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# PERFORMANCE ATTRIBUTION

## APPROACHES, PITFALLS & BEST PRACTICES

Gone are the days where back-of-the-head understanding of returns and risks was good enough to manage and maneuver the portfolio. With availability of sophisticated solutions, fund managers are increasingly adopting advanced techniques to measure the portfolio performance in an objective and comprehensive manner. This paper discusses the performance analysis, their approaches and some best practices.

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## DEFINING ATTRIBUTION

Attribution analysis segregates the outperformance of the portfolio (with respect to the index) to the relevant factors and across hierarchies.

Attribution, in fund management parlance, has been a widely used term referring to metrics ranging from returns, contribution and alpha attribution to fund management decisions.

An equity fund manager makes his bets on sectors and selects securities within a sector to outperform the market index against which he/she is benchmarked. Essentially, he makes two decisions, viz. Sector Allocation and Security Selection. The outperformance of the fund is attributed to these two decisions via attribution analysis, which explains a fund manager's skill at understanding sectors or picking stocks or both.

The process of attributing the performance of a portfolio to the fund management decisions and hence skill is called Attribution.

## AVOID THE TRAP

### Attribution vs. Contribution

Attribution is widely misunderstood as a contribution analysis which is the weighted return contribution of portfolio constituents to the portfolio return<sup>1</sup>

Attribution is different than contribution and the following example demonstrates why an analysis based on contribution might be incorrect.

Table 1 demonstrates a sample Fund benchmarked against an Index. The holdings comprise of four stocks with suggested weights and returns. Portfolio outperforms the index by 0.7% (Alpha=0.7%), the outperformance being contributed by various securities. Let's consider the Contribution column which suggests that Stock A overweight was the best decision yielding 0.5% outperformance. This can be interpreted as more weight in Stock A would have increased alpha.

Table 1. Base Case Scenario

Stocks	Fund Wt.	Index Wt.	Returns	Fund Returns	Index Returns	Contribution	Attribution
A	33%	25%	6%	2.0%	1.5%	0.5%	0.3%
B	19%	25%	3%	0.6%	0.8%	-0.2%	0.0%
C	29%	25%	5%	1.5%	1.3%	0.2%	0.1%
D	19%	25%	-4%	-0.8%	-1.0%	0.2%	0.4%
Total	100%	100%	-	3.2%	2.5%	0.7%	0.7%

Table 2 demonstrates the effect of putting additional 3% in Stock A in the fund, thus overweighting it even more. The 3 % is balanced by reducing 1 % from other stocks. Rightly, by putting more money in the best performing stock, the portfolio alpha increases to 0.9%.

**Table 2. Aligning weights as per Contribution**

Stocks	Fund Wt.	Index Wt.	Returns	Fund Returns	Index Returns	Contribution	Attribution
A	36%	25%	6%	2.2%	1.5%	0.7%	0.4%
B	18%	25%	3%	0.4%	0.8%	-0.2%	0.0%
C	28%	25%	5%	1.4%	1.3%	0.2%	0.1%
D	18%	25%	-4%	-0.7%	-1.0%	0.3%	0.5%
Total	100%	100%	-	3.4%	2.5%	0.9%	0.9%

Now let's consider the Attribution column in Table 1. Attribution column depicts that the majority of outperformance was contributed by the underweight decision in Stock D. This can be interpreted as even more underweight in Stock D would have increased alpha. Table 3 demonstrates the effect of removing additional 3% from Stock D in the fund, thus underweighting it even more. The 3 % is balanced by adding 1 % to other stocks. As expected due to more underweight in the worse performing sector the alpha contributed by Stock D increases. It's worth noting that the alpha of the portfolio has increased to 1%, which is higher than the alpha is Table 2.

**Table 3. Aligning weights as per Contribution**

Stocks	Fund Wt.	Index Wt.	Returns	Fund Returns	Index Returns	Contribution	Attribution
A	34%	25%	6%	2.0%	1.5%	0.5%	0.3%
B	20%	25%	3%	0.6%	0.8%	-0.2%	0.0%
C	30%	25%	5%	1.5%	1.3%	0.3%	0.1%
D	16%	25%	-4%	-0.6%	-1.0%	0.4%	0.6%
Total	100%	100%	-	3.5%	2.5%	1.0%	1.0%

This implies that underweighting Stock D was a better decision as compared to overweighting Stock A, with the given weights, which is brought forward clearly by Attribution analysis.

The example establishes the fact that analysis based on contribution, though informative, can be quite misleading in nature.

Segregating returns contributed by various constituent securities can also be termed as attribution

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## ATTRIBUTION APPROACH

Fund managers should use the attribution approach as per the fund management style and mandate. This section provides a brief on the various approaches to attribution. A deep dive and explanation of each methodology is beyond the scope of this paper.

### Holdings vs. Transaction based

The holdings based approach primarily works on the holdings data and doesn't take into account the transactions. This might be good enough for a passive portfolio, however for active portfolio managers who regularly maneuver their portfolios, transactions based approach is advisable. It becomes a must when one is analyzing performance over a long period where the number of transactions might start impacting the returns.

### Based on fund management decisions (type of fund – equity/debt, Fund Style etc.)

Since the objective of performance attribution is to attribute performance to fund management decisions, the approach followed for a fund should map the fund management philosophy. Many fund managers get plagued by using the attribution system without regard to the fund style.

While the equity fund managers decide on the sector allocation and stock selection, the fixed income fund managers' decisions are relevant to the movement of base yields, spreads across the maturity buckets. Using an equity attribution approach by a debt fund manager might not be wise. Attribution factors like Carry, Curve and Spread would make more sense to a debt fund manager. Similarly, an equity fund manager who is mandated to be a stock picker without any constraints around sectors, shouldn't be using a typical equity allocation-selection approach.



### Based on fund management decisions (type of fund – equity/debt, Fund Style etc.)

Within equity attribution, there are various approaches including the Arithmetic and Geometric approach. Where Arithmetic approach calculates the outperformance based on the difference of returns, geometric approach calculates the same as a ratio of portfolio and benchmark returns. The approaches can use various methodologies including Brinson, Brinson-Fachler and Brinson-Hood-Beebower models to segregate the outperformance into the relevant factors.

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## ACHIEVING COMPREHENSIVENESS

Looking at just the returns of the portfolio might lead to an incorrect evaluation. A comprehensive analysis of risk, returns, consistency and style is important to reach a performance related judgment. Additional factors might be required to handle derivatives and trading.

### Custom attribution factors

Fund houses should ensure that the attribution factors map to the fund management style. For example, if the fund managers are dealing with derivatives the attribution analysis should demonstrate the impact of leveraging the portfolio as compared to the cash investments. Similarly, a trader's effectiveness should be analyzed by the intra-day timing of transactions.

### The True North: Risk Adjusted Performance Measures

A fund's performance should be evaluated with a comprehensive approach. Risk Adjusted Performance Measures help in understanding if the return generated was commensurate with the levels of risk assumed in the portfolio. Many statistics like Jensen Alpha, Tracking error, Sharpe, Treynor and Sortino ratios are widely used for the same. Consistency in various market scenarios is also a litmus test. Fund houses should keep track of deviation of fund from the mandated style and the relevance of the benchmark index while measuring outperformance of funds. A large cap fund compared to a large cap index can easily show outperformance when the mid-caps are rallying and the fund manager has shifted style in favor of midcaps.

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## ACHIEVING ACCURACY

Since the analysis is highly sensitive to data, fund houses should ensure data sanctity failing which the outputs might be way off the reality.

It's important that emphasis be laid on being accurate while doing attribution analysis. Excel can be used for some preliminary analysis but it is advisable to use a system as the reliance and acceptance of the attribution analysis in the fund house grows.

### Transaction Costs, Dividends, Management Fees

Many systems assume transactions at the end of the day price which leads to inaccuracies. Transactions should be considered at actual price and net of brokerage and other charges. Dividends should be taken into account while calculating the performance for accuracy. Generally attribution is done gross of fee because management fee is not a fund management decision. If required, fund management fee can be added back to the top level returns to calculate the net of fee performance.

## Data Sensitivity

This is one of the most important, still the widely neglected aspect. Since this analysis relies heavily on data, even a single bad data point may lead to incorrect analysis. Missing a split/bonus, incorrect stock-sector mappings, incorrect prices and missing/bad data are a few of the numerous pitfalls encountered. Handling these issues and the data size become all the more challenging if analysis is done using excel.

## Daily Attribution

Daily calculation of returns and attribution effects is the most accurate methodology of attribution. These daily numbers should be subsequently aggregated for analysis of the desired period. This ensures that the reported numbers are accurate and represent the correct picture. GIPS has suggested TWR methodology for attribution which implies considering the transactions with a Time-Weighted-Return approach. The approach would suffice for basic analyses; however the fund houses should migrate to daily attribution which is the purest form of TWR.

## Return Aggregation

The attribution factors over a period cannot be aggregated by using the  $(1+f_1) * (1+f_2)...$  compounding method. This method can only be applied to portfolio level returns and stock/sector un-weighted returns. Since the attribution factors are weighted statistics, sophisticated algorithms<sup>2</sup> should be used to aggregate the daily outputs for the multi-period analysis.

<sup>2</sup> Cariño, Menchero, Frongello are some of the algorithms

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