussion

The results and findings of this study are discussed in two parts. At first, I make both horizontal and vertical comparisons of the performance of the ETFs within the group and with the benchmark index as well. Later, I deal with the results of tracking error analysis made under the two approaches explained earlier.

↳ **Risk-Return Performance of ETFs and Nifty :** Market based investments brought in huge losses to investors in 2011. All the funds under observation delivered negative returns amidst larger volatility. The loss made by Kotak Nifty was lowest despite it showing fluctuations at par with other funds. BSL Nifty and IFL Nifty produced losses at a rate greater than that of the benchmark index. However, in subsequent years, I could observe market recovery that helped investors to recuperate their previous losses. All the funds gained value appreciation and IFL Nifty delivered returns at a greater scale than the market average. In 2013, most market-based funds produced only marginal returns, while the risk performance of most funds were found uniform and market volatility was fairly low. However, in 2014, the ETF market in India bounced back with outstanding trend that it had never shown before. The rate of return produced by all the fund investments during the year was highest of the period under observation. IFL Nifty out beat all other funds with larger amount of returns but with a moderate risk profile. BSL Nifty exhibited efficiency in generating returns excess of market return.

**Table 1. Return and Risk Profile of ETF Investments**

| | Return (%) | | | | Risk *(S.D)* | | | |
|---|---|---|---|---|---|---|---|---|
| **Fund** | **2011** | **2012** | **2013** | **2014** | **2011** | **2012** | **2013** | **2014** |
| BSL Nifty | -3.735 | 1.040 | 0.2827 | 2.945 | 7.63 | 6.56 | 3.74 | 5.46 |
| IFL Nifty | -3.659 | 2.359 | 0.6859 | 3.133 | 5.59 | 5.31 | 3.86 | 3.89 |
| Kotak Nifty | -1.837 | 2.094 | 0.4505 | 2.393 | 5.76 | 5.02 | 3.99 | 3.87 |
| Nifty Bees | -2.438 | 2.163 | 0.2576 | 2.404 | 5.81 | 5.19 | 3.72 | 3.51 |
| Q-Nifty | -2.488 | 1.964 | 0.3506 | 2.066 | 5.87 | 5.18 | 4.24 | 3.46 |
| Nifty | -2.311 | 2.236 | 0.1870 | 2.473 | 5.96 | 5.31 | 3.94 | 3.82 |

**Table 2. Tracking Error of ETFs During 2011-2014**

| Fund | 2011 | Rank | 2012 | Rank | 2013 | Rank | 2014 | Rank |
|---|---|---|---|---|---|---|---|---|
| BSL Nifty | 3.149 | 2 | 3.023 | 1 | 2.431 | 1 | 2.157 | 2 |
| IIFL Nifty | 0.182 | 5 | 0.268 | 5 | 0.787 | 3 | 1.449 | 3 |
| Kotak Nifty | 1.171 | 3 | 0.911 | 3 | 0.679 | 4 | 0.428 | 5 |
| Nifty Bees | 0.554 | 4 | 0.397 | 4 | 0.322 | 5 | 0.324 | 6 |
| Q-Nifty | 3.220 | 1 | 0.914 | 2 | 0.971 | 2 | 1.111 | 4 |

**(i) Tracking Error Analysis of ETFs - Approach I :** Standard deviation of the differential returns measures the tracking error (inversely tracking efficiency) and the results are reported in the Table 2. On looking across the years, one can observe persisting trend in return differentials until 2014, the best performing year for ETFs in India as per the Table 1. The return differentials of BSL Nifty (all years) and Q Nifty (except in 2014) are relatively high. However, the return differentials are found positive for BSL Nifty and negative for Q Nifty. On the other side, the performance deviations of Nifty Bees and Kotak Nifty from the benchmark returns are somewhat low, which can be considered as the sign of efficiency of their fund managers to track the benchmark index.

**(ii) Tracking Error Analysis of ETFs - Approach II :** While I regress the fund return against the benchmark return, the standard error measures tracking error of ETF investments. The inferences that one could make regarding the efficiency of funds in tracking the benchmark index movement do not contradict with the conclusion that I derived under Approach I. According to this approach also, error is found to be low during later years. BSL Nifty committed such error at higher rate in almost all years. Kotak and Nifty Bees were behind in terms of this measure.

**Table 3. Tracking Error of ETFs During 2011-2014**

| Fund | 2011 | Rank | 2012 | Rank | 2013 | Rank | 2014 | Rank |
|---|---|---|---|---|---|---|---|---|
| BSLNifty | 0.209 | 2 | 0.244 | 1 | 0.141 | 1 | 0.180 | 2 |
| IIFL Nifty | 0.020 | 5 | 0.021 | 5 | 0.049 | 3 | 0.131 | 3 |
| Kotak Nifty | 0.073 | 3 | 0.074 | 2 | 0.034 | 4 | 0.037 | 5 |
| Nifty Bees | 0.036 | 4 | 0.032 | 4 | 0.018 | 5 | 0.029 | 6 |
| Q-Nifty | 0.211 | 1 | 0.072 | 3 | 0.057 | 2 | 0.077 | 4 |

The time series used for analyzing the tracking efficiency registers inconsistent results. In other sense, performance rating of funds is different on various time scales. In all the years, there are differential returns produced by ETFs schemes under study. The market recorded low error in tracking index performance during the last two years of the study period. Relatively well performers, IFL Nifty and BSL Nifty have been in the market trend in none of the years. In fact, these funds generated return at a rate higher than Nifty return in many years. Tracking error measured by computing standard error in the regression of the fund return on the benchmark return again proved that most funds did not make any close chase of the benchmark. Tracking error according to the approach I followed should not be viewed critically. This is because the funds that showed extreme error were found to be the best performers in the study. Most of the funds did not exhibit consistent performance. This is not only true with regard to risk return performance, but also with respect to tracking efficiency.

## Conclusion

This paper assesses the tracking efficiency of exchange traded funds (ETFs) operating in the Indian stock market. The research based on monthly price data of six Nifty based ETFs during the period from 2011-2014 employed the well-accepted tracking error measures : 'standard deviation of differential returns' and the 'standard error' in regression estimating individual ETF returns against the benchmark index return to analyze the tracking efficiency.

The analysis produced mixed results. Interestingly, no fund performed consecutively at an outstanding level throughout the study period. Many funds underperformed the underlying benchmark index and were found to be less profitable than the index portfolio investing during market downturns. However, in the later years, the market registered upward swing and majority of the funds produced excess return for its investors at a rate higher than that of benchmark return. My observation in this regard is quite opposite of Hryciw (2011). In more precise terms, the market for ETF investments in India performed outstandingly at alternate years. Same is true with regard to price volatility and risk conditions also. Tracking error of the funds under study should not be criticized as such. All the funds which registered higher rate of differential return, in fact, out beat the benchmark index. They were able to produce excess return for its investors at a rate higher than that of benchmark return. However, the analysis found diverging performance during later years. However, this is not true for every fund during the later years of study. Ultimately, I suggest that preferring ETFs to index portfolio investing creates greater arbitraging opportunities and yields superior returns to the investors of emerging markets like India, particularly, during the times of market buoyancy. Such findings support the claim of Dolvin (2009).

## Research/Policy Implications

This research has practical implications in many ways. The findings revealed by this study would help current and prospective investors to grab deeper insights as to the potentials of ETF investments to make gains through passive investment strategies. The regulators can design apposite policy framework to warrant fairness and level playing field for the investments in the segment that can revive the investor confidence and indirectly overcome the fragility of the financial markets in the country. The fund managers can validate their asset allocation efficiency relative to their peers in the industry that may provide future directions in portfolio revisions through better combinations for asset mix.

## Limitations of the Study and Scope for Further Research

This study does not undertake any extensive research and considers the performance of only five ETF investments during a relatively small sample period of four years in the tracking error analysis. I recommend a replication of this study covering longer time period and a larger sample of ETFs to claim for better inferential validity. This research does not investigate the factors determining the tracking efficiency of fund investments. Hence, further research in the area can assess the factors responsible for the return differentials between ETFs and benchmark index before suggesting the relevant strategic framework for fund managers to enhance their asset allocation efficiency.

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