

Index funds performance – Some insights

By

Prof. G. Sethu and Dr. Rachana Baid

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Abstract

Passive investment management has become an important component of the investment management industry. The responsibility of the index fund managers is to deliver risk and return same as the underlying index. Many factors impact investment performance. Some of these factors lie outside the sphere of influence of the fund manager. For a comprehensive assessment of fund performance and follow up, it has become necessary to identify the causes and attribute components of fund performance to these causes. Attribution analysis plays a crucial role in identifying factors controllable by the fund manager and in computing the part of fund performance arising out of managing these factors. Such analysis should form the basis of motivational systems for fund managers in a fund management company. While significant attention has been paid to performance attribution in equity and income funds, research relating to the same in the index fund domain is scarce. This paper suggests a few ideas to plug this gap. The findings indicate that significant contribution to index fund tracking error may arise from factors that are not under index fund manager's control. We also notice that tracking error is not neutral to some of the factors.

I. Introduction:

The passive investment management philosophy began in 1971 at Wells Fargo with simple index funds. Growth of index funds in United States was dramatic in the 1970s and 1980s and gained impetus in the UK and Europe in the 1980s. In Japan too, significant growth in indexing occurred in the last few years. The assets under passive fund management are about \$ 1 trillion amounting to about 8% of the entire industry worldwide. In India, the first index fund was launched by the Unit Trust of India in 1998. However, in the recent past (last six months) index fund segment has acquired momentum with the launch of many index funds. The index fund industry in India is in nascent stage with approximately Rs. 6.7 billion assets under management. This segment

is expected to grow. In particular, this product seems to appeal to the institutional investors and the corporations.

Indexing has flourished because it is compatible with both theoretical findings and practical needs. On the theoretical side, the philosophy of passive fund management emanates from the efficient market hypothesis. If the markets are difficult to beat, then there is no point in spending money to devise methods and strategies to outperform the market. Instead of the “*high return high cost*” approach it is better to focus on “*market return low cost*” approach. This kind of differentiated product has an appeal to treasury managers and high networth individuals and has resulted in huge inflows from institutions, corporations and high networth individuals. These investors are in a position to demand and expect pre-defined performance from the investment managers. They not only look at the overall performance but also investigate the factors that contribute to the overall performance. The fund management company has to respond to this situation. Therefore, it is of paramount significance that we find a method to attribute the overall index fund performance to causal factors of relevance.

II. Literature review:

In the mid-1960s researchers at the University of Chicago developed the Efficient Market Hypothesis that says that price of a security reflects all available information. Eugene Fama (1965) fine-tuned the EMH framework and suggested three forms of informational efficiencies: the weak form, the semi-strong form and the strong form. EMH implies the impossibility of an investor consistently outperforming the market through customized investment strategies. Clearly, no fund manager would be able to beat the market consistently, if markets were informationally efficient.

Michael Jensen’s study (1968) of mutual fund performance found that the average mutual funds produced disappointing returns. A report on the performance of 57 mutual funds and their sensitivity to market fluctuations by Treynor and Mazuy (1966) concluded that perhaps no investor, professional or amateur, can outguess the market. Patricia and Rolf

(1983) conducted a test to see the consistency in performance of active fund managers and concluded that the best one can hope from selecting an investment manager strictly on the basis of past results is a 50-50 chance of success – about the same odds as a flip of a coin. Sharpe (1991) asserts that, on average, active managers cannot better the returns derived from passive management strategies. The reasoning is that the performance (before investment expenses) of the index equals the weighted average return of both passive and active investors¹. Grinblatt and Titman (1992) analyzed how mutual fund performance relates to the past performance, and found evidence that differences in performance between funds persist over time and that this persistence is consistent with the ability of fund managers to earn abnormal returns. Ippolito (1993) established that there is no evidence of superior performance after adjusting the return for risk and expenses. Carhart (1997) documents that the persistence of performance in actively managed mutual funds is almost completely attributable to common factors in stock returns and scale economies in investment rather than superior portfolio management ability. Denial, Grinblatt, Titman, and Wermers (1997) showed that mutual funds, particularly aggressive growth funds, exhibit some selectivity ability but exhibit no characteristic timing ability. Cunningham and Fender (1999) revisited the debate of passive and active management processes and found that only a very small percentage of money managers have outperformed the after-tax S&P index. Malkiel and Aleksander (2001), found no evidence that the success of indexing is self-fulfilling. Bogle (2002) demonstrated that low cost funds outperform high cost funds on both an absolute and risk-adjusted basis. The majority of performance evaluation studies over the last three and half decades, including Malkiel (1995) and Gruber (1996), have generally questioned the ability of active fund management to outperform the market.

Given the overwhelming evidence that mutual fund managers as a family do not create superior net returns compared to the index through their active fund management process,

¹ Each passive manager will obtain precisely the market return before costs. From this it follows that the average return from the active management must equal the market return.

there is a case for passive index tracking with emphasis on minimizing fund management expenses².

Discerning investors have sought to understand the specific factors that contribute to overall fund performance. This approach to attributing the overall performance to individual causal factors has been a useful tool for internal management control within the fund complex. Several approaches have been noticed in attribution analysis. Fama's (1972) approach is based on the Capital Asset Pricing Model. It splits the overall return into risk-free rate, systematic risk premium, premium for unsystematic risk and returns due to superior fund management capabilities. Multifactor models have included more explanatory parameters, some of which are economy specific while others are firm specific (Ross, 1976). This method has become quite popular in the fund industry. Hendriksson and Merton (1981) established that perfect market timing ability was equivalent to owning a call option that pays at expiration the return to the best performing asset class. Grinblatt and Titman (1984) generated insights about the applicability of commonly used measures of portfolio performance. They decomposed the measured abnormal returns of an investor into three components: selectivity, timing and the mismeasurement of the average beta of the portfolio strategy, Sharpe (1992) recommended asset class factor model that can help make order out of the chaos that often attends the investment process. Denial, Grinblatt, Titman, and Wermers (1997) developed 'characteristic timing' and 'characteristic selectivity' to detect that whether portfolio managers successfully time their portfolio weightings on these characteristics and whether they select stocks that outperform the average stocks having the same characteristics.

² It may, however, be noted that though evidence indicates that active fund management does not pay, this in no way has reduced the size of the actively managed fund industry. Attempts are underway to solve this puzzle. See Shefrin, H. (1999) "Beyond Greed and Fear", Cambridge, MA: Harvard Business School; Shiller, R. (2000) "Irrational Exuberance", Princeton University Press; Shleifer A. (2000) "Inefficient Markets" New York, Oxford University Press

If the passive fund management strategy seeks to mimic the index, then the legitimate performance measure would be to assess the divergence between the fund and the index at any point in time. The tracking error is a statistic that indicates the divergence of the fund from that of the index.

Building an index fund portfolio is theoretically a straightforward approach, requiring the fund manager to invest in all constituent index securities in exactly the same proportion as the underlying benchmark. In practical terms, however, it is not that simple for various reasons. Index represents a mathematical calculation derived from a portfolio of securities that are not subject to the same market frictions faced by the index funds, such as the change in the underlying index. If the compositions, of the underlying index changes, the theoretical portfolio's new weight can be achieved automatically. The index fund manager, on the other hand, will be required to physically trade in the index stocks with a view to realign the portfolio. Apart from index composition changes, transaction costs (Perold 1988), fund cash flows, the treatment of dividends by the index, the volatility of the benchmark and corporate activity (Chiang, 1998), are identified as the main factors driving index fund tracking error. The liquidity of the underlying index will also have implications for transaction costs and, hence, the tracking error incurred by index funds (Keim and Madhavan, 1999). Transaction cost associated with trading in the securities market influences the ability of index mutual funds to replicate the performance of the index. The index itself is calculated as a paper portfolio that assumes that transaction can occur instantaneously, in unlimited quantity and without cost (Perold, 1988). But, the same is not the case with an index fund. Tracking error may also arise when index securities are subject to corporate restructuring, such as merger or take-over by another company outside the index (Chiang, 1998). Beneish and Whaley (1996) identify that front-running by market participants, who acquire index securities ahead of their inclusion in the benchmark, can have undesirable impact on the index funds. The magnitude of tracking error may also depend upon the portfolio management approach used to replicate return on the index³. Non-replication strategies aim to minimize

³ Equity Index Funds can be constituted by a variety of different techniques. Broadly speaking, a fund can include all the stocks which comprise the index known as "fully replicated funds", or can be made up of a sample of stocks known as "sampled funds"

transaction cost compared with full replication strategy. Attempts to reduce transaction costs through sample strategies may, however, result in higher tracking errors arising from the performance of excluded securities (Olma 1998).

Tracking error can be expressed by a variety of statistical measures⁴. The popular measure of tracking error used in the fund industry is the square root of the second moment of the deviations between the portfolio return and benchmark return⁵. However, this measure is not free from limitations. Pope and Yadav (1994) warn of potential estimation bias in tracking error arising from the use of high frequency data (i.e. daily or weekly data). They show that negative serial correlation in tracking error can bias the estimate of tracking error upward. While the use of low frequency data does not lead to significantly negative serial correlation, there is loss of information.

Fisher (2001) defines the relationship between the tracking error and VaR. Blitz and Andiouke (2001) presented a tracking error allocation framework in a three step process: 1) identifying the independent investment decision; 2) ranking the forecasting capabilities for the investment decisions; and 3) calculating the optimum partial tracking error. Sethu & Baid (2002) noticed that tracking error is influenced by extraneous factors (such as inefficient information infrastructure and inefficient fund transfer facilities) that are beyond the influence of the asset management company.

⁴ Fund analytical services such as Morningstar and Lipper have recognized the importance of several factors that contribute to the overall fund performance (past returns, risk ratings, portfolio composition, and fund investment style etc.). However, it has not been possible to integrate all these parameters into a composite theoretical framework that explains the overall fund performance. Much of fund analytics, therefore, has taken recourse to expert judgement rather than theoretical rigour.

$$^5 TE = \sqrt{\frac{\sum_{k=1}^n \{(R_{Pk} - R_{Bk}) - (\bar{R}_{Pk} - \bar{R}_{Bk})\}^2}{n-1}}$$

TE tracking error
 R_{Pk} return of the tracking portfolio in period k
 R_{Bk} return of the predetermined benchmark portfolio in period k
n number of periods

While research has examined the matters relating to tracking error, not much has been said about tracking error attribution. In any case, the importance given to attribution analysis for diversified equity funds and debt funds is conspicuous by its absence when it comes to index funds⁶.

III. Theoretical Framework

As stated in section II above, the literature is replete with discussion about mutual fund performance including that of equity index funds. However, not much has been said about how much should a fund manager be held responsible for an index fund's tracking error. We propose a simple theoretical framework in this direction. Our approach indicates a method to attribute the total tracking error to different sources.

A Mutual fund scheme's balance sheet appears as follows.

Balance Sheet of an index fund scheme

Liabilities	Assets
Net worth (N)	Portfolio (P)
Other liabilities (L)	

Number of units: n

⁶ In this context it may be noted that while index funds are special class of equity funds, the fundamental approach to performance measurement of an active equity fund is completely different from that of a passive equity fund.

Let us assume a hypothetical index fund scheme whose portfolio (asset side of the scheme's balance sheet) is invested in the index. Let us further assume that the outside liabilities are exactly proportional to the asset side of the scheme.

Let the portfolio of the index fund scheme at time t on marked to market basis be P_t . Let the other liabilities be L_t and net worth be N_t . If there are n_t units outstanding then the scheme's net asset value per unit would be

$$NAV_t = (P_t - L_t) / n_t \dots\dots\dots (1)$$

Assuming a constant relationship between the portfolio P and other liabilities L.

Then $L_t = M \cdot P_t$ we get $NAV_t = (1 - M) \cdot P_t / n_t \dots\dots\dots (2)$

The scheme's return during a time period t to t+1 is computed as

$$(NAV_{t+1} - NAV_t) / NAV_t \dots\dots\dots (3)$$

The return furnished by the index during the same period is $(I_{t+1} - I_t) / I_t \dots\dots\dots (4)$

The difference between these two returns is given by (4)-(3)

$$v = (I_{t+1} - I_t) / I_t - (NAV_{t+1} - NAV_t) / NAV_t \dots\dots\dots (5)$$

This can be written in terms of relatives as $v = (I_{t+1} / I_t) - (NAV_{t+1} / NAV_t) \dots (6)$

Therefore from (6) and (2), $v = (I_{t+1} / I_t) - (P_{t+1} / P_t) \cdot (n_t / n_{t+1}) \dots\dots\dots (7)$

If the fund manager is able to build a portfolio made of index, and ***if there are no fresh inflows or outflows***⁷, then, $(P'_{t+1} / P_t) = (I_{t+1} / I_t)$ where P' represents the situation ***without net flows***. But open-ended funds face inflows and outflows. Therefore, the portfolio size at (t+1) would be $P_{t+1} = (P'_{t+1} + X_{t+1})$ where X_{t+1} is the fresh net flow at (t+1).

Then from (7), $v = (I_{t+1} / I_t) - ((P_t \cdot (I_{t+1} / I_t) + X_{t+1}) / P_t) \cdot (n_t / n_{t+1}) \dots\dots\dots (8)$

When there are inflows, new units are allotted to the investors. (Similarly, when there are outflows, existing units are redeemed) The price at which units are sold (and repurchased) has a relationship to the net asset value of the unit. This is stated as,

⁷ Net flows: redemption and fresh sales; net outflow means redemption exceeds fresh sales; net inflows means fresh sales exceed redemption.

$$S = (1+d) \cdot \text{NAV} \text{ where } S \text{ is the price and } d \text{ is the load}^8 \dots\dots\dots(9)$$

The time at which the fund manager invests the inflows, and the time at which the NAV is computed for deciding the price S, are not always the same. Let us assume that the fund received during the interval t to (t+1) is invested at (t+1). There are various practices in the fund industry as to the NAV used for pricing purposes. Some funds use the past (retrospective) NAV (that is, NAV_t), some use the current NAV (that is, NAV_{t+1}), while there are also situations where future (prospective) NAV (that is, NAV_{t+2}) is also used⁹. Let us, for the sake of illustration, follow the retrospective NAV based pricing system. That is,

$$S_{t+1} = (1+d) \cdot \text{NAV}_t \dots\dots\dots (10)$$

Then, X_{t+1} = S_{t+1} · δn_{t+1} where δn_{t+1} is the new units allotted at time (t+1)

$$X_{t+1} = \delta n_{t+1} (1+d) \cdot \text{NAV}_t \dots\dots\dots (11)$$

Substituting (11) in (8) we get,

$$\text{Then } v = (I_{t+1} / I_t) - \{ (P_t \cdot (I_{t+1} / I_t) + \delta n_{t+1} (1+d) \cdot \text{NAV}_t) / P_t \} \cdot (n_t / n_{t+1}) \dots\dots\dots (12)$$

$$v = (I_{t+1} / I_t) - \{ (I_{t+1} / I_t) + \delta n_{t+1} \{ 1+d \} \cdot \text{NAV}_t / P_t \} \cdot (n_t / n_{t+1}) \dots\dots\dots (13)$$

$$v = (I_{t+1} / I_t) \cdot (\delta n_{t+1} / n_{t+1}) - (\delta n_{t+1} \{ 1+d \} \cdot \text{NAV}_t) \cdot (n_t / n_{t+1}) / P_t \dots\dots\dots (14)$$

As P_t · (1-M) = n_t · NAV_t, we get from (14),

$$v = (I_{t+1} / I_t) \cdot (\delta n_{t+1} / n_{t+1}) - (\delta n_{t+1}) \cdot (1+d) \cdot (1-M) / n_{t+1} \dots\dots\dots (15)$$

⁸ As a general matter, the entry and exit loads could be different. Given this, in case of redemption it will be (1 - d₁), in case of fresh sales it will be (1+ d₂). However, our computations assume entry load and exit load are the same.

⁹ NAV applicable for sale and repurchase: 10.30 a.m. –2.30 p.m.: Same day’s NAV; After 2.30; next day’s NAV (IDBI Principal Index Fund); NAV applicable for sale and repurchase: 10.30 a.m. –12.00 a.m.: Same day’s NAV; After 12.00; next day’s NAV (UTI Nifty Index Fund)

$$v = (\delta n_{t+1} / n_{t+1}) \cdot \{ (I_{t+1} / I_t) - (1+d) \cdot (1-M) \} \dots\dots\dots (15)$$

Tracking error (TE) is given by $\sigma \left((\delta n_{t+1} / n_{t+1}) \cdot \{ (I_{t+1} / I_t) - (1+d) \cdot (1-M) \} \right) \dots (16)$

A few inferences can be made from equation (16). When there are no net inflows and outflows, δn_{t+1} would be zero, thereby making the entire expression (16) zero. In other words, a closed end fund would have a zero tracking error if the portfolio is invested in the index whereas an open ended fund might still show a tracking error¹⁰. The magnitude of tracking error in an open-ended fund depends upon the nature of inflows and outflows ($\delta n/n$), the load structure, and the index movements $\delta(I_{t+1}/I_t)$. None of these factors are controllable by the individual fund manager. Index movement is market determined, load structure is determined by the trustees; fund inflows and outflows are determined by the liquidity and investment needs of the unit holders.

Under some seemingly stringent assumptions¹¹, we may try and analyze the how much each of the following factors may contribute to the tracking error:

- the inflows and outflows
- the index movements

Let us assume that the factor $(\delta n_{t+1} / n_{t+1})$ could be pulled out of the bracket in equation (16) and replaced by a representative average such as $(\delta n_{av} / n_{av})$ ¹². Then we get from (16),

$$\text{Tracking error} = (\delta n_{av} / n_{av}) \cdot \sigma (I_{t+1} / I_t) \dots\dots\dots (17)^{13}$$

¹⁰ Exchange traded funds seem more like closed-ended funds, at least for small investors. They might, and then show lower tracking errors.

¹¹ Though the assumptions seem to be stringent, results from our data analysis establish the reasonableness of these assumptions. While the theoretical framework and hypotheses stated in section IV are based on Equation (17), the data analysis is based on equation (16).

¹² This is not strictly right; however, this device helps us to understand the structure of the tracking error in a conceptual way. The validity of such device may have to be reviewed on the basis of empirical results that do not involve such simplistic assumptions. See footnote 8.

Let us assume that the fund begins with n_0 units. Clearly, when the average net flows during a period are positive (i.e., inflows exceed outflows), n_{av} would be larger. In that case, we would expect $(\delta n_{t+1} / n_{t+1})$ to gradually decrease in size thereby leading to lower tracking errors. On the other hand, when the average net flows during a period are negative (i.e., outflows exceed inflows), we would expect $(\delta n_{t+1} / n_{t+1})$ to gradually increase in size, leading to higher tracking errors. In fact, the relationship between tracking error and n_{av} is hyperbolic in nature. An important outcome of this is that the tracking error is magnified substantially when there are net outflows. In other words, the behaviour of tracking error is asymmetric with respect to the direction of net flows.

From the attribution angle, equation (17) quantifies the component of tracking error that would arise even when the fund manager invests in a portfolio that replicates the index perfectly. This uncontrollable component of tracking error can further be attributed to index volatility, and average net flows. A complete attribution framework should be able to further compute the precise contribution by each such factor. Let us begin with equation (17). We can rewrite the equation as

$$TE_{uc} = FF \cdot IR \dots\dots\dots (17)^{10}$$

where TE_{uc} is the uncontrollable component of the tracking error

FF is the average net flows given by $(\delta n_{av} / n_{av})$ and

IR is the volatility of the index computed as the standard deviation of the index relative, $\sigma (I_{t+1} / I_t)$

Assume that the entire universe of index funds exhibits an average net flow pattern of FF_{AV} . Then for an individual fund, $FF_i = FF_{AV} + \delta FF_i$

Using this approach, equation (17) can be written as

$$TE_{uc} = (FF_{AV} + \delta FF_i) \cdot IR \dots\dots\dots (18)$$

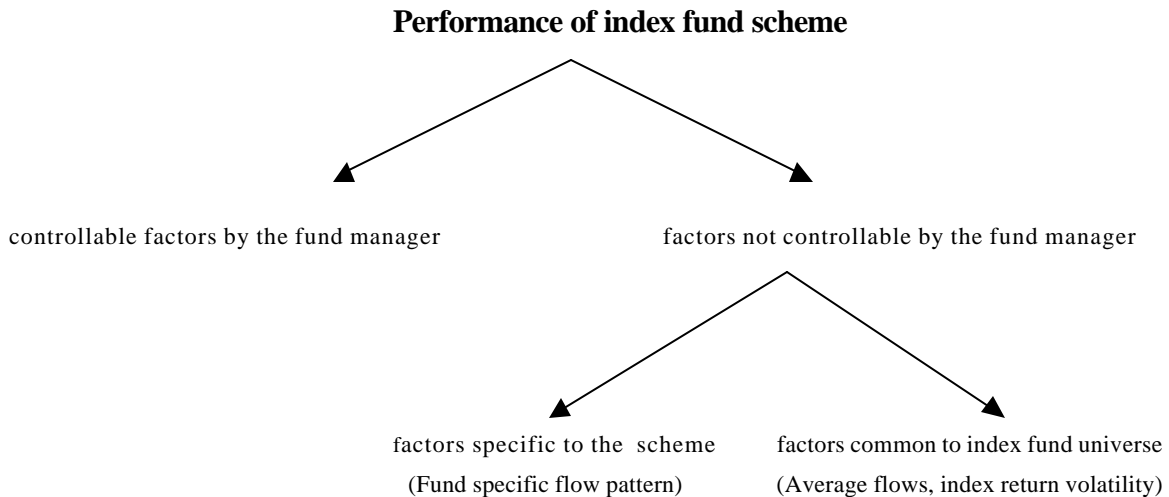
¹⁰ It may be noted that only the magnitude of $(\delta n_{t+1} / n_{t+1})$ is important and not the sign. The tracking error is always positive

The first component is common to index fund universe. The second component is scheme specific. While information relating to net flows is not available in the public domain, agencies that calculate and report fund performance should be able to collect this information, and compute the two components of equation (18)

Summing up the results from the theoretical framework developed here, we may state that:

- i. The tracking error in an index fund arises on account of two broad sets of factors, namely, factors that are controllable by the fund manager and the factors that are not controllable by the fund manager
- ii. Factors controllable by the fund manager are specific to the fund manager's ability to create an appropriate portfolio
- iii. Factors that are not controllable by the fund manager arise from three sources: index return volatility, pattern of net flows in the open-ended fund, and the load structure
- iv. Under some seemingly strong assumptions (with a view more to examine the directional relationship rather than taking recourse to specifically measuring both the direction and magnitude of the contribution by the different factors), it is seen that the uncontrollable component of the tracking error
 - increases with index return volatility
 - increases with average net flows
 - is asymmetric w.r.t. average net flow direction

These findings can be presented as an attribution framework in the following manner:



It is useful to examine the order of magnitude of the tracking error components that we discussed. The index return volatility in the Indian stock markets could be as high as 40%p.a. In the index funds (of size, say Rs. 100 crore) the average inflows and out flows could vary on daily basis from a few lakhs to as high as Rs. 20 crores! It is usually noticed that the outflows are relatively smaller compared to the inflows. However, there could be periods when there could be sustained inflows or outflows. It is unusual that such large flows could be sustained over long periods. If we assume that fund size could increase or decrease by about 25% over a year, and if we assume 252 trading days, then the increase or decrease in fund size, on average could be 0.1% per day. Using these data, equation (17) shows the uncontrollable component of tracking error in the range of 40basis point! Given that good index funds report tracking errors below 50 basis points, this error of 40 basis points is not small. This inference is based on strong assumptions. When we relax these assumptions, the numbers could change.

IV. Hypotheses:

In an open ended portfolio that replicates the index perfectly, the uncontrollable component of tracking error

- increases with index return volatility
- decreases with average net flows
- magnitude is asymmetric w.r.t. average net flow direction
 - increases with net outflows
 - decreases with net inflows

V. Methodology and Data Analysis:

A crucial input required to test the hypotheses is the data relating to daily inflows and outflows. This information is not available in the public domain. Besides, the portfolio disclosures by the various funds indicate that funds are not precisely tracking the index at all times. It is quite easy to create a hypothetical fund mounted on an index and use a simulation exercise to investigate the outcomes. First, we generated a hypothetical index with its returns normally distributed. We assumed several values for index return volatility (5%, 10%, 15%, 20%, 25%, 30%, 35% and 40% p.a.) and generated various scenarios of the index behaviour. To determine the influence of net flows on the tracking error, we generated random distributions (with prescribed means of -0.15% , -0.125% , -0.1% , 0% , $+0.1\%$, $+0.125\%$, and $+0.15\%$ and standard deviation of 0.1%) representing scenarios of mean net inflows and mean net outflows. We assumed that the fund manager exactly tracks the underlying benchmark, and that the other liabilities of the funds move proportional with the asset side of the fund. A measurement window of 3 years (with 252 trading days in year and 756 daily *observations*) was used. In all 280 simulation runs are made.

VI. Results:

The results of the simulation are shown by way of graphs A, B and C.

Graph A shows the relationship between tracking error ¹⁴ and index return volatility for different values of net flows. It is seen that as the index return volatility increases, the tracking error increases. This validates our first hypothesis that ***“the tracking error increases with index return volatility”***. When the index return volatility is 40% and when net flows are -0.15%, the annualised tracking error could be about 20 basis points. This is not a small number.

Graph B shows the tracking error versus average net flows for various values of index return volatility. This confirms our second hypothesis that ***“tracking error decreases with increases in net flows”***.

Graphs B and C show that the tracking error is an inverse function of the average net flows. That is, the sensitivity of tracking error to daily mean net flows is high when the net flows are negative and low when positive. This validates the hypothesis that ***“the magnitude tracking error is asymmetric w.r.t. average net flow direction”***. Tracking errors increase steeply from about 5 basis points to 20 basis points when the net flows turn slightly negative. If the redemption pressure is higher and is sustained for a while, then the tracking error during that period could be substantially higher.

In other words, graph B and C are downward sloping with very steep shape at the left and near flat lines to the right.

¹⁴ In this paper, we are only considering the uncontrollable component of tracking error.

VII. Practical Implication:

It is seen that uncontrollable tracking errors could be sizeable and may overshadow the fund manager's performance. Successful funds are perceived to be those with low tracking errors and large net inflows. Given that inflows do not contribute to tracking error as much as outflows do, this seems to be a case of "*Success breeding Success*".

Both index volatility and net flows are beyond the control of the fund manager. The current tracking error framework exhibits asymmetrical behaviour vis-à-vis. net flows in an open-ended index fund. This places the index fund managers at a serious disadvantage when redemption pressure is high. This raises question as to the neutrality of measurement system to factors extraneous to the fund manager.

Conclusions:

Even if the fund manager invests only in the index, there are various reasons why tracking error would still be present. These factors include the quantum of units sold and repurchased, and the underlying index volatility. Our computations indicate substantial tracking error arising out of these uncontrollable factors. Therefore, while tracking error could be a fair measurement system from the unit holder point of view, it could be an unfair measure as far as the passive fund manager is concerned.

In spite of these findings, it is noticed that several index funds are notching up very low tracking errors in the recent months. It is worth examining how fund managers, even as they attempt to manage funds passively, have been able to keep these influences away resulting in such low tracking errors. It is quite possible that fund managers are spending a lot of time adjusting their portfolios to drive tracking errors to low levels¹⁵. This is contrary to the passive fund management philosophy on which the index funds are based. This could mean that fund managers are driven by performance measurement framework

¹⁵ Minimizing the volatility of tracking error will not produce a more efficient managed portfolio – Richard Roll.

rather than being driven by underlying investment management philosophy of the scheme.

The results seem to indicate the validity of the theoretical framework notwithstanding the extreme simplicity of the model. The findings provide encouragement for building a more robust model and examining index funds performance attribution in greater detail and depth. The theoretical model developed above is not country specific and can be applied across markets. Given that in the developed markets substantial amount of investors' money is going into index funds, such investigation would be a useful.

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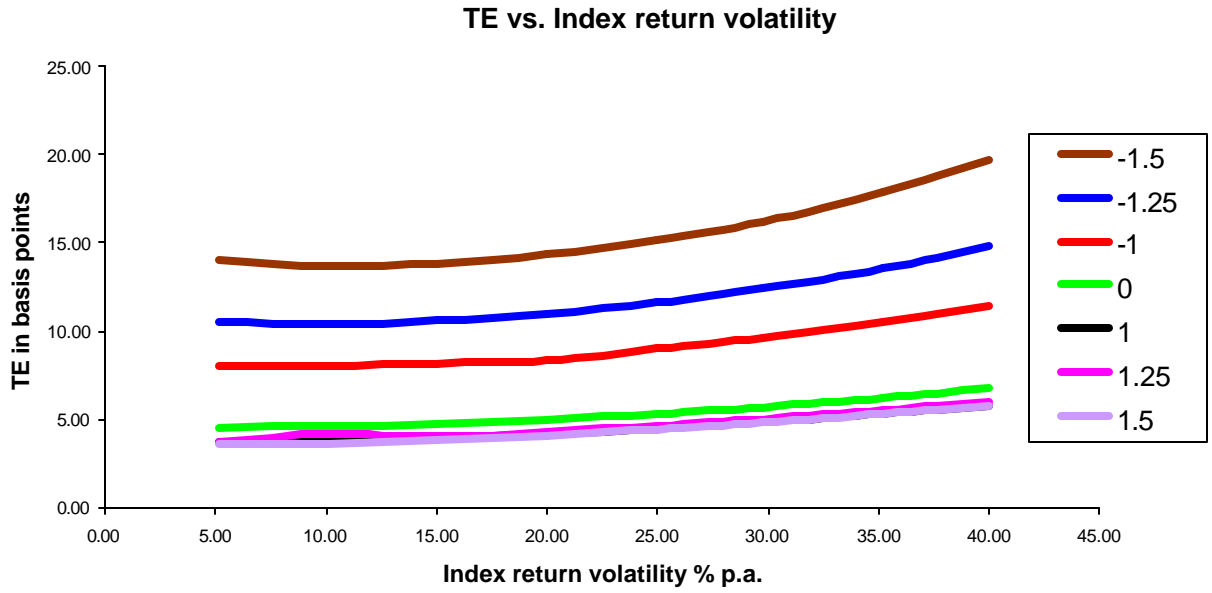
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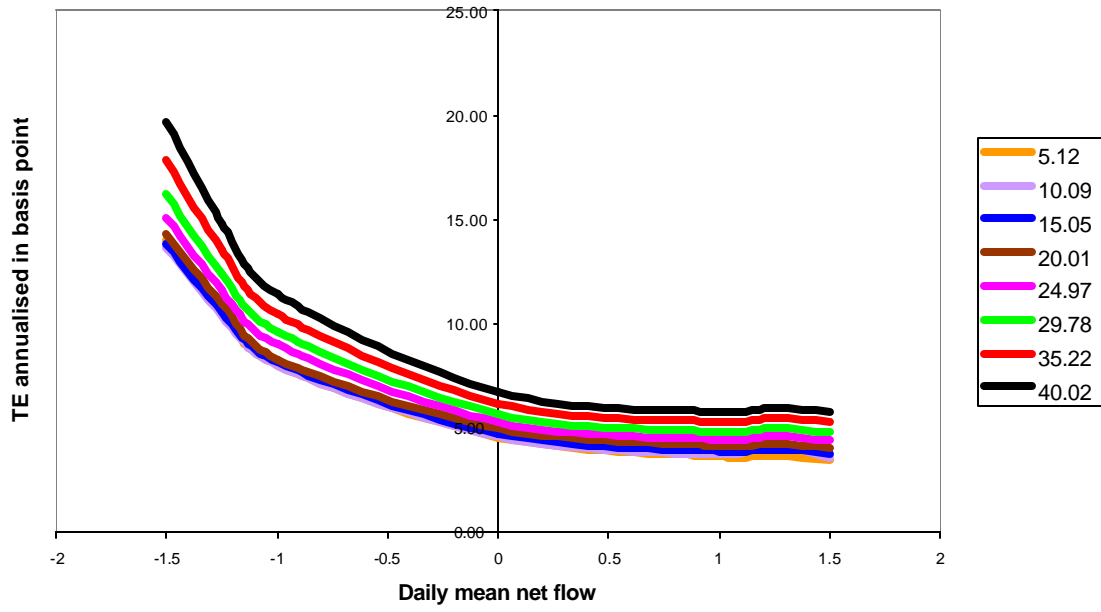
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Graph A



Graph B

TE vs. net flows



Graph C

TE vs. daily net flows

