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A Critical Analysis of Performance Measures of Mutual Funds

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Abstract – The Mutual Fund industry today, with about 44 players and more than two thousand and five hundred schemes, is one of the most preferred investment avenues in India. However, with a plethora of schemes to choose from, the retail investor faces problems in selecting funds. Factors such as investment strategy and management style are qualitative, but the funds' record is an important indicator too. Though past performance alone cannot be indicative of future performance, it is, frankly, the only quantitative way to judge how good a fund is at present. Therefore, there is a need to correctly assess the past performance of different mutual funds. In this context, various tools used for measuring various mutual funds schemes and their units have been critically analyzed. I have made a humble attempt to critically analyze various measures used for the performance of schemes. Readers will understand that different measures will give different results based on the risk-return characteristics of various schemes.

Key Words – Net Assets Value, Assets under Management (AUM), Portfolio Turnover, Standard deviation, Beta, R-Squared, Sharpe Measure, Treynor Measure, Jenson's Model, and Expense Ratio

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PERFORMANCE MEASURES OF MUTUAL FUNDS

Experts suggest investing in top-performing mutual funds to improve upon chances of higher returns. But the question that arises is how to identify whether a fund is performing well or not. Moreover, how to track the performance of your fund once you have invested? Accordingly, in this article, I have made an attempt to relatively analyze various measures used for the performance of mutual funds. Various measures used in this article are (1) Net Assets Value (NAV), Standard Deviation Method, Beta, Sharpe's Measure, Treynor Measure, R-Squared, and Expense Ratio. The relativity of different measures has also been compared to critically analyze a particular measure.

NET ASSETS VALUE (NAV) PER UNIT

Net Assets Value per unit refers to the total assets managed by the fund at their market value divided by several outstanding units of the fund. For example, a fund is having net assets worth Rs. 100 crores and Rs. 10 crore units are outstanding. Thus, the net asset value per unit of the fund would be Rs. 10. The NAV of a scheme will depend on the market value of its investments and hence it will fluctuate with the fluctuating share price of its investments. An increase in NAV means capital appreciation for investors.

Net Asset Value (NAV)
Market Value of investments + Receivables + Other accrued Income + Other assets – Payables – Accrued expenses – Other liabilities.

Let us take an example to understand the concept of NAV. A mutual fund has collected money by the issuance of 1,000 units of the fund @ Rs. 10 each. (We ignore front-end charges, annual fees, and other factors for simplicity purposes.) The amount is invested in the following securities

X: 100 shares @ Rs. 20

Y: 200 shares @ Rs. 10

Z: 300 shares @ Rs. 20

After a week the prices of X, Y and Z are 25, 8 and 30 respectively.

The NAV of the fund is calculated in the following manner:

	No. of Units	Share Price (Rs.)	Amount (Rs.)	Share Price (after one week) in Rs.	Amount (Rs.)
X	100	20	2,000	25	2,500
Y	200	10	2,000	8	1,600
Z	300	20	6,000	30	9,000
Total			10,000		13,100
No. of units			1,000		1,000
NAV			10		13.1

There is a capital appreciation of Rs. 3.1 per unit of the fund.

Return for mutual fund investors can be in the form of dividends from the scheme or capital appreciation in the form of increased NAV or both.

ASSETS UNDER MANAGEMENT (AUM)

It is used to gauge how much money a fund is managing. Mutual Funds use this as a measure of success and comparison against their competitors; in lieu of revenue or total revenue they use total 'assets under management.

The difference between two AUM balances consists of market performance gains/(losses), foreign exchanges movements, net new assets (NNA) inflow/(outflow), and structural effects of the company. Investors are mainly interested in the NNA, which indicates how much money from clients had been newly invested. Furthermore, it's common to calculate the key figure 'NNA growth', which shows the NNA in relation to the previous AUM balance (annualized).

PORTFOLIO TURNOVER

Each buy and sells transaction in the stock markets involves a brokerage cost. This brokerage cost must be borne by the mutual fund, which in turn passes it on to its investors. So, investors have to pay for the trading carried out by the fund on their behalf. Obviously, the higher the volume of trading, the greater will be the associated costs. And greater trading costs can reduce returns. So how does one know how much the fund manager is trading? The answer to this question is provided by the turnover ratio. The turnover ratio represents the percentage of a fund's holdings that change every year. To put it simply, a turnover rate of 100 percent implies that the fund manager has replaced his entire portfolio during the period given. The higher the turnover ratio, the greater is the volume of trading carried out by the fund.

Is a high turnover bad? Well, that depends on what it achieves. If high turnover can generate high returns, then there should be no problems. The problem arises when a fund is trading heavily and not generating commensurate returns. The turnover ratio is more important for equity funds where the trading cost of equities is substantial. So, each time a fund manager buys and sells, he must keep in mind that the cost of buying and selling will eat into the fund's returns.

STANDARD DEVIATION

The most basic of all measures- Standard Deviation allows you to evaluate the volatility of the fund. Put differently it allows you to measure the consistency of the returns.

Volatility is often a direct indicator of the risks taken by the fund. The standard deviation of a fund measures this risk by measuring the degree to which the fund fluctuates in relation to its mean return, the average return of a fund over a period.

A security that is volatile is also considered higher risk because its performance may change quickly in either direction at any moment.

A fund that has a consistent four-year return of 3%, for example, would have a mean, or average, of 3%. The standard deviation for this fund would then be zero because the fund's return in any given year does not differ from its four-year mean of 3%. On the other hand, a fund that in each of the last four years returned -5%, 17%, 2%, and 30% will have a mean return of 11%. The fund will also exhibit a high standard deviation because each year the return of the fund differs from the mean return. This fund is, therefore, riskier because it fluctuates widely between negative and positive returns within a short period.

BETA

Beta is a commonly used measure of risk. It basically indicates the level of volatility associated with the fund as compared to the benchmark.

So quite naturally the success of Beta is heavily dependent on the correlation between a fund and its benchmark. Thus, if the fund's portfolio doesn't have a relevant benchmark index then a beta would be grossly inadequate.

A beta that is greater than one means that the fund is more volatile than the benchmark, while a beta of less than one means that the fund is less volatile than the index. A fund with a beta very close to 1 means the fund's performance closely matches the index or benchmark.

If, for example, a fund has a beta of 1.03 in relation to the BSE Sensex, the fund has been moving 3% more than the index. Therefore, if the BSE Sensex increased 10%, the fund would be expected to increase 10.30%.

Investors expecting the market to be bullish may choose funds exhibiting high betas, which increase investors' chances of beating the market.

If an investor expects the market to be bearish soon, funds that have betas less than 1 are a good choice because they would be expected to decline less in value than the index.

Sharpe Ratio and Treynor Ratio are the tools to measure the performance of mutual funds over a period.

R-SQUARED (R^2)

The success of Beta is dependent on the correlation of a fund to its benchmark or its index. Thus whilst considering the beta of any security, you should also consider another statistic- R squared that measures the Correlation

The R-squared of a fund advises investors if the beta of a mutual fund is measured against an appropriate benchmark. Measuring the correlation of a fund's movements to that of an index, R-squared describes the level of association between the fund's volatility and market risk, or more specifically, the degree to which a fund's volatility is a result of the day-to-day fluctuations experienced by the overall market.

R-squared values range between 0 and 1, where 0 represents no correlation and 1 represents full correlation. If a fund's beta has an R-squared value that is close to 1, the beta of the fund should be trusted. On the other hand, an R-squared value that is less than 0.5 indicates that the beta is not particularly useful because the fund is being compared against an inappropriate benchmark.

RELATION BETWEEN BETA AND R – SQUARED

1. BETA

Suppose that the Beta of your mutual fund scheme is 1.2. Hence you may hope that if the market moves by 10% your scheme returns will move up by 12%. However, it also depends on the value of R Squared. If the R Squared of your fund is 0.5, then in that case you cannot use Beta accurately. It will not represent the underlying stocks of your scheme. The reason is that R squared should be between 0.8 to 1. Only then it will bear a strong relationship with the benchmark index and hence Beta will reflect the movement of the scheme accurately.

Fortunately, there are statistical tools, which can give you an idea of how a fund will move in relation to the market. Hence if you feel sure about certain market predictions, then you can also get an idea of your funds' response in the future.

1. Beta is a statistical measure that shows how sensitive a fund is to market moves. Thus, if the Sensex moves up by 25%, a fund's beta will tell you whether the fund's return will be more than 25% or less than 25%.

2. The beta value of an index itself is taken as one.

3. Equity funds can have beta values, which can be above one, less than one or equal to one.

4. By multiplying the beta value of a fund with the expected percentage movement of an index, the expected movement in the fund can be determined.

5. Thus, if a fund has a beta of 1.2 and the market is expected to move up by 10%, the fund should move by 10% (obtained as 1.2 multiplied by 10). Similarly, if the market loses ten percent, the fund should lose 12% (obtained as 1.2 multiplied by minus 10)

6. This shows that a fund with a beta of more than one will rise more than the market and fall more than the market. Clearly, if you would like to beat the market on the upside, it is best to invest in a high beta fund. But you must keep in mind that such a fund will also fall more than the market on the way down.

7. Therefore, it is worth noting, that over an entire cycle, returns may not be much higher than the market.

8. Similarly, a low beta fund will rise less than the market on the way up and lose less on the way down.

9. Therefore, if your prime concern is safety, a fund with a beta of less than one is a better option. Such a fund may not gain much more than the market on the upside; it will protect returns better than market falls.

10. So, beta seems to be just what the doctor ordered. But as in the case of all things which seem to be too good to be true, there is a catch.

11. The problem is that beta depends on the index used to calculate it. It can happen that the index bears no correlation with the movements in the fund. Thus, if the beta is calculated for a large-cap fund against a mid-cap index, the resulting value will have no meaning. This is because the fund will not move in tandem with the index.

12. Due to this reason, it is essential to look at a statistical value called R-squared along with beta.

2. R SQUARED

1. R-squared is a statistical measure that represents the percentage of a fund's movements that can be explained by movements in a benchmark index. It is thus a measure of the correlation between a fund and its benchmark.

2. For fixed-income securities, the benchmark is the T-bill. For equities, the benchmark is the BSE, Sensex, or NSE Nifty.

3. The R – Squared value shows how reliable the beta number is.

4. It varies between zero and one.

5. An R – Squared value of one indicates a perfect correlation with the index.

6. Thus, an index fund investing in the Sensex should have an R – Squared value of one when compared to the Sensex.

7. For equity diversified funds, an R squared value greater than 0.8 is generally accepted to mean that the underlying beta value is reliable and can be used for the fund.

8. A high R squared (between 0.85 and 1) indicates the fund's performance patterns have been in the line with the index.

9. A fund with a low R squared (0.7 or less) does not act much like the index.

10. For example, if a fund has an R – Squared value of close to 1 but has a beta below 1, it is most likely offering better risk-adjusted returns.

11. If a fund has an R – Squared value of close to 1 but has a beta above 1, it is most likely going to offer higher volatility and higher returns in an upward market and lower returns in a downward market. The fund would be relatively riskier

12. A low R – squared means you should ignore the beta.

Beta and R – squared should thus be used together when examining a fund's risk profile.

MEASURES OF RELATIVE PERFORMANCE

THE SHARPE MEASURE

In this model, the performance of a fund is evaluated based on the Sharpe Ratio, which is a ratio of returns generated by the fund over and above the risk-free rate of return and the total risk associated with it. Sharpe Ratio is obtained by dividing the difference between the return of the portfolio and the risk-free rate of interest by the standard deviation of the portfolio return. This ratio considers surplus return earned by the fund over risk-free rate of interest and then divides it by standard deviation of the portfolio return (which is basically a representative of risk which measures the deviation of the actual return of the portfolio with respect to mean return).

Symbolically, it can be written as:

Sharpe Index or Sharpe Ratio (S_i) = $(R_i - R_f)/ \sigma_p$

Where, R_i is the return of the fund/portfolio, R_f is the risk-free rate of return/interest and σ_p is the standard deviation of the fund/portfolio return.

The logic here is that while comparing the performance of various mutual funds we should see "surplus return over risk-free rate" per unit of standard deviation. What we are comparing is surplus return per unit of risk which we are undertaking. Higher the return better is the fund. Let us say there are two funds. The first one has consistently given a return of 10% in the last three years. The other fund has given a return of 10%, 5%, and 15% (averaging 10%) in the last 3 years respectively. Which fund is better? The answer here is that although both these funds have given equal returns, fluctuations in 2nd funds are higher. When we calculate return per unit of risk, it will be higher for the 1st fund and hence its performance is better.

	Fund A	Fund B
Risk-Free Rate of Return	8%	8%
Return of Portfolio	14%	18%
Standard Deviation of Portfolio	20%	40%

In the above example we can see that return of fund A has been 14% while the return of fund B has been 18%. We can very easily be misguided and assume that the performance of Fund B has been better. The fact is that we never judge the performance of a fund without bringing in the element of risk into our analysis. Let us calculate Sharpe Ratio

	Fund A	Fund B
Sharpe Ratio	= (14-8)/20	=(18-8)/40
	=0.3	=0.25

What we can see is that the surplus return which we can earn per unit of risk is higher in case of Fund A. Thus according to this measure performance of Fund A has been better.

THE TREYNOR MEASURE

Developed by Jack Treynor, this performance measure evaluates funds based on Treynor's Index. This Index is a ratio of return generated by the fund over and above the risk-free rate of return (generally taken to be the return on securities backed by the government, as there is no credit risk associated), during a given period and systematic risk associated with it (beta). Treynor Ratio also considers surplus return earned over risk-free return but the measure of risk here is beta (a measure of systematic risk) rather than the standard deviation. The emphasis is more on market risk (systematic risk) rather than the deviation of returns from the mean. It should be noted that this measure ignores the unsystematic risk or risk which is typical to a particular security. This measure is more relevant as unsystematic risk is negligible in the overall portfolio of a mutual fund (or at least supposed to be) and hence it is feasible to judge the performance of a fund from this measure. Thus, the Treynor ratio is obtained by dividing the difference between the return of the portfolio and the risk-free rate of interest to the beta (market risk/systematic risk) of the portfolio. Symbolically, it can be represented as

Treynor's Index or Treynor Ratio (T_i) = (R_i - R_f)/ β_i.

Where R_i represents the return of the portfolio/fund, R_f is the risk-free rate of return/interest and β_i is the beta of the portfolio/fund.

	Fund A	Fund B
Risk-Free Rate of Return	8%	8%
Return of Portfolio	14%	18%
Beta of the Portfolio	0.7	1.4

TREYNOR RATIO

	Fund A	Fund B
Treynor Ratio	=(14-8)/0.7	=(18-8)/1.4
	=8.57%	=7.14%

According to this measure, the performance of Fund A is better than the performance of Fund B irrespective of higher return of Fund B.

Can these Ratios give a different Result?

More often than not these ratios give the same evaluation rankings. But there can be situations when the rankings given by these ratios differ. Let us take an example of such case:

	Fund A	Fund B
Risk-Free Rate of Return	8%	8%
Return of Portfolio	14%	18%
Standard Deviation of Portfolio Returns	80%	90%
Beta of the Portfolio	0.7	1.4
Sharpe Ratio	0.075	0.11
Treynor Ratio	0.085	0.071

In the above example both the measures are giving exactly opposite performance evaluation of the funds. As per Sharpe Ratio, Fund B has outperformed Fund A. On the other hand, as per Treynor Fund A has done better. A clear understanding of Standard deviation and beta will help us in solving this anomaly. If the objective of the investor is to benchmark the performance of these funds with the market, then he should take Treynor Ratio as an appropriate measure. On the other hand, if he is more concerned with the fluctuations return over a period of time, he should take Sharpe Ratio as a reasonable measure for evaluation.

ABSOLUTE PERFORMANCE MEASURES

There are some absolute performance measures such as *Jenson's Alpha*, *Fama's Measure* and *Expense Ratio* which provide an indication about the performance of a mutual fund as a whole.

JENSON'S MODEL [JENSON'S ALPHA]

Jenson's model proposes another risk-adjusted performance measure. This measure was developed by Michael Jenson and is sometimes referred to as the Differential Return Method. This measure involves the evaluation of the returns that the fund has generated vs. the returns actually expected out of the fund given the level of its systematic risk. The surplus between the two returns is called Alpha, which measures the performance of a fund compared with the actual returns over the period. *Jenson's Alpha Measure* helps us in identifying whether the fund has been able to outsmart its expected return. This concept is related to CAPM. When a portfolio is constructed out of different securities, a certain

return is expected from it in accordance with its beta.

One of the set standards used to measure the performance of mutual funds is its market benchmark. Alpha is a financial ratio that reflects the returns generated by the fund over and above the returns generated by the benchmark index. If the value of Alpha is zero, it means that the fund has performed in line with the benchmark, whereas a negative value would mean underperformance as compared to its benchmark index. However, if the value of Alpha is above zero, it means that the fund has outperformed. For instance, if a mutual fund generates a return of 15% in a year, whereas the benchmark grows at 12%, the Alpha value, in this case, would be 3. It is generally considered as a measure that represents the value that a fund manager adds or subtracts to a portfolio's returns.

The expected return of a security is equal to

$R_e = R_f + \beta(R_m - R_f)$

Where, R_f is the risk-free return, β is the systematic risk and R_m is the return on the market index (return earned by the fund or average market return during the given period). After calculating it, alpha can be obtained by subtracting the required return from the actual return of the fund.

Higher alpha represents the superior performance of the fund and vice versa. The limitation of this model is that it considers only systematic risk, not the entire risk associated with the fund and an ordinary investor cannot mitigate unsystematic risk, as his knowledge of the market is primitive.

Let us take an example

Risk Free rate of interest i.e. Return provided by Government securities = 8%

Return on Sensex = 16%

Beta of the portfolio = 1.2

Thus, the expected return on the portfolio = 8% + 1.2(16%-8%) = 17.6%

What we can infer from this is that any investor who is investing in a security with a beta of 1.2 or a portfolio with a beta of 1.2 is reasonably expected to earn 17.6% when the market yields 16%.

It should be noted that when we are investing in security with a beta of 1 we earn what the market portfolio (Sensex or Nifty) has earned.

Now let us introduce the concept of Jenson's Alpha:

Jenson's Alpha = R_m-R_e

Where Rm is the return earned by the fund.

Thus a mutual fund should be evaluated on the basis of excess return which it has been able to earn over its expected return. (Expected return as discussed above is what anyone is expected to earn by investing in securities of that risk class i.e. beta)

Let us say that in the above scenario there is a fund that has given a return of 20% (with 1.2 as portfolio beta). Thus its Jenson's Alpha is 20%-17.6% = 2.4%

Since this value is positive the fund has been able to outsmart market expectations.

FAMA'S MEASURE

Fama's measure is obtained by the following formula:

Fama's Measure = $R_p - [R_f + (\sigma_p/\sigma_m)(R_m - R_f)]$

Where, R_p = actual return of portfolio; R_f = risk-free return, R_m = return on a market index, σ_p = standard deviation of portfolio return, σ_m = standard deviation of the market index return. Thus, instead of β, which considers only systematic risk, this measure takes into account the standard deviation of stock return as well as the standard deviation of market returns.

EXPENSE RATIO

Expense ratio refers to the total amount of expenses of the fund as a percentage of total assets of the fund. The expenses include all the charges in the form of administrative overheads, salary of staff, etc. However, expenses do not include brokerage.

The Expense ratio states how much you pay a fund in percentage term every year to manage your money. For example, if you invest Rs 10,000 in a fund with an expense ratio of 1.5 percent, then you are paying the fund Rs 150 to manage your money. In other words, if a fund earns 10 percent and has a 1.5 percent expense ratio, it will mean an 8.5 percent return for an investor. Funds' NAVs are reported net of fees and expenses; therefore, it is necessary to know how much the fund is deducting. Since this is charged regularly (every year), a high expense ratio over the long term may eat into your returns massively through the power of compounding. Different funds have different expense ratios. But the Securities & Exchange Board of India has stipulated a limit that a fund can charge. Equity funds can charge a maximum of 2.5 percent, whereas a debt fund can charge 2.25 percent of the average weekly net assets.

The largest component of the expense ratio is management and advisory fees. From

management fee, an AMC generates profits. Then there are marketing and distribution expenses. All those involved in the operations of a fund like a custodian and auditors also get a share of the pie. Interestingly, brokerage paid by a fund on the purchase and sale of securities is not reflected in the expense ratio. Funds state their buying and selling price after taking the transaction cost into account. Recently, funds have launched institutional plans for big-ticket investors, where the expense ratio is relatively lower than normal funds. This is because the cost of servicing is low due to larger investment amounts, which means lower expenses. A lower expense ratio does not necessarily mean that it is a better-managed fund. A good fund is one that delivers a good return with minimal expenses.

MAJOR ISSUES INVOLVED IN MUTUAL FUND INVESTING

The return on these funds is never equal to the return on securities that the investor can earn if he invests directly in those securities. The reason being, the front-end load, back end load, and annual expenses deducted from the fund.

FRONT END FEES

This is the fee charged by the AMC at the time of initial investment in the fund. Let's say an investment scheme charges a Front-end fee of 1% at the time of investment. So, when an investor is investing Rs.100 in the scheme, the amount which will be invested by the AMC will be Rs.99 i.e. after deducting 1% as AMC charges.

Amount to be invested: 10,000 Front end fees: 2% Investor can earn a return of 16% himself What is the return which a mutual fund should earn to give the investor a return of 16%. Ignore annual charges for the time being.
Step 1: Investor has to earn a minimum of 1600 (i.e. 16% of 10,000 which he can himself earn from the market) Total value of this investment after 1 year: 10,000 + 1,600 = 11,600 **Step 2:** Amount which has been invested: 10,000 Amount which has been deducted as Front-end fees: 2% of 10,000 Amount finally pooled for investments: 9,800 Investors should receive a return from this investment such that total inflow for the 1st year is at least 11,600 what he can himself earn from the market. So, the total return which these funds of 9,800 should give is 11,600 – 9,800 = 1,800 Therefore, return expressed in percentage = 1,800 x 100/9,800 = 18.36% Thus, a return of 18.36% will make the investor indifferent to both the alternatives. An important point to note here is that at a portfolio return of 18.36% the effective return to an investor will only be 16%.

EXIT LOAD

This is the amount of fee charged in the form of a percentage at the time of redemption/surrender of the unit. Generally, funds that charge front-end fees do not charge back-end fees/exit load.

ANNUAL RECURRING EXPENSES

These are expenses that are deducted annually for meeting administrative and other expenses of the fund.

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