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Decision-Based Evaluation of the Performance of a Hierarchically Structured Investment Process

What calculation method is your performance attribution system based on? The authors say it's most likely one developed by Brinson and Fachler, Allen, or Karnosky and Singer. However, these methods aren't always the best choice, say the authors, because they "do not follow the investment decision process exactly." As you might suspect, they have their own model to offer – the Investment Decision Process model.

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An explosion of new technology is allowing investment managers to assess and recast their holdings almost instantly. As assets under management become a dominant measure of success for professional investment organizations, asset managers look to technology for help in making swifter, smarter decisions about the investment process. They also seek tools that can analyze and document their skill to prove their value to inside and outside clients. Performance-attribution systems are high on the wish lists of many asset managers as a means for measuring which investment decisions paid off relative to a relevant benchmark – and which did not.

However, these professionals are increasingly aware that performance attribution only yields sensible results if the method used perfectly reflects the investment decision process. If performance is awarded to decisions[1] not actually made, it not only leaves questions unanswered, but it also might lead to misleading insights.[2] In practice, such an essential precondition makes performance evaluation a complicated task.

Currently, investment professionals are focused on the details of the total investment process. Several standards will require investment organizations to implement daily[3] calculations in order to produce numbers and figures that are more accurate. The intricacies involved in these calculations are being researched at an accelerated pace[4] together with new attribution methodologies that focus on fixed income assets.[5] Presently, most performance attribution systems are based on the methods developed by Brinson and Fachler, Allen, or Karnosky and Singer and rather limited in their use with sector and issue selection attributions. These methods are primarily designed for portfolios of (international) equity, but they are applied to other asset classes as well, such as fixed income, in which one is likely to make rather different types of decisions than those made in equity portfolios. Applying these methods is inherently incorrect, because they do not follow the investment decision process exactly. The correct model is based on the specific type of decisions portfolio managers make and the actual decisions should therefore, as much as possible, be supported by the implemented attribution model.

Because investment processes differ and change through time, performance attributions require a flexible model that accounts for the changing nature of the various investment decision processes per asset type. This approach not only addresses changes in the structure or the decisions at the operational, stock-picking level, but also in the total hierarchy of the investment process.

This article introduces a generic attribution model for the complete investment organization. Importantly, the model separates the hierarchical structure of the investment process from the attribution method and therefore allows one to implement different attribution methods for various parts of the investment process.

THE INVESTMENT PROCESS

One can consider the investment departments of large institutions as investment organizations that manage the assets of one or more clients. Often a hierarchically structured investment process is adopted, in which several professionals make decisions on various levels that impact the ultimate composition of the investment portfolio. Consequently, the results obtained by the portfolio managers on the operational level depend on the decisions (*i.e.*, budget allocations) made by others on the higher levels. In other words, the decisions made by portfolio managers contribute not only to the total result of the organization, but also to the subsequent decisions. For an accurate assessment of the quality of the investment organization as a whole, it is necessary to measure and record the marginal value of every decision made.

The purpose of this article is to show which steps are needed to evaluate the performance of every decision made by the investment organization. This is done by presenting answers to the following questions:

- How can we map the hierarchy of the organization?
- How do we disentangle the contribution of each decision in the overall result?
- Which attribution methods are suitable for this analysis and does one combine various attribution methods for different types of decisions?

Designing a performance evaluation process takes two steps. First, we define the hierarchy of the investment organization. Within this hierarchy, the decision layers and the prevailing order of decisions are identified. These issues are important because the type and the order of the decisions determine to a large extent the correct attribution methods. Second, the organization selects the desired measurement and attribution methodologies, which are best to reflect the added value of the decisions made on various levels, together with the limitations established by previous decisions.

THE IDP-MODEL

To support the investment process, we have developed the Investment Decision Process (IDP) Model for structuring the investment process and implementing the correct attribution methodologies. We will clarify the concepts of the IDP-Model with a simple example, which is based on the method by Brinson and Fachler (BF).[6,7] In practice, such a method is a two-step process. However, most investment processes consist of more than two decision levels. In order to evaluate such processes, one should correctly 'stack' several BF schemes.

The Investment Decision Process includes every decision made concerning the division of the assets under management over the various asset categories. To analyze each decision's contribution to the total return, a modeling approach must measure the marginal value of every individual decision. In this respect, the hierarchy of the decisions becomes crucial. We therefore use the IDP-Model, which serves as a proper foundation for registering the decisions and relating them to each other.

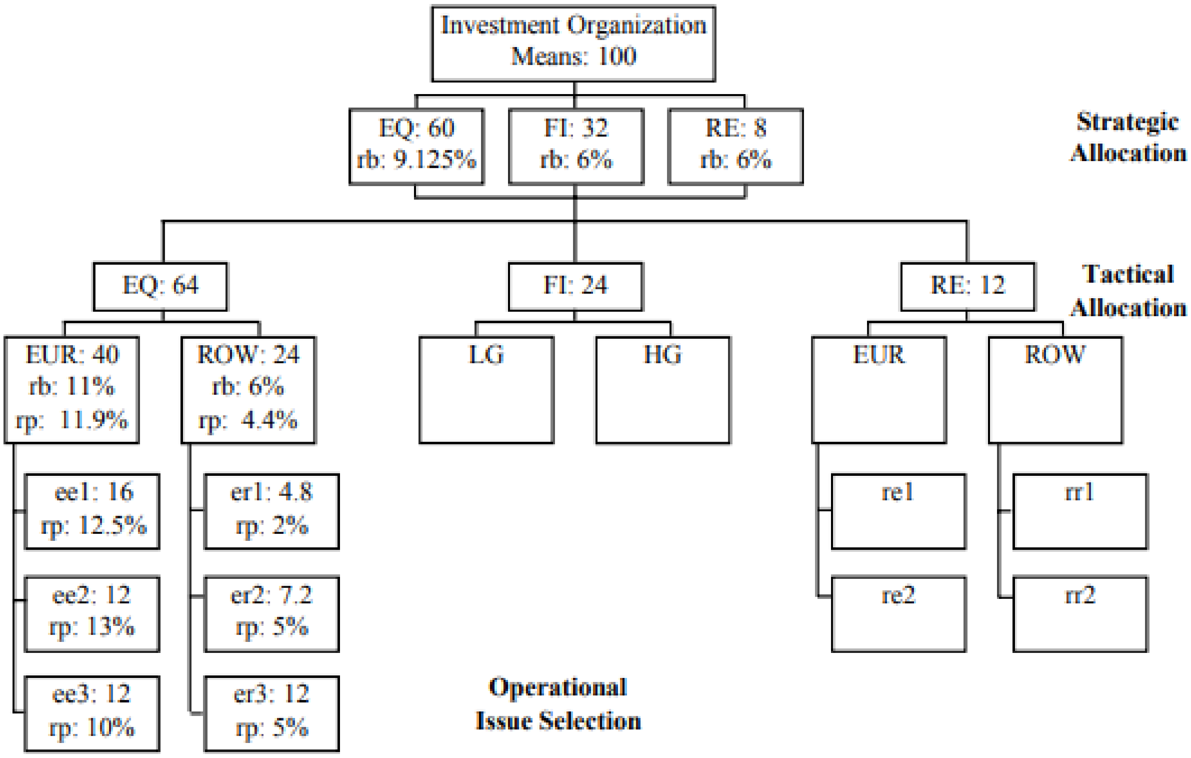
DETERMINATION OF THE HIERARCHY

The hierarchy of decisions can be regarded as a tree. This tree shows the decisions made that together make up the operational (stock-picking) level. More importantly, the tree shows not only the decisions, but also the order of the decisions. Figure 1 (*see page* 49) shows an example of such a tree. The way the tree is structured is defined in the consultancy phase of an implementation of our performance software and usually makes the decision process of such an organization more explicit.

In Figure 1, the decision tree of the example investment organization consists of four decision levels. On the first and highest level, the strategic (long-term) allocation decision is made.

The tactical implementation, which starts with the tactical allocation decision, comprises the lower part of the tree. This particular tree further identifies two region selection decisions (within Equity (EQ) and Real Estate (RE)) and one credit rate selection decision. The final operational decisions are made on the bottom part of the decision tree.

Figure 1
A Hierarchically Structured Asset Management Organization.



The strategic selection decision divides the available means of 100 among equity (EQ: 60), fixed income (FI: 32) and real estate (RE: 8). The tactical allocation decision determines the deviation of the tactical (short term) allocation from the strategic (long term) allocation (respectively: 4, −8, 4). The next decision within equity and real estate is a regional allocation. It divides the available means per asset category over two regions represented by Europe (EUR) and the rest of the world (ROW). Finally, the operational decision picks the securities within each region by selection of three stocks (ee1, ee2, ee3 and er1, er2, er3 for EQ and re1, re2 and rr1, rr2 for RE). Although this example does not further evaluate the decisions made within fixed income, the IDP-Model's flexibility enables measurement of these decisions in a similar way, or by applying a different attribution methodology (if necessary), while remaining part of the whole attribution process. For equity we have given a further example of the means allocation down to the issue level, together with the operational portfolio returns (rp) and benchmark/index returns (rb). These figures will be used in the paragraph dealing with excess returns.

<u>The Effect of a Decision</u>

After identifying the decisions in the hierarchical process, the effects of every decision on the total return must be analyzed. Every decision involves a number of investments, such as the investments of the strategic and tactical level (EQ, FI and RE). These investments do not need to be real physical investments (*e.g.*, stocks or bonds), but may be investments in asset categories, like EQ or FI, sectors or countries. Only operational decisions are real physical investments.

Weights of the investments and returns of the operational investments can be derived directly from the investment process. All non-operational, non-physical investments still need a return assignment. For that rea-

Table 1
The IDP-Model (with BF) Applied to a Hierarchical Investment Process.

Individual Decisions	w	r	R	E
Strategic			**7.875%**	
Equity	60.00%	**9.125%**	5.475%	
Fixed Income	32.00%	6.000%	1.920%	
Real Estate	8.00%	6.000%	0.480%	
Tactical			**8.000%**	**0.125%**
Equity	64.00%		5.840%	0.365%
Fixed Income	24.00%		1.440%	–0.480%
Real Estate	12.00%		0.720%	0.240%
Equity per region			**9.125%**	**0.000%**
EQ, EUR	62.50%	**11.000%**	6.875%	1.172%
EQ, ROW	37.50%	**6.000%**	2.250%	–1.172%
EQ, EUR			**11.900%**	**0.900%**
ee1	40.00%	12.500%	5.000%	0.600%
ee2	30.00%	13.000%	3.900%	0.600%
ee3	30.00%	10.000%	3.000%	–0.300%
EQ, ROW			**4.400%**	**–1.600%**
er1	20.00%	2.000%	0.400%	–0.800%
er2	30.00%	5.000%	1.500%	–0.300%
er3	50.00%	5.000%	2.500%	–0.500%

son the IDP-Model regards non-operational investments as investments in a certain appropriate benchmark index.

The effect of the decision on the total return of the fund can be measured by determining the return of every individual decision. The IDP-Model bases this return on the weights and the returns of the investments within the decision. In other words, the return of a decision is the weighted sum of returns of the investments within this decision.

Finally, the IDP-Model determines the influence of decisions on the total fund result by having the return of the previous decision serve as a benchmark for the current decision. The parent decision forms the benchmark for the decision being measured. Therefore, the strategic decision usually is the benchmark for the tactical decision. The tactical decision serves as a benchmark for the following decision level, and so on. Given the example in Table 1 where the strategic decision has a return of 7.875% and the tactical decision has a return of 8.0%, the tactical decision has added 0.125% to the total investment result. Considering the total available means of 1,000,000 Euro (=100), the added value of the tactical decision is 1,250 Euro.

The Meaning of the Return of a Decision

An important step in determining the effect of decisions on the investment process is the assumption to regard all of the non-physical investments as investments in an appropriate index. This choice relates closely to the question of what the return of an investment actually expresses. In a hierarchical investment organization, a decision on a certain level puts constraints on the subsequent decisions.

For example, assume that the region manager, who decides upon the weights for the EUR and ROW, assigns a budget to the portfolio manager of 'Equity Europe.' The latter manager takes care of the stock selection. In this example, the region manager restricts the budget that is available to the portfolio manager. However, this restriction does not influence the percentage return that the portfolio manager can achieve with his own decision(s). In other words, the returns of (or the constraints set out by) other managers do not influence the determination of the return of a decision made by a certain manager. Only when abiding by these rules can the effect of individual decisions be accurately measured by the expression 'return of a decision.'

The IDP-Model satisfies this rule by regarding every non-operational investment in a decision as an investment in an index. Table 1 (*see page* 50) shows the analytics of a hierarchically structured investment organization based upon the IDP-Model applied to the tree of Figure 1 (*see page* 49). The columns 'w' and 'r' represent the weights and the (index) returns[8] of the various investments. The total return of the decisions can be found in the column 'R', as well as the contribution of the individual investments to the result of the various decisions. Column 'E' shows the excess returns, as well as the contributions of the investments in the total excess return. The determination of the excess return is explained in the next paragraph.

<u>The Excess Returns</u>

The first decision made is the strategic allocation decision, for which there are only external benchmarks, such as the liabilities of a pension fund.[9] However, the tactical allocation decision can be compared with the strategic decision. The IDP-Model regards the strategic decision as the benchmark for the tactical decision. The excess return is now represented by $e_{tact} = r_{tact} - r_{strat}$

In the example, the added value amounts to 0.125% of the tactical decision, which means that the tactical decision has a positive effect on the total fund result. The other decisions can be analyzed in the same manner, as shown in Table 1. An important aspect of the IDP-Model is that the results of each decision sum to the total result of the investment organization. The IDP-Model requires that within each layer of the hierarchy the available means cannot appear or disappear without a reason. The example below shows the sum of the market values of the index investments EUR and ROW in the region decision for Equity to be exactly the same as the market value of the Equity investment itself in the tactical decision.[10]

This example shows how the IDP-Model compares with three Brinson Fachler (BF) analyses. In that respect, the IDP-Model provides a method for relating a number of attribution analyses in a consistent manner. At first, the similarity of the BF model to the IDP-Model might not seem evident. However, the difference on every decision level is just the allocation effect of the BF method with the selection and interaction effect pushed down toward the operational level. The effect on the operational level includes issue selection (simply another allocation effect) and the remaining interaction effect.

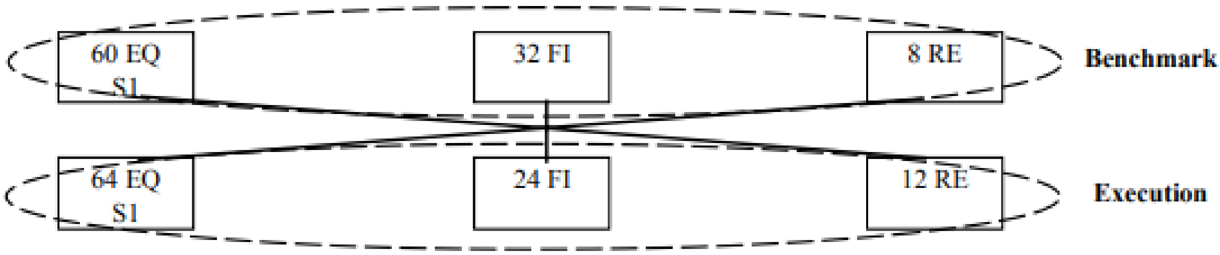
Although the examples used above are somewhat simple, this model becomes more interesting when applied to (very) complex hierarchies.

Separation IDP Structure and Attribution Methodologies

It is important to recognize that the IDP-Model does not present just one method of possible calculation methodologies and attribution analyses. As presented in the examples above, with the IDP- model, the whole investment decision process can be decomposed into several decision levels. Additionally, with a (consistent) benchmark hierarchy, the marginal added value of every decision can be evaluated. Further, the IDP-Model enables the user to examine the total fund result in terms of the added value of each decision (level) made.

Since the attribution methodology in the IDP-Model is largely independent from the hierarchical structure, virtually any attribution methodology can be incorporated, including different versions of the geometric[11] or Burnie, Knowles and Teder method.[12]

Figure 2
Added Value of a Decision.



<u>Performance Base</u>

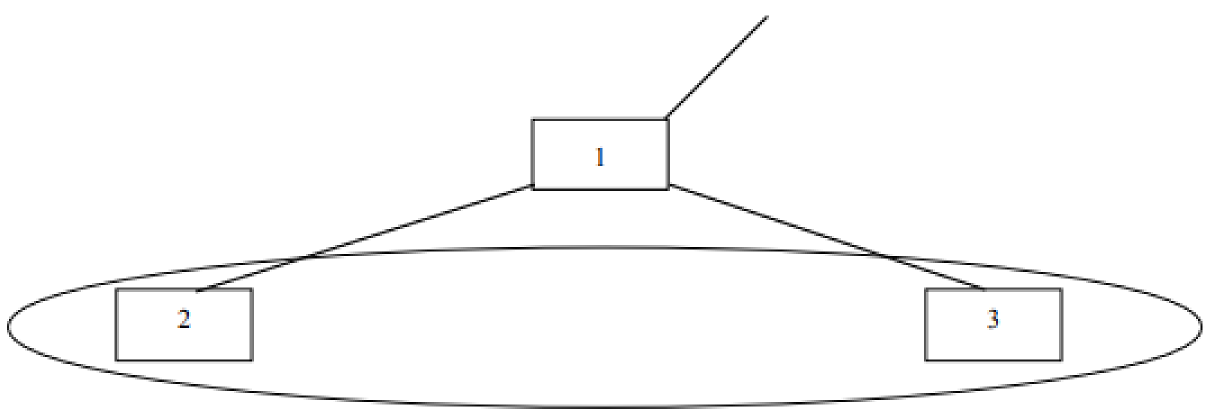
The flexibility of the model not only allows one to use attribution methodologies that differentiate in return or gain assignment to the distinguished sources of contribution, but also in the use of different performance bases. Usually a return is calculated as:

$$\frac{gain}{performance\ base}.$$

The performance base cannot only be defined as the market value, but as well as the available means, the exposure of certain (virtual) investments or the Value at Risk (VaR) of such an investment. Since the available means cannot, as stated above, appear or disappear in the IDP-Model without reason, the performance base on a certain level should, in general, be the summation of the performance bases of the subsequent level. For example, in Figure 3 the performance bases of 2 and 3 should sum into the performance base of 1.

However, the model can deviate from this rule when, for example, a risk adjusted performance measure is introduced, such as the model used by the Ontario Teachers' Pension Plan.[13] The performance bases in that situation no longer sum up because the return calculations use the Value at Risk concept. This methodology introduces a risk diversification that reduces the total risk in 1 compared to the summation of the risk exposures of 2 and 3. In this particular case, the IDP-Model will show a risk reduction effect in order to make the marginal added

Figure 3
Available Means of 1 Split Over 2 and 3.



value of the decisions sum up to the total excess fund result. This is similar to the benchmark effect generated when the benchmark hierarchy used is inconsistent.

Therefore, one of the main conclusions derived from this introduction of the IDP-Model is the fact that it separates the organization of the investment (decision) process from the attribution methodology. This provides some interesting operational advantages:

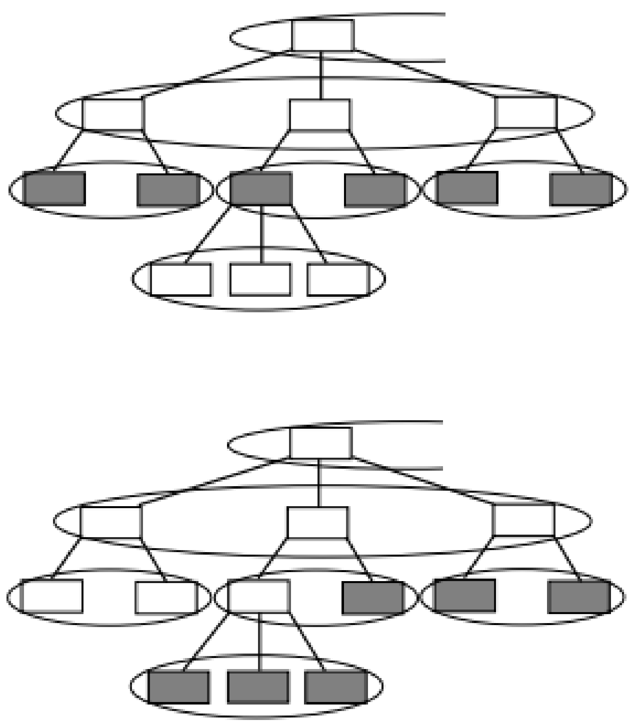
- The attribution method can be made entirely consistent with the investment process;
- The attribution method and the hierarchy are independently changeable;
- The most appropriate attribution method can be applied for every (sequence of) decision(s);
- There exists a better insight in both the hierarchy as well as in the attribution method.

THE EFFECT OF AN AGGREGATION OF DECISIONS

The previous paragraphs introduced the IDP-Model, in which the calculations are ordered hierarchically. Apart from the analytics involved in measuring an individual decision, the IDP-Model can also serve as a platform for simultaneously determining the effect of several decisions, *i.e.*, aggregate. Because the IDP-Model starts with individual decisions, it is always possible to sum the influences of the decisions into an 'aggregate decision.' The summation shows the cumulative effect of the decisions on the total investment result, or in other words, the added-value generated by the aggregation of these individual decisions.

Figure 4 provides four examples. The shaded blocks present aggregated decisions. An example of how the (excess) return of these decisions is calculated and presented below.

Figure 4
Aggregations of Different Individual Decisions.



In general, it is possible to determine the (operational) return of a certain level in the investment process by taking the weighted sum of the (operational) returns of the subsequent level. This enables one to determine the return of the total investment organization by summing the returns of the operational level. Similar to Table 1 (*see page* 50), a benchmark is identified for every layer (aggregation level) resulting in a benchmark hierarchy. The BF method produces the following attribution report:

When viewed in more detail, the result presented here is simply the breakdown of the EQ investment result into the decision levels of Figure 1. Additionally, the example clarifies that the IDP-Model calculates the allocation effect for every decision and leaves the selection and interaction effect to be explained by the subsequent decisions.

<u>The Return of Individual and Composite Decisions</u>

In Table 2, the portfolio return in one layer of the hierarchy is a weighted summation of all the decisions in the subsequent decision layer. This return is therefore that of several decisions because it expresses the return of all the subsequent layers. In turn, the decisions of the managers in the operational layer influence the evaluation of the managers' decisions in the layers above (*e.g.*, the region selection decision). This methodology is used when the evaluation of a manager's decision must include the decisions made by all his or her subordinates. Figure 5 (*see page* 55) provides an example in which the top shaded box represents the manager's decision; and, three boxes at the end of the left branch present decisions made by his fund managers.

However, the results of Table 2 don't tell us how to evaluate the individual decisions of the managers when starting with an aggregate decision. It can be shown that the only way to determine the return of an individual decision accurately is to use a method in which the returns of an investment are independent of the returns of other investments, as is applied by the IDP-Model.

Table 2
The Determination of the Effect of Several Decisions.

Several	Portfolio		Benchmark		Attribution			
Decisions	w	r	w	r	Allocation	Selection	Interaction	TOTAL
<u>IO</u>	100.0%	7.736%	100.0%	8.400%	1,250	–3,425	785	–1,390
Equity	64.0%	9.088%	60.0%	9.125%	3,650	**–225**	**–15**	3,410
Fixed Income	24.0%	5.000%	32.0%	6.000%	–4,800	–3,200	800	–7,200
Real Estate	12.0%	6.000%	8.0%	6.000%	2,400	0	0	2,400
<u>Region (EQ)</u>	100.0%	9.088%	100.0%	9.125%	0	**–240**	0	**–240**
EQ,EUR	62.5%	11.900%						
EQ,ROW	37.5%	4.400%						
<u>EQ, EUR</u>	100.0%	11.900%	100.0%	11.000%	0	3,600	0	**3,600**
ee1	40.0%	12.500%						
ee2	30.0%	13.000%						
ee3	30.0%	10.000%						
<u>EQ, ROW</u>	100.0%	4.400%	100.0%	6.000%	0	–3,840	0	**–3,840**
er1	20.0%	2.000%						
er2	30.0%	5.000%						
er3	50.0%	5.000%						

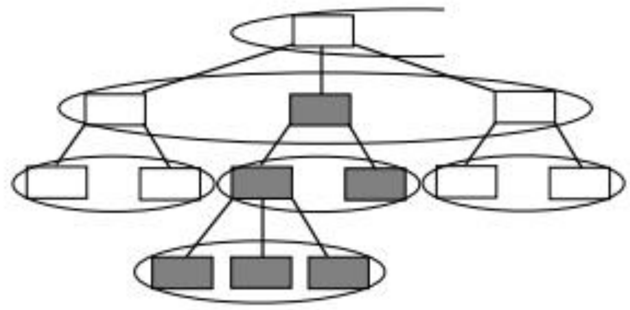
Because the IDP-Model decomposes the total investment decision process into manageable pieces, it can model almost any structure and decision, which allows one to evaluate much more complex IDPs as well.

ADDING COMPLEXITY

More Extensive Hierarchies

In the previous simple examples, we stacked a few decision layers in which all the decisions had a similar structure; they were all bets toward some sector (including geographical sectors) or issue selections. In this paragraph an example is given that introduces additional decision types, such as a timing and a hedging decision. This example is by no means exhausting and the detail given is not very extensive, as we feel this is beyond the scope of this article. However, it will serve as an example for the capabilities and flexibility of the IDP-Model.

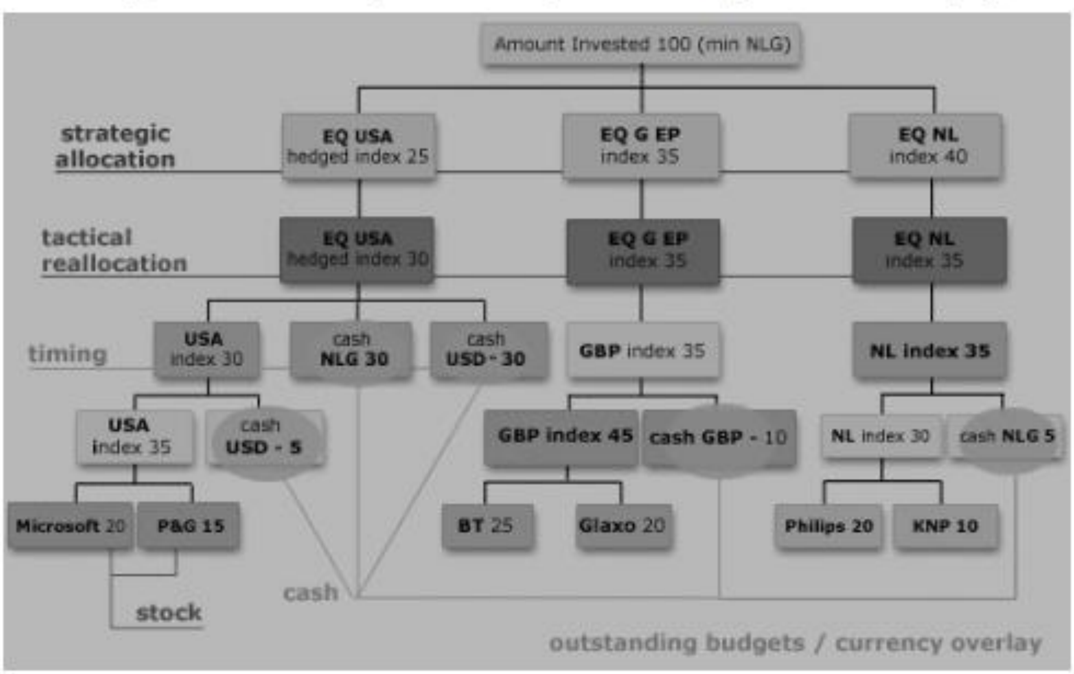
Figure 5
A Manager's Decision Including the Decisions of the Subordinates.



In this instance the IDP-Model we are using invests 100 (mln. NLG[14]). The strategic allocation is as follows:

- hedged USA index 25 (mln NLG),
- EUR index 35 (mln NLG),
- NL index 40 (mln NLG).

Figure 6
Example of a More Complex Hierarchy with Still Only One Asset Category.



At the tactical level a reallocation takes place over these investment categories. This leads to the following division of the total available means:

- hedged USA index 30 (mln NLG),
- GBP index 35 (mln NLG),
- NL index 35 (mln NLG).

Hedging

Given the strategic hedge policy, this tactical decision leads to the following exposures:

- NLG 30, (USD 30 completely hedged)
- GBP 35,
- NLG 35.

The hedging decision is an excess return resource that may be attributed to the manager who actually makes the investment. In that case, hedging should be incorporated into the base IDP as shown before and can be considered one of the many decisions (implicitly) made. Indexes serving as a benchmark are hedged, and reflect the extent to which a financial institution is willing to subject itself to the risk of currency exposure.

However, our financial institution decides to make another process or department accountable for the currency risk and a currency overlay is implemented on top of the basic IDP. Therefore, a purely model-like decision is made (the performance of this decision ≅ nil), which goal it is to separate the positions in the hedged indices into an unhedged index and a position representing the hedging strategy. We implement this by modeling the hedged position of 30 mln NLG in USD as positions

- 30 mln NLG in an unhedged USA index:
  USA index 30,
- –30 mln NLG in USD:
  USD cash –30,
- 30 mln NLG in NLG:
  NLG cash 30.

With this modeling the portfolio managers are settled with an unhedged index and not with a hedged index. The implementation of the tactical investment in the unhedged U.S.A. index is the job of the portfolio manager of the U.S.A., while the implementation of the virtual cash position (implementation of the hedge-part of the tactical investment) is settled through an overlay-construction in the cash management.

Timing

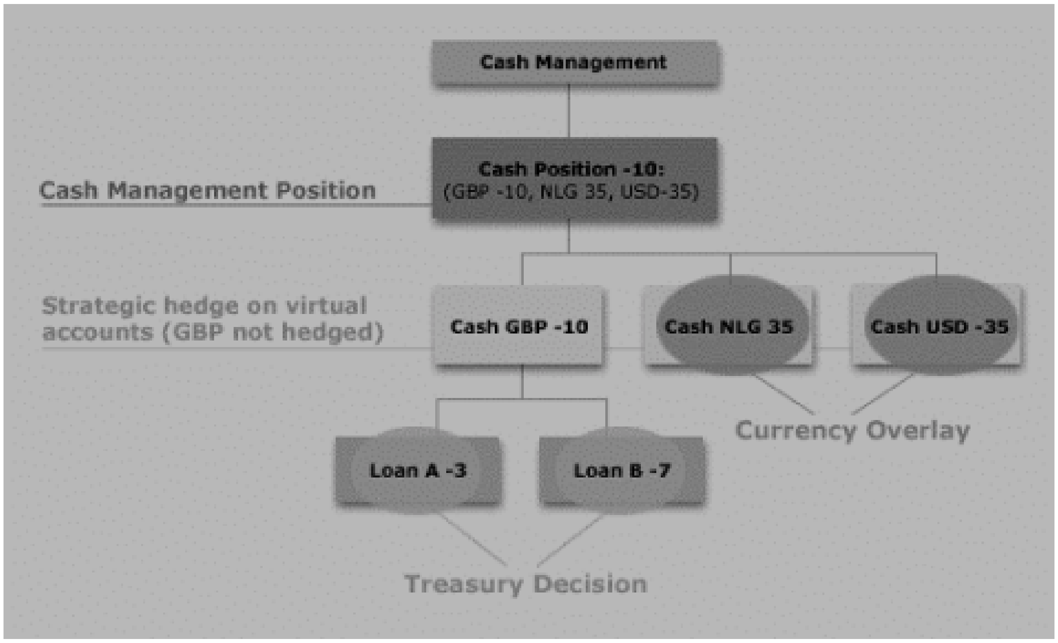
In this IDP, a timing decision is made in the EQ U.S.A. portfolio. As with every decision within the IDP, a timing decision must also be benchmarked against a certain index. In the single period model discussed until this point, we have assumed that a manager would invest all of the funds available. However, when a manager is assigned a specific (virtual) budget and has the option not to invest part of this budget, he has the ability to make a timing decision.

The manager can decide to invest the money today, tomorrow or maybe even not invest at all, if he thinks waiting to invest the money is a better option than investing the money right away. Compared to the benchmark (in which we consider all the money to be invested) this could create an excess return, which we can measure by defining a timing decision in the IDP.[15]

Examining this decision type in more detail allows us to calculate the excess return as the difference between the money-weighted return of the total available means and the time-weighted return of the invested means (assuming that the return of the money not invested is equal to zero).

In our hypothetical organization we see that the portfolio manager, with a mandate 'USD index 30' actually invests 35. He has taken a bet of 5 mln. Taking such a bet is represented in the model by showing in the in-between layer 'USD index 35' a virtual cash-position of –5. The result of this decision compared to the benchmark decision is the timing result. In this model, the two other portfolio managers have taken a

Figure 7
Cash Management Derived from Original IDP.



bet as well. The portfolio manager with the U.K. mandate, has taken a bet of 10 and the investor with the Dutch mandate a bet of –5. The implementation of the bets is being settled through an overlay construction in the budgets overlay.

The last decision in Figure 6 (*see page* 55) is the operational stock picking decision. The portfolio manager portrays his mandate by actually investing in different instruments.

Budgets Overlay

In the budgets overlay the positions are gathered that originated from the taken bets of the portfolio managers. These operational timing bets, gathered per currency, are in our example:

- USD –5,
- GBP –10,
- NLG 5.

The budgets overlay is introduced because the strategic hedge decision (USD 100%, GBP 0%) also applies to exceeding the budget. For the currency exposure because of the exceeding of the budget we have to decide, per *currency*, depending on the strategic hedge-policy, in what way they must be hedged.

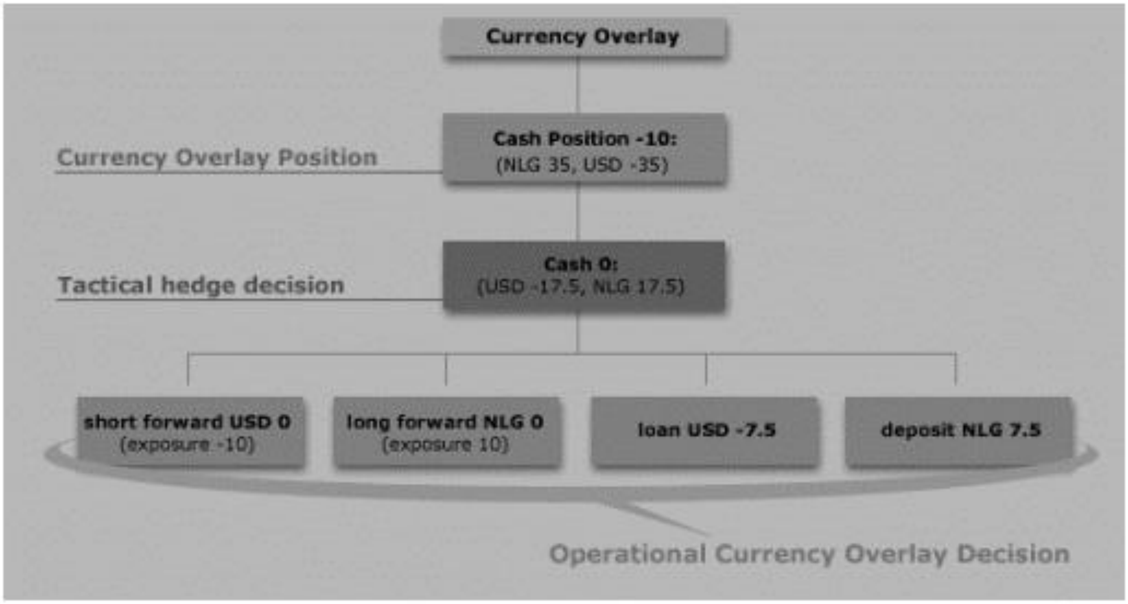
Cash Management Overlay

In the cash management overlay, all 'virtual' cash positions are gathered. In our example they are:

	Hedging	Budget Overlay	Overlay Cash
USD	–30	–5	–35
GBP	0	–10	–10
NLG	30	5	35

In Figure 7, cash overlay decides how to invest the remaining cash positions in either 'cash related' securities or forward them to a currency overlay program. GBP is not hedged and this position is therefore implemented by means of a loan A (–3) and a loan B (–7),

Figure 8
Currency Overlay IDP Derived from Cash Management.



while the USD is strategically 100 percent hedged for a NLG base currency. The remainder is taken care of by the currency management overlay.

Currency Overlay

The overlay in Figure 8 gathers the existing (unwanted) currency exposures from Figure 7 (*see page* 57) and can offset them by letting the responsible department taking the appropriate derivative positions. Decisions made by the other department (*e.g.*, a treasury department) must also be evaluated. Therefore, we can create a new IDP that measures the bets taken against the benchmark hedging structure originally set by the financial institution.

The top decision (like all overlays) consists of investments to be implemented in currency overlay, as they are 'shot through' from other parts of the IDP model. In this case they are:

- USD –35,
- NLG 35.

Note: this is exactly equal to the total operational USD–exposure of the fund. The position per foreign currency must be interpreted as the strategic hedge decision.

The second decision in the currency overlay represents the tactical hedge decision. In our example the tactical currency committee had decided to hedge 50 percent. The strategic cash position to be taken is therefore ($35 \times 50/100 = 17.5$):

- cash USD –17.5,
- cash NLG 17.5.

Operationally, this will be implemented by the positions (which deviates from the tactical decision).

- Short forward USD (USD-exposure –10) 0,
- Loan USD –7.5,
- Deposit NLG 7.5.

Table 3
IDP Decisions Report Grouped by Asset Category.

Level	Excess			
	Month-To-Date		Year-To-Date	
Decision	Return	Gain	Return	Gain
Operational Cash	0.01%	–2.10	–12.90%	–53.90
All decisions Cash	0.94%	–2.10	–12.90%	–53.90
Country Selection	0.70%	44.50	2.16%	144.80
Operational Stockpicking	–1.08%	–105.30	–0.36%	–30.00
Portfolio Selection	–0.34%	–32.90	–1.08%	–110.60
Tact. Budgetregion Alloc.	–0.22%	–20.90	–1.68%	–162.70
Tactical Region Allocation	0.08%	8.10	–0.07%	10.70
Timing decisions	–0.47%	–44.90	–2.55%	–253.20
All decisions Equity	–1.33%	–151.40	–3.58%	–401.00
Operational expenses	0.00%	0.00	0.00%	0.00
All decisions Expenses	0.00%	0.00	0.00%	0.00
Country Selection	0.02%	0.10	–0.25%	–3.10
Credit-class Selection	0.00%	0.10	–0.80%	–12.60
Operational Stockpicking	0.15%	5.50	0.65%	23.40
Portfolio Selection	0.05%	1.60	0.31%	10.50
Tact. Budgetregion Alloc.	0.00%	0.00	0.00%	0.00
Tactical Region Allocation	–0.05%	–1.50	0.18%	5.30
Timing Decisions	–0.11%	–3.80	–0.49%	–15.90
All Decisions Fixed Income	0.06%	2.00	–0.40%	7.60
Operational Stockpicking	0.00%	0.00	–1.40%	–17.30
Portfolio Selection	–0.06%	–0.70	–0.50%	–6.50
All Decisions Real Estate	–0.06%	–0.70	–1.90%	–23.80
All Decisions	**–0.39%**	**–152.20**	**–18.78%**	**–471.10**

Reporting

As shown earlier in this article, the IDP-Model can calculate the added value of individual decisions as well as the added value of various decisions by (for the most part) summing the individual attributions into decision aggregates. A report generated by the IDP-Model may look like the one in Table 3, where each row shows the marginal added value result of a decision or an aggregation of decisions. They sum up to the total fund return of –0.39% (or a negative gain of 152.20) for the month-to-date period, or –18.78 % (or a negative gain of 471.10) for the year-to-date period.

CONCLUSION

Clients, internal management, and regulators all have expectations that the investment organization must fulfill. The right information is important, but the right tools to analyze it can make all the difference. In a hierarchically structured investment organization, it is useful not only to evaluate the operational (stock picking) decisions, but also to evaluate every decision made. For this purpose, we have developed the IDP-Model, with which one can dissect a total investment decision process into individual decisions. Using the IDP-Model for determination of the investment hierarchy enables one to apply existing attribution models to the analysis of the total investment organization and can therefore create a complete and, more importantly, an exact picture of the investment organization. While extending the more standardized performance measurement and attribution, the IDP-Model provides the organization with very useful information about its total investment decision process.

This article illustrates the flexibility of the IDP with the help of the attribution model of Brinson and Fachler. The IDP-model is introduced as an accumulation of several BF attribution models, in which every layer presents a new decision. Having created this hierarchy, it is important that one calculates the return of a decision. With the benchmark hierarchy prescribed by the IDP, the IDP-Model can determine the influence of individual decisions on the total investment result by calculating their marginal added value (attribution effect).

Using the IDP-Model to decompose various decisions enables management to calculate the excess return of an aggregate of decisions, based on the excess returns of the individual decisions. The decisions can be grouped conveniently together to gain insight into which parts of the investment process are really adding value and which are not. Furthermore, the flexibility of the IDP-Model allows one to build very complex structures and to model most (hierarchical) investment structures on the strength of the separation of the attribution methodology and the hierarchical organization.

This article was meant to introduce the basic principles of the IDP-Model and we have illustrated this by two examples without going into very much detail. We are aware that this article therefore provides only an initial introduction to the IDP-Model; and, that some subjects in this article are only briefly discussed. To thoroughly understand the ideas of the IDP-Model, most subjects deserve a more elaborate description and we intend to disclose more information at a later stage. Any questions that may arise before this extra information is presented may be directed to the authors, who can be contacted via email at pearl@ortec.com.

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ENDNOTES

[1] A decision is defined as a well-defined part of the investment process consisting of a set of actions (passive or active), which distribute the available means over a number of (virtual) investments for every evaluation period.

[2] See *e.g.* Molenkamp.

[3] See *e.g.* Damien Laker. We agree that one should always use the highest valuation frequency possible in order to create the most accurate answers.

[4] See *e.g.* Menchero and Carino. Mirabelli provides in his thesis an overview of the drawbacks and other intricacies that are involved with several of these multi-period attribution methodologies.

[5] See *e.g.* Campisi and Van Breukelen.

[6] See Brinson and Fachler.

[7] The formulae for the arithmetic attribution methodology applied in the examples are given by:

Total Effect: $$R^A_t - R^P_t = \sum_i (w^A_{i,t} \text{ x } r^A_{i,t} - w^P_{i,t} \text{ x } r^P_{i,t}),$$

Allocation Effect: $$\sum_i (w^A_{i,t} - w^P_{i,t}) \text{ x } (r^P_{i,t} - R^P_t),$$

Selection Effect: $$\sum_i w^P_{i,t} \text{ x } (r^A_{i,t} - r^P_{i,t}),$$

Interaction Effect: $$\sum_i (w^A_{i,t} - w^P_{i,t}) \text{ x } (r^A_{i,t} - r^P_{i,t}),$$

Taking the Selection and Interaction effects together yields: $$\sum_i w^A_{i,t} \text{ x } (r^A_{i,t} - r^P_{i,t}).$$

with $w_{i,t}$ denoting the weight for issue i on time t for either the actual portfolio (A) or the benchmark portfolio (P) and $r_{i,t}$ denoting the return for the issue i and time t for both portfolios.

[8] The used benchmark hierarchy is assumed to be consistent (meaning that benchmark returns are made up of returns and weights of subsequent benchmark layers). Without this assumption the model may generate a benchmark effect that can be displayed separately.

[9] See Keith Ambachtsheer (1998).

[10] For the determination of the result of a decision, it is important to use consistent indexes. In practice this is not always feasible. For the IDP-Model this means that the excess returns of the decisions will be presented, including a so-called benchmark effect. The summation property of the results is however maintained.

[11] The formulae for the geometric attribution methodology:

Total Effect:

$$\frac{1+R^A_t}{1+R^P_t} - 1 = \frac{\prod_i (1+r^A_{i,t})^{w^A_{i,t}}}{\prod_i (1+r^P_{i,t})^{w^P_{i,t}}} - 1 = \prod_i \frac{(1+r^A_{i,t})^{w^A_{i,t}}}{(1+r^P_{i,t})^{w^P_{i,t}}} - 1,$$

Allocation Effect: $$\prod_i \left(\frac{1+r^P_{i,t}}{1+R^P_t}\right)^{w^A_{i,t} - w^P_{i,t}} - 1,$$

Selection Effect: $$\prod_i \left(\frac{1+r^A_{i,t}}{1+r^P_{i,t}}\right)^{w^P_{i,t}} - 1,$$

Interaction Effect: $$\prod_i \left(\frac{1+r^A_{i,t}}{1+r^P_{i,t}}\right)^{w^A_{i,t} - w^P_{i,t}} - 1,$$

Taking the Selection and Interaction effects together yields:

$$\prod_i \left(\frac{1+r^A_{i,t}}{1+r^P_{i,t}}\right)^{w^A_{i,t}} - 1.$$

[12] The formulae for the Burnie, Knowles and Teder (1998) attribution methodology:

Total Effect:

$$\left[1+\frac{\sum_i w_{i,t}^A\left(r_{i,t}^A-r_{i,t}^P\right)}{1+\sum_i w_{i,t}^A r_{i,t}^P}\right]\left[1+\sum_i (w_{i,t}^A-w_{i,t}^P)\left[\frac{\left(1+r_{i,t}^P\right)}{\left(1+\sum_i w_{i,t}^P r_{i,t}^P\right)}-1\right]\right]=\frac{1+\sum_i w_{i,t}^A r_{i,t}^A}{1+\sum_i w_{i,t}^P r_{i,t}^P}$$

Allocation Effect:

$$(w_{i,t}^A-w_{i,t}^P)\left[\frac{\left(1+r_{i,t}^P\right)}{\left(1+\sum_i w_{i,t}^P r_{i,t}^P\right)}-1\right]$$

Selection Effect: $w_{i,t}^P\left(r_{i,t}^A-r_{i,t}^P\right)/\left(1+\sum_i w_{i,t}^A r_{i,t}^P\right)$

Interaction Effect:

Taking the Selection and Interaction effects together yields: $w^A_{i,t}(r^A_{i,t}-r^P_{i,t})/\left(1+\sum_i w^A_{i,t}r^P_{i,t}\right)$.

[13] See *e.g.* De Bever et al.

[14] NLG = Dutch Guilder, ORTEC is headquartered in the Netherlands. That's why…

[15] The profound reader will probably remark that we can also decide to add an extra asset class, CASH, to the index and create a customized benchmark consisting of the original index and the extra cash investment.

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