Decomposing the Money-Weighted Rate of Return

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INTRODUCTION

Considering the research and the literature on performance measurement and attribution as well as the discussions on the performance presentation standards the impression arises that the time is over for the money-weighted rate of return methodology. Most people speak of the time-weighted rate of return concept and think that this is the ultimate methodology for calculating the rate of return. But there are still some other people who believe that it is also worth fighting for the money-weighted rate of return concept.

We belong to the latter group and with this article we want to step into the gradually starting discussion on the value and the suitability of the money-weighted rate of return methodology.[1] This article addresses the return attribution from a client's point of view and illustrates the decomposition of the money-weighted rate of return (MWR) and its relationship to the return attribution based on the time-weighted rate of return concept.[2]

Today it is common practice in the asset management industry to calculate and to report the time-weighted rate of return (TWR) on a total portfolio level to existing as well as to prospective clients.[3] The TWR is insensitive to changes in the money invested in the portfolio and therefore allows a comparison of the portfolio return across peer groups and against a benchmark or an index. This property might be the main reason why it is also common practice to analyze and to decompose the TWR and not the MWR of a portfolio. However, there is also a need for calculating and decomposing the MWR because it is the MWR which covers the timing effect of cash flows into or out of the portfolio. The MWR reflects the timing of cash flows and is consistent with the absolute profit and loss of a portfolio. Due to these characteristics the MWR is the true return from a client's point of view if it is the client's decision to invest money into or to withdraw money from the portfolio.[4]

AN INTUITIVE APPROACH TO DECOMPOSE MWR

As it is not common practice to run a performance or return attribution from a client's perspective which covers the timing effect of cash flows, in the following we illustrate an intuitive procedure to decompose the MWR of a portfolio on the total portfolio level.[5] The basic idea of this approach is to decompose the MWR of a portfolio such that the most important investment decisions from a client's perspective are reflected:[6]

a) the "benchmark effect", which is the return contribution due to the decision to invest the initial money into a specific benchmark strategy and which is equal to the benchmark return over the investment period,

b) the "management effect", which is the return contribution due to the decision to change the asset allocation and stock selection of the portfolio relative to the benchmark over the investment period, and

c) the "timing effect", which is the return contribution due to the decision to change the money invested in the benchmark strategy and in the active asset allocation of the portfolio over the investment period.

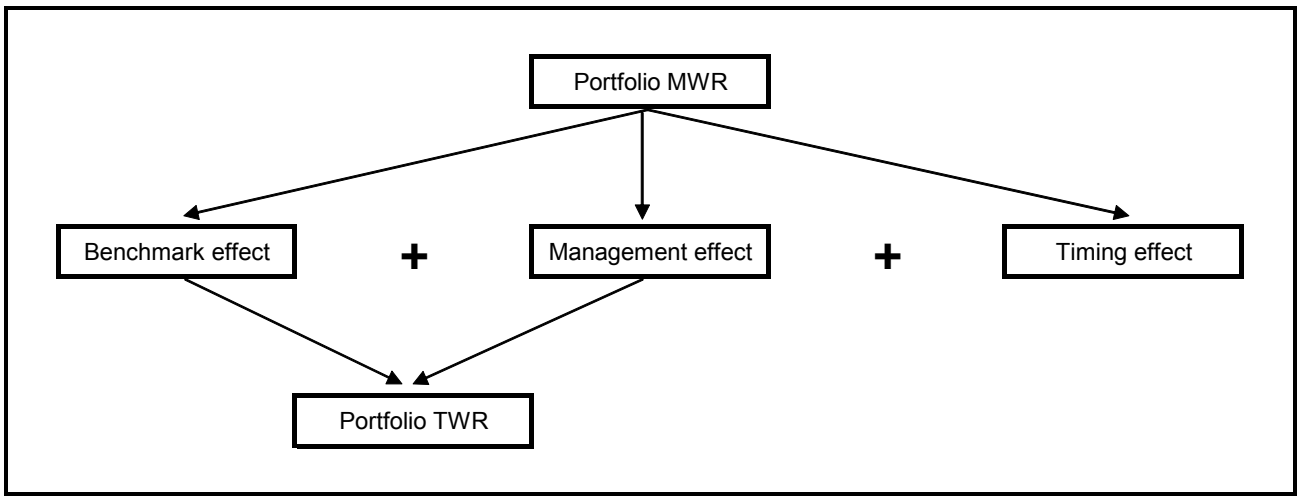

Figure 1: *Overview of the decomposing approach*

Figure 1 illustrates our decision-oriented approach and shows the relationship between the MWR and the TWR of a portfolio where the TWR of a portfolio is the sum of the benchmark effect and the management effect. In addition, for investment periods with no (external or non-discretionary) cash flows the MWR is equal to the TWR and there is no timing effect. The different return contributions can be further decomposed according to the specific investment decisions. For example, the management effect is often split up into the asset allocation, stock selection and currency management effect and the timing effect can be decomposed in the effect from changing the money invested in the benchmark strategy and in the effect from changing the money invested in the active asset allocation.

The return contributions of the MWR of a portfolio are derived from the benchmark return and the MWR as well as the TWR of the relevant portfolio over the investment period. The TWR of the portfolio is calculated assuming no cash flows but considering the active asset allocations over the investment period.[7] In measuring the benchmark return it is also implicitly assumed that no money is invested into or is withdrawn from the benchmark portfolio.[8] On the opposite, the MWR of the portfolio reflects not only the active asset allocations but also - and often more importantly - the timing effect of the cash flow decisions. After calculating the overall returns of the benchmark and the portfolio, the benchmark effect equals the benchmark return, the management effect is the difference of the TWR of the portfolio and the benchmark return and the timing effect is the difference between the MWR and the TWR of the portfolio.

In order to isolate the timing effect completely it is necessary to calculate not only the "true" TWR but also the "true" MWR. The "true" TWR is not affected by any cash flow. It is best practice to calculate the "true" TWR on a daily basis and then to link the daily returns geometrically over the investment period. On the opposite the "true" MWR covers the total timing effect of all cash flows and is calculated using the internal rate of

return methodology over the investment period. Using instead an approximation method often results in a residual return component relative to the fictitious "true" return (TWR or MWR) whose missed evidence may lead to misleading feedback into the investment process.

AN EXAMPLE FOR DECOMPOSING MWR

We proceed by considering a one month investment period from 31st of March up to end of the following April and as seen in table 1 a discretionary balanced portfolio investing in the three asset classes: equities, bonds and cash. The first two columns show the asset allocation of the benchmark as well as of the portfolio as of 31st of March and the third column shows the portfolio's asset allocation after changing the active asset allocation and simultaneously investing additional money into the portfolio on the 15th of April. We assume a buy and hold strategy for the portfolio for the two sub-periods: 31st of March to 15th of April and 15th of April to 30th of April, and for the benchmark portfolio for the entire investment period without any rebalancing. In addition we suppose that the client invests 1'000 Euros at the beginning of the investment period and additional 500 Euros into the portfolio on the 15th of April.

Asset class	Asset allocation benchmark as of 31.03.	Asset allocation portfolio as of 31.03.	Asset allocation portfolio as of 15.04. (after adjustments and cash flow)
Equities	30.0%	50.0%	40.0%
Bonds	60.0%	45.0%	55.0%
Cash	10.0%	5.0%	5.0%

Table 1: *Asset allocation of the portfolio and the benchmark*

To simplify the example we assume that the portfolio manager only invests in index funds which have the same returns as the underlying indices shown in table 2 and used to calculate the benchmark return. This implies that there is no stock picking effect and that the active returns relative to the respective asset classes are zero. In addition, we do not consider transaction costs, management fees or any other fees.

Indices and index funds	Return for the period 31.03. until 15.04.	Return for the period 15.04. until 30.04.	Return for the period 31.03. until 30.04.
Equities	3.00%	15.00%	18.45%
Bonds	2.00%	1.00%	3.02%
Cash	0.50%	0.50%	1.00%

Table 2: *Returns of the indices and index funds*

The MWR is calculated using the internal rate of return methodology and the TWR is calculated using the portfolio re-valuation on the 15th of April when the cash inflow occurred. After calculating the different returns of the portfolio and for the benchmark following our exposition, figure 2 illustrates the return decomposition for our sample portfolio. According to the investment decisions made, these return contributions can be assigned to the relevant decision makers. For a regular

discretionary portfolio, the portfolio manager's skill is measured by the management effect whereas it is the client who is ultimately responsible for the benchmark and the timing effect.[9]

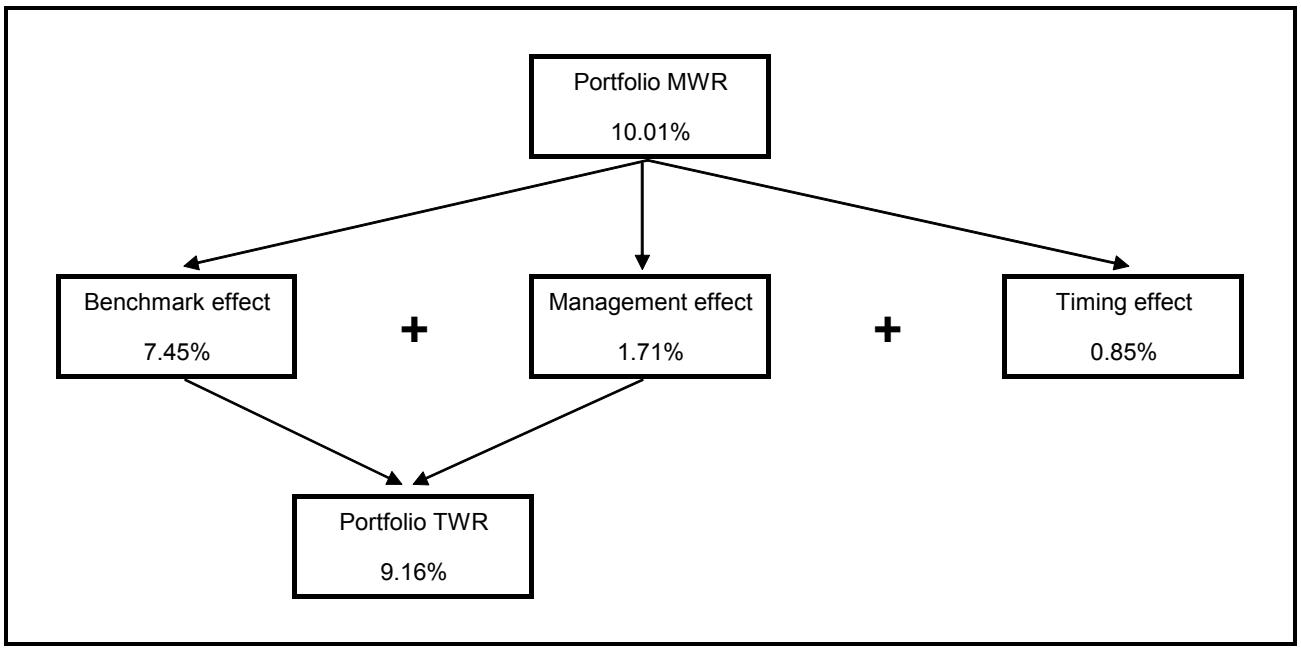

Figure 2: *Decomposing the money-weighted rate of return – version 1*

FURTHER DECOMPOSING MWR

A more detailed analysis of the investment decisions allows to further decompose the MWR of the portfolio and to further break down its return contributions. The proposed (general) decision-oriented framework is as follows:[10]

a) to mirror the specific decisions into (absolute) asset allocations,

b) to calculate the corresponding returns and

c) to assign the returns as well as the return differences to the investment decisions as well as to the relevant decision makers.

In our example, after analyzing the investment process we come up with the following six implicit or explicit investment decisions, where decisions 2 and 3 are assigned to the portfolio manager and the other decisions are the client's responsibility:

- decision 1: Investing the initial money into the benchmark.
- decision 2: Changing the asset allocation at the beginning of the period.
- decision 3: Changing the asset allocation in the middle of the month.
- decision 4: Investing additional money into the benchmark in the middle of the month.
- decision 5: Investing additional money into the active asset allocation in the middle of the month.
- decision 6: Investing additional money into the changed active asset allocation in the middle of the month.

For each of the six investment decisions table 3 illustrates the returns of the corresponding asset allocation and indicates whether the relevant asset allocation is influenced by the active asset allocation on the 31st of March, by the cash inflow on the 15th of April and/or by the changed asset

allocation on the 15th of April. Moreover table 3 shows for each strategy the resulting MWR and TWR for the portfolio as well as for the benchmark.

The returns of the strategy 6 in table 3, which reflect the actual asset allocation held during the total observation period, are the overall returns from a client's and from a portfolio manager's point of view. We also introduced the MWR for the benchmark which is used as a basis for measuring the timing effect of changing the money invested in the benchmark strategy from a client's perspective.[11] Without the MWR of the benchmark we would not be able to calculate this timing effect in isolation but instead had to mix it with the other timing effects due to decisions 5 and 6.

Strategy		Active asset allocation on the 31.03.	Cash inflow on the 15.04.	Changed asset allocation on the 15.04.	Return
1	Benchmark MWR				7.45%
1	Benchmark TWR				7.45%
1	Portfolio MWR				7.45%
1	Portfolio TWR				7.45%
2	Benchmark MWR	x			7.45%
2	Benchmark TWR	x			7.45%
2	Portfolio MWR	x			10.63%
2	Portfolio TWR	x			10.63%
3	Benchmark MWR	x		x	7.45%
3	Benchmark TWR	x		x	7.45%
3	Portfolio MWR	x		x	9.16%
3	Portfolio TWR	x		x	9.16%
4	Benchmark MWR		x		8.06%
4	Benchmark TWR		x		7.45%
4	Portfolio MWR		x		8.06%
4	Portfolio TWR		x		7.45%
5	Benchmark MWR	x	x		8.06%
5	Benchmark TWR	x	x		7.45%
5	Portfolio MWR	x	x		11.78%
5	Portfolio TWR	x	x		10.63%
6	Benchmark MWR	x	x	x	8.06%
6	Benchmark TWR	x	x	x	7.45%
6	Portfolio MWR	x	x	x	10.01%
6	Portfolio TWR	x	x	x	9.16%

Table 3: *Returns of the different decision-based asset allocations*

The last step of the more detailed decomposition of the MWR of our sample portfolio is to assign the return contributions to the investment decisions as well as to the relevant decisions makers. In comparison to the previous break down shown in figure 2, figure 3 introduces another possibility for decomposing the MWR of the portfolio.

The MWR of the sample portfolio can be split up into the MWR of the benchmark and the active MWR. The active MWR is the total return contribution to the MWR of the portfolio due to all active asset allocation decisions and to the timing effect of changing the money invested in these active asset allocations. The timing effect benchmark is not covered by the active MWR because it includes no active decision relative to the benchmark but relates to the decision of changing the money invested in the (passive) benchmark strategy. In absence of any active asset allocation bet the active MWR is zero and the excess return versus the TWR of the benchmark comes only from the timing of the cash flows into or out of the benchmark portfolio. In case of active asset allocations combined with a change in the invested money, the active MWR

consists not only of the active TWR or the management effect but also includes always a timing effect due to the change of the money invested in the active asset allocations. Comparing the TWR of the portfolio with the TWR of the benchmark results the usually reported excess return or active TWR which is related to the active asset allocation decisions by the portfolio manager not influenced by the (external or non-discretionary) cash flows. In figure 3 we also differentiate between the management effects 1 and 2 which are the result of the active asset allocation versus the benchmark at the beginning of the investment period as well as the return contribution of changing the active asset allocation in the middle of the month.

The different return contributions can be linked to the aforementioned six investment decisions:

a) the benchmark TWR reflects the return contribution of decision 1,

b) the management effect 1 reflects the return contribution of decision 2,

c) the management effect 2 reflects the return contribution of decision 3,

d) the timing effect benchmark reflects the return contribution of decision 4 and

e) the timing effect active asset allocation reflects the return contribution of decision 5 and 6.

Without any (external or discretionary) cash flow the timing effect active asset allocation as well as the timing effect benchmark vanishes and the analysis reduces to the classical TWR case.

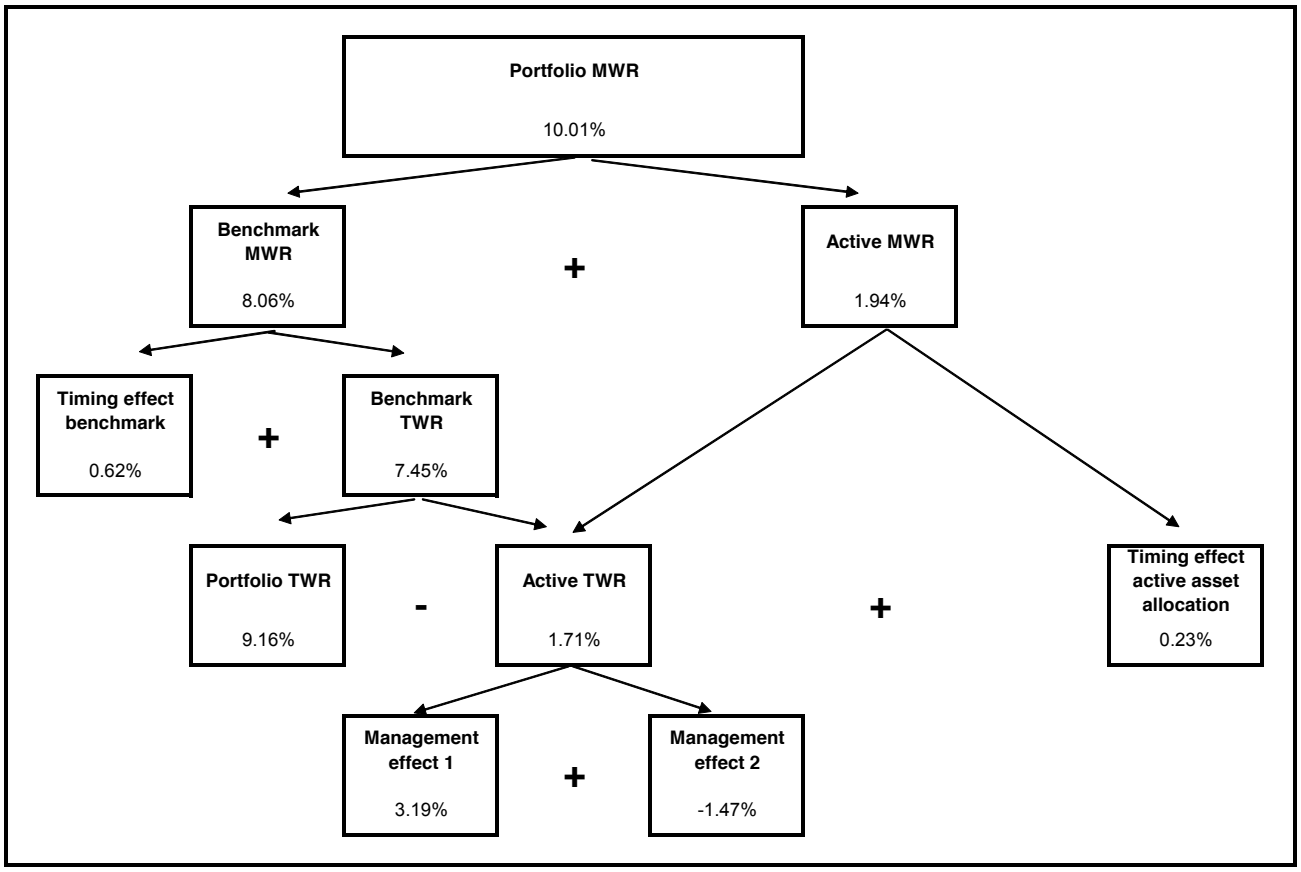

Figure 3: *Decomposing the money-weighted rate of return – version 2*

A well-known property of the MWR is that the (percentage) returns can easily be transformed into absolute profit and loss figures per unit of currency. Figure 4 illustrates the same analysis for the sample portfolio as in figure 3 but with absolute profit and loss figures due to the different investment decisions by the client and by the portfolio manager over the investment period.

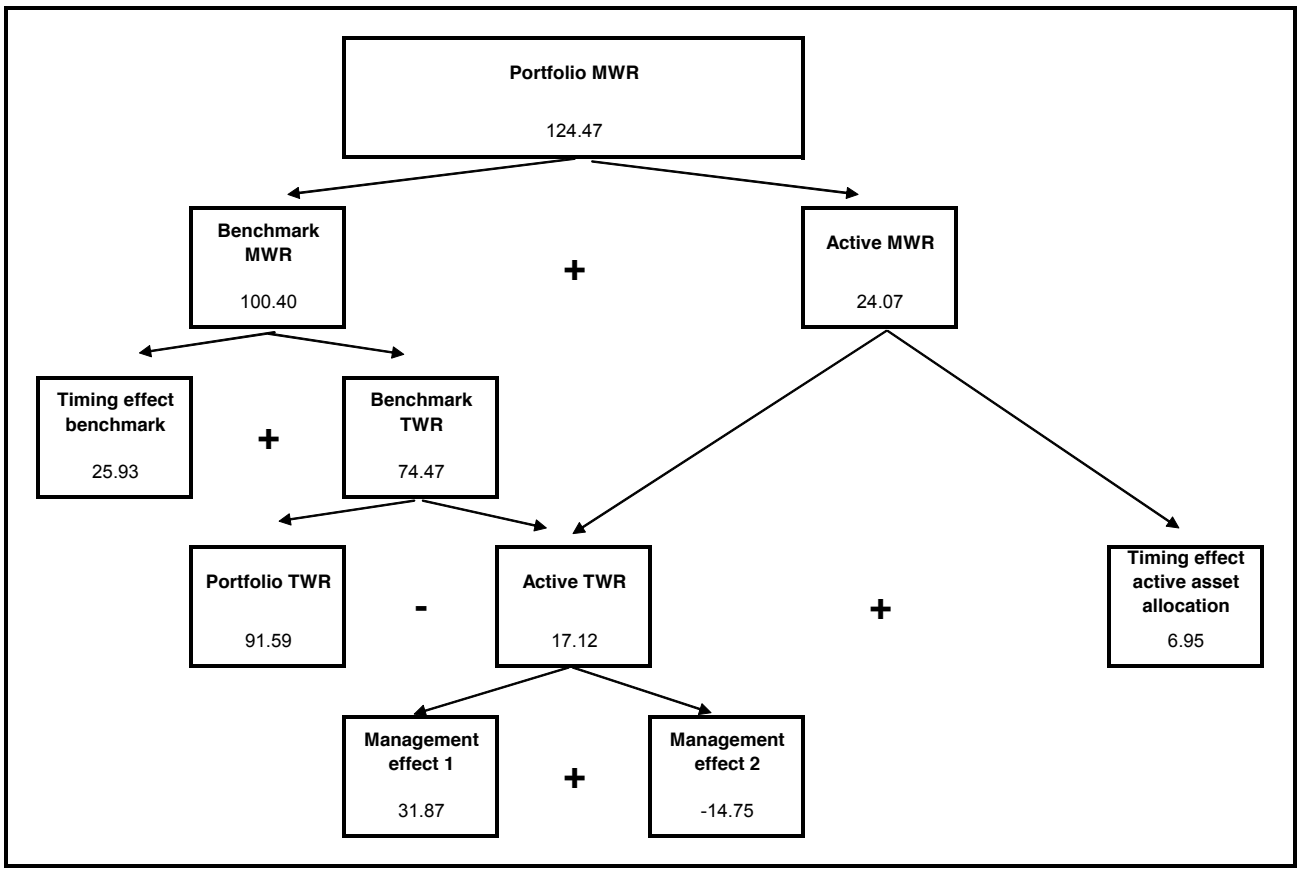

Figure 4: *Decomposing the absolute profit and loss*

CONCLUSION

This article illustrates that neither the MWR calculation nor the MWR decomposition should be neglected but rather incorporated into the performance reporting and evaluation process. Not considering the MWR concept and with this ignoring the timing effects of the (external or non-discretionary) cash flows bears the risk of misinterpretation and of wrong feedback into the investment process.[12] The MWR concept still adds value and is by no means outdated. Moreover, all participants are encouraged to remember the basics in order to get back the lost insights of the MWR concept and should reintroduce the MWR concept to the area of performance measurement as well as to the area of performance attribution.

CONTACT INFORMATION

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ENDNOTES

1 For a similar opinion, please see "Using Performance Statistics: Have Measures Lost the Plot"; in: Journal of Performance Measurement; Winter 2002/2003; page 22-32; by R. Darling and A. MacDougall.

2 This article is based on the presentation "Decomposing MWR" held by Dr. Stefan Illmer on the Spaulding Performance Measurement Forum in Warsaw 2003. The presentation is available from Dr. Stefan Illmer (stefan.illmer@csam.com).

3 This is in line with the principles and the spirit of the Global Investment Performance Standards (GIPS™) which deal with the return calculation and presentation from a portfolio manager's point of view on a total portfolio level.

4 Moving from the total portfolio level to a subportfolio level, the "right" measure for calculating the segment returns depends on whether the timing effect of the cash flows is considered. If it is the portfolio manager's decision to invest money into or to withdraw money from the different subportfolios, in comparison to the total portfolio level TWR might not be the right measure to calculate the "true" return. The control over the timing of cash flows is the relevant basis when choosing the "right" return calculation methodology.

5 For the differences between performance attribution and return as well risk attribution, please see the EIPC working paper on guidance for users of attribution analysis which is available on the AIMR webpage (www.aimr.org).

6 This procedure for decomposing the MWR is a general framework and can be applied to individual investment processes and can be adjusted according to the specific needs of the client and the portfolio manager. In the following we concentrate our argumentation on the total portfolio level and we do not consider the return contributions of portfolio segments.

7 If not otherwise stated, in the following cash flows are always supposed to be external or non-discretionary.

8 As discussed later in this article the timing effect of changing the money invested in the benchmark portfolio can also be quantified by considering a MWR for the benchmark portfolio.

9 In the case where the client can choose different portfolio managers or asset management companies to implement his or her benchmark strategy, one could argue to assign the management effect also to the client and to rename it as the "portfolio manager (selection) effect".

10 A similar procedure is well described in an article "Decision-Based Evaluation of the Performance of a Hierarchically Structured Investment Process"; in: Journal of Performance Measurement; Fall 2001; page 47-62; by Jeroen Geenen, Marc Heemskerk and Michiel Heerema. Another approach was presented by Dr. Stefan Illmer at the 3rd Performance Measurement & Attribution Forum in Zurich 2002. Please email to Stefan Illmer (stefan.illmer@csam.com) to get a copy of his presentation "Looking beyond the portfolio level: measuring the effect of other layers in the decision making process".

[11] The MWR of a benchmark portfolio is the MWR of the portfolio assuming no active management decisions like stock picking or the asset allocation decision, but considering the in- and outflows from a client's point of view.

[12] An interesting example of a case where neglecting the timing effect of cash flows may lead to wrong feedback is when one measures the segment returns of a portfolio only using the TWR methodology - like normal return attribution software packages do. The TWR return attribution neutralizes the timing effect of the cash flows into or out of a certain investment segment and the resulting TWR contribution is not affected by the timing effect of a rebalancing. Running a TWR return attribution without considering the timing effect of cash flows may contradict the common understanding of the two different concepts for calculating returns. If the decision maker has control over the cash flows, the return decomposition of a portfolio should (also) be done using the MWR concept. In such a case the segment returns should (also) be calculated as a MWR and not only as a TWR. The knowledge of the timing effect in changing the money invested in the different investment segments is without any doubt valuable management information. It is not clear whether the existing return attribution software packages do address the timing effect of (internal) cash flows appropriately and therefore additional research is needed.