Turnover Performance

While analyzing an investment portfolio, in particular untangling its transactions, you have probably wondered which of these trades have had a decisive influence, positive or negative, on the performance of the portfolio. Although it is straightforward to analyze whether a single purchase or a single sale involved a security whose price subsequently increased or dropped, it is almost impossible to focus on the "big picture." The turnover performance measure provides a first answer to the difficulty stated above. Working at the level of asset classes, it generates a time series of relative performance, revealing transactions or groups of transactions having determinedly influenced the performance of the investment.

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Structure of the article

Since the analysis of the management style of investment portfolios is typically carried out with performance attribution, we start by reviewing the properties of this method. We draw attention to some of its weaknesses, or at least to some traits that do not entirely correspond to the behavior of asset managers or to the expectations of practitioners.

We then define the desired goals of a new performance measure that we call turnover performance. This measure operates at the level of the asset classes, like the allocation component of performance attribution. We show how to calculate the turnover performance and the resulting excess return performance curve, by calculating the contribution of each transaction to the excess performance. Finally, we provide a real-life example of such a curve and analyze the corresponding results.

We emphasize in the concluding remarks that the turnover performance does not replace the traditional performance attribution. It is a new performance measure that will appeal to practitioners but does not yet have the comprehensiveness and legitimacy of performance attribution.

Performance attribution

The analysis of asset management is traditionally carried out with the help of performance attribution. The performance attribution decomposes the performance of the investment in a passive and an active component. The passive component assumes an investment replicating exactly the underlying benchmarks and according to the target weights of the investment strategy. The active component of the performance is the difference between the effective performance and the passive performance. This difference is in turn decomposed into an allocation component that results from a manager's weighting of the asset classes differing from the targeted strategic weighting, a security selection component that results from an investment selection within an asset class differing from that investment held in the underlying benchmark, and an interactive component that cannot be directly attributed to a specific pattern of investment. The performance attribution methodology has been initiated by Brinson and Fachler (1985) and Brinson, Hood and Beebower (1986), and has been extended and re-fined in numerous publications since then.

The performance attribution, however, shows several weaknesses:

1) Next to the "allocation" and the "selection" components of the active asset management there is an "interaction" term that cannot be assigned to either the allocation or the selection behavior of the asset man-ager. This would not be a serious problem if the interaction term was always small compared to the other components. Unfortunately this is not always the case, especially when the interval of analysis is relatively large and the weights of the asset classes vary accordingly.

2) This brings us to the next weakness of performance

attribution. The weights of the asset classes are considered fixed over the whole interval, although they can vary, not only due to transactions, but simply due to the evolution of market prices.

3) The previous weakness was tentatively solved by di-viding the interval of analysis into small intervals on which the weights are stable. Unfortunately, the aggregation of the results on the small intervals into the global results on the original interval of analysis has not been solved. Several methods have been suggested, including GRAP (1997) Cariño (1999), Menchero (2000), Davis and Laker (2001), Frongello (2002), but so far none have been able to get unanimous applause.

4) This point cannot be considered as a weakness per se, but it questions the definition of the "neutral" management policy, *i.e.*, the policy that does not produce any active component (the allocation and selection components are both zero). In order to have a zero allocation component, the asset manager has to constantly rebalance the asset classes. This is the only way to keep the allocation weights of the asset classes equal to the strategy weights. Under this model, "doing nothing" is considered active management.

5) Finally, the performance attribution does not go down to the transaction level. It shows the components of active asset management but does not point out the transactions that have led to these results.

Let us go back to point 4 above. Of course it is perfectly legitimate to evaluate the asset management by analyzing the deviations from the strategic weighting of the investment. However, these deviations are not necessarily the result of active decisions of the asset manager but of the different market tendencies of the asset classes. The asset manager would be forced to constantly rebalance the weights of the asset classes in order to offset these evolutions if her goal were to keep the weights of the asset classes equal to the strategic weights. Practical experience, however, shows the following:

- The asset manager does not continually rebalance the asset classes even if her expectations are neutral.
- The client has another perception of the active asset management. Each trade is seen as an active decision of the asset manager, whether this was done for rebalancing purposes or actively over- and under-weighting some asset classes is irrelevant. The question is, "What has the asset manager done?" and not "Why has she done it?"

Interestingly, the benchmarks of the individual asset classes, for example stock indexes, are normally weighted by capitalization and not with constant weights. This means that a replication does not require constant rebalancing. A similar definition of the strategic allocation could be defined, avoiding the permanent re-balancing of the asset classes.

We have seen investors analyzing hundreds, even thousands of transactions in order to find out "what has happened" mostly with limited success because each single transaction does not have a significant impact by itself. The asset manager usually does not implement a tactical change with one or two transactions but with a group of transactions spread out over a period of time. Finding such groups of transactions is a huge challenge.

Goals and properties of the new measure

Considering that the security selection abilities of the asset manager are essentially exposed by the traditional performance report (performance of investment classes compared with the return of their respective benchmark), we are looking for a measure that emphasizes the allocation capabilities of the asset manager. This measure must have the following properties:

- It operates at the level of the investment class and not at the level of the individual security.
- Investment shifts within the same investment class (selection) essentially do not influence the allocation component of the performance.
- The neutral policy (producing a performance of zero) is the "do nothing" policy. We will explain shortly exactly what this implies.
- Transactions are analyzed individually.

The first two properties are also found in traditional per-

formance attribution. The third property differs from the similar assumption of the performance attribution for which the neutral policy is the strategic asset allocation. In our new measure the neutral policy is the “do nothing” policy. This means that the asset manager only intervenes if an external event causes the transfer of value from one asset class to another. In this case, she must “neutralize” this transfer in order to remain in the neutral policy. Let us give a few examples:

- When a bond gets reimbursed at maturity, the asset manager has to reinvest the whole amount in a bond of the same asset class in order to remain neutral.
- The asset manager must also reinvest in a bond of the same asset class the interest payment that she receives in order to remain neutral.
- The asset manager has to reinvest, in a stock of the same asset class, the money that she receives as a dividend or resulting from the sale of a stock.

In the absence of an external event though, the asset manager really does nothing, except for selection purposes. A neutral selection shift would be realized by sell-ing an asset and purchasing another asset of the same asset class for the exact same amount as the sale. The sale would cause a transfer to a cash account, which would then be exactly canceled out by the replacement purchase. Similarly, the two transactions would cancel each other out regarding the common asset class of the two assets.

We assume throughout this article that the cash accounts belong to the asset class “liquidities,” which also in-cludes cash equivalent investments such as time de-posits, call money, and money market funds.

Some transactions do not involve a transfer from one asset class into another, but a single inflow into an asset class or outflow out of an asset class. A cash deposit, for example, is an inflow into the asset class “liquidities.” The neutral investment policy can be defined in different ways. For example, the cash deposit should be allocated according to the investment strategy or used to rebalance the investment toward the investment strategy. Both these policies can be considered in an actual implementation of the model.

The analysis is based on the transactions themselves and not only on the positions. This allows not only the computation of an “allocation“ performance but also the contribution of each transaction to this performance. There is no need to recognize the purpose of a single transaction. The consideration of the flow transfers between asset classes automatically neutralizes the transactions that are performed for selection purposes, since the corresponding flows cancel out, and flows from the same asset class are considered as invested in the corresponding benchmark.

Computation of the turnover Performance

The turnover performance measure is computed on a given time interval (t_0 , T) that we call the performance interval. Each transaction in the performance interval is regarded as a potential turnover transaction and individually analyzed as such. As we have seen before, the transactions such as purchases, sales, dividends, interests, etc., are turnover transactions between the asset class of the corresponding asset and the asset class “liquidities.” Let us now examine in detail the contribution of a transaction to turnover performance. Such a transaction is just analyzed from the point of view of its flows in and out of the corresponding asset classes: positive for inflows and negative for outflows. A purchase is seen as a flow into the asset class of the bought asset and a flow out of the asset class “liquidities.”

Let us examine a transaction at time t in the interval (t_0 , T) involving a security of the asset class and the “liquidities” asset class. Its flow into or out of the asset class A is $\overline{}$, and its flow into or out of the “liquidities” asset class A is $\overline{}$. Let us define $\overline{}$ the value of the benchmark for asset class A at time t and $\overline{}$ the value of the benchmark for the “liquidities” asset class at time t. Remembering that the performance interval ends at time T, the nominal contribution of the transaction to the turnover performance is defined as

$$\overline{} \qquad \overline{} \ .$$

The first term can be defined as the contribution to turnover performance of the flow of asset class A. It can be regarded as the value at time T of an investment (long or short) at time t in the benchmark of the asset

class *A*. Similarly, the second term can be defined as the contribution to turnover performance of the flow of the "liquidities" asset class. It can be regarded as the value at time of an investment (long or short) at time *t* in the benchmark of the "liquidities" asset class.

The nominal contribution of the transaction to turnover performance can be positive or negative; a positive value showing a favorable transaction and a negative value an unfavorable transaction, compared to the neutral investment.

The sum of these contribution values for all transactions in the performance interval gives the nominal result of the turnover performance. This value in dollars can be easily transformed into a relative value (in percent) of the average invested capital. This is the turnover performance that reflects the effects of turnover between asset classes, *i.e.*, the allocation component of the performance.

We can further refine this already promising result. Actually, we do not only know the absolute amount of the turnover performance, we also know where it comes from since we know the contribution of each single transaction to this result. We can therefore cumulate the contributions from the start date of the performance in-terval up to any time t and present the final result not simply as a return, but as a time series of returns. The resulting curve allows a visualization of the periods with favorable and unfavorable transactions. The sharp changes of the curve readily underline the important turnover transactions which can then be analyzed in de-tail. We will see a real-life example of such a chart after going through a simple example in the next section.

The only data required for the computation of the turnover performance are the flows generated by the transaction and the applicable benchmark values at both the date of the transaction and the end of the performance interval. In particular, it does not require any security prices beside those given by the trades. Also, the computations are executed on the basis of nominal amounts and only thereafter transformed into percentage returns. This is in contrast with the transaction-based performance attribution which requires a recalculation of the asset class weights after each transaction; *i.e.*, requires the prices of all the securities in the portfolio at the time of each transaction. Also, the performance attribution directly operates at the level of returns, as opposed to the tunover performance which operates with nominal values.

Simple example of turnover Performance

Consider the following simple example (Table 1) with three asset classes: "Liquidities," "Stocks USA" and "Stocks Europe." The performance interval runs from December 31, 2011 to December 31, 2012. The holdings on December 31, 2011 are included below.

There are four transactions, numbered 1 to 4, at two different calendar dates during the performance interval (see Table 2).

The benchmark values (converted into dollars where necessary) for the start date, the end date, and the dates of the transactions are given in the table below for the three asset classes (see Table 3).

As described above, we will start by computing the nominal contribution to the turnover performance for each transaction.

Transaction 1

Sale of securities from the asset class "Stocks Europe" on 03.28.2012 for a trade value of $1,000.

The flow out of the asset class "Stocks Europe" is $1,000 on 03.28.2012. The benchmark value for this

Table 1

Asset class	Market value on Dec 31, 2011 in $
Liquidities	2,000
Stocks USA	12,000
Stocks Europe	6,000

asset class is 110.66 at this date and 119.13 on 12.31.2012. This gives a nominal contribution to the turnover performance of -1000 * 119.13 / 110.66 = $-1,076.54.

The flow into the asset class "Liquidities" is $1,000 on 03.28.2012. The benchmark value for this asset class is 100.74 at this date and 102.83 on 12.31.2012. This gives a nominal contribution to the turnover performance of 1000 * 102.83 / 100.74 = $1,020.69.

The nominal contribution of the transaction to the turnover performance is therefore -1,076.54 + 1,020.69 = $-55.85.

This result is summarized in the Table 4 below.

The contributions to turnover performance of the next three transactions are given below as the summarized tables.

Transaction 2

Purchase of securities in the asset class "Stocks Europe" on 03.28.2012 for a trade value of $1,000 (see Table 5).

Notice that transactions 1 and 2 cancel out with respect to the turnover performance. This should be no surprise since the combination of these two trades is a replacement of securities within the same asset class and there-fore does not change the allocation among the asset classes.

Transaction 3

Sale of securities from the asset class "Stocks USA" on 06.01.2012 for a trade value of $800 (see Table 6).

Transaction 4

Purchase of securities in the asset class "Stocks Europe" on 06.01.2012 for a trade value of $800 (see Table 7).

The combination of transactions 3 and 4 can be viewed as a pure reallocation of $800 from "Stocks USA" to "Stocks Europe." The combined contribution to turnover performance of these two trades is positive, since the asset class "Stocks Europe" performed better

table 2

#	Date of transaction	Type of transaction	Asset class of the securities traded	Trade value of the transaction
1	03.28.2012	Sale	Stocks Europe	1,000
2	03.28.2012	Purchase	Stocks Europe	1,000
3	06.01.2012	Sale	Stocks USA	800
4	06.01.2012	Purchase	Stocks Europe	800

table 3

Date	Benchmark values in $		
	Liquidities	Stocks USA	Stocks Europe
12.31.2011	100.00	100.00	100.00
03.28.2012	100.74	112.08	110.66
06.01.2012	101.23	104.11	94.88
12.31.2012	102.83	114.77	119.13

table 4

Asset class	Flow	Contribution to turnover performance
Stocks Europe	-1,000	-1000 * 119.13 / 110.66 = $- 1,076.54
Liquidities	1,000	1000 * 102.83 / 100.74 = $ 1,020.69
Total Transaction		- 1,076.54 + 1,020.69 = $-55.85

table 5

Asset class	Flow	Contribution to turnover performance
Stocks Europe	1,000	1000 * 119.13 / 110.66 = 1,076.54
Liquidities	-1,000	-1000 * 102.83 / 100.74 = -1,020.69
Total Transaction		1,076.54 – 1,020.69 = $55.85

table 6

Asset class	Flow	Contribution to turnover performance
Stocks USA	-800	-800 * 114.77 / 104.11 = -881.90
Liquidities	800	800 * 102.83 / 101.23 = 812.64
Total Transaction		-881.90 + 812.64 = $-69.26

table 7

Asset class	Flow	Contribution to turnover performance
Stocks Europe	800	800 * 119.13 / 94.88 = 1,004.47
Liquidities	-800	-800 * 102.83 / 101.23 = -812.64
Total Transaction		1,004.47 - 812.64 = $191.82

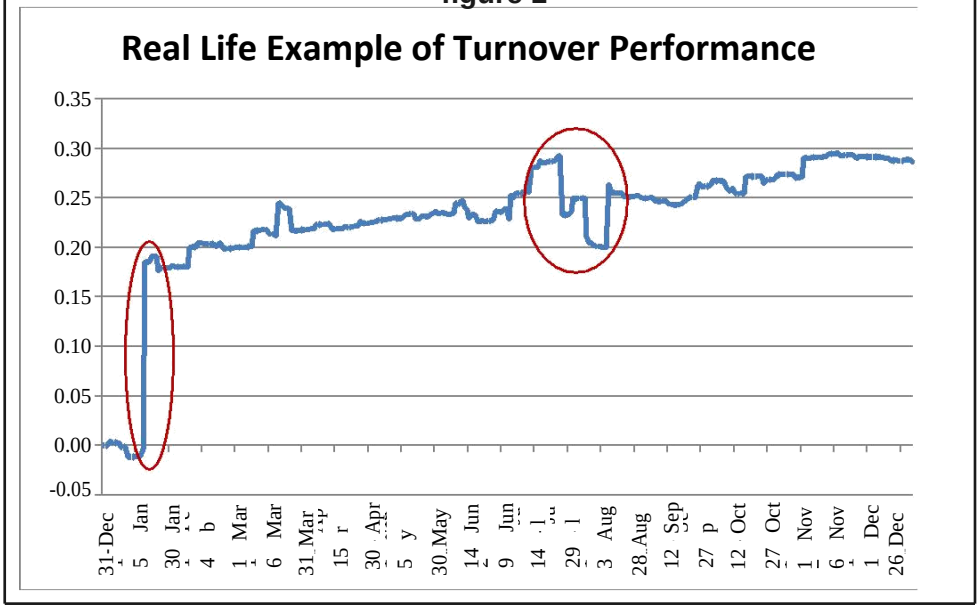
than the asset class "Stocks USA" when regarded as the evolution of their respective benchmarks between the date of the trades and the end of the performance inter-val.

The overall nominal turnover performance is then -55.85 + 55.85 -69.26 + 191.82 = $122.57. This nominal value can be expressed as a percentage value of the invested capital. Since we do not have external cash flows, we can take the start value of $20,000 as the invested capital. We then get a turnover performance of 122.57 / 20,000 = 0.61 percent. We also know that this turnover performance is entirely due to the two transactions of June 1, 2012.

real life example of turnover performance

The same computation process can be applied to a real-life portfolio. We have applied this method to compute

figure 1



the turnover performance for a pension fund over the period of one year, with ca. 5,000 transactions. The result is given in Figure 1, showing a total turnover performance of 0.29 percent. We readily see two periods having a manifest influence on the turnover performance. These periods are marked with a red oval.

On January 18, numerous Swiss and American stocks were sold, resulting in an increase of the turnover performance, the stocks benchmarks having underperformed the liquidity benchmark. The sales spread over more than 30 transactions, so that an analysis of individual transactions would not have pointed out this event, which resulted in an outperformance of 0.2 percent.

- On July 26 and August 6, the purchase of Swiss stocks had a negative influence on the performance. The purchase of European stocks on August 16, however, resulted in a slight outperformance.
- This analysis clearly underlines groups of transactions having together a noticeable influence on the performance, although the influence of each individual transaction on the performance is almost negligible, which is generally the case.

Possible extensions

The turnover performance measure can also take transaction fees into account, even in the case of a turnover within the same asset class (*i.e.*, selection). In the case of a purchase, for example, we would consider the in-flow into the class of the asset excluding the transaction fees, but we would consider the outflow out of the asset class "liquidities" including the transaction fees. The sum of the flows of the transaction would then be negative, therefore lowering the turnover performance. Thus transaction fees would also be taken into account in se-lection transactions; the sale of an asset and the purchase of an asset of the same class being both prejudiced by the transaction fees.

We can use the same technique to take into account the investment strategy at the beginning of the performance interval. We can compute the contribution of the difference between the effective market value of each asset class and its value according to the investment strategy. We then add these values to the contributions of all the transactions in the performance interval. We otherwise proceed similarly. The turnover performance curve will then start at a value usually different from zero, reflecting the deviation from the investment strategy at the beginning of the interval. The fact that the asset manager does not rebalance toward the strategy, however, has no influence on the turnover performance.

Conclusion

Although we started this article describing the performance attribution, the turnover performance cannot be considered as a substitute for performance attribution. It takes from performance attribution the idea of replacing the investment of an asset in a given asset class by an artificial investment in the corresponding bench-mark. However, it performs the analysis at the transaction level instead of the position level, opening new possibilities of investigation. It only computes the allocation component of the active performance, the computation of the selection component remaining open.

The results have been shown to practitioners, who showed considerable interest. They view the turnover performance measure as a tool that allows them to analyze the behavior of the asset managers with much more efficiency as before and with much more precision than with traditional performance attribution.

It is, however, not a replacement for performance attribution since it does not divide the excess return in more or less clearly defined components. Maybe some future research on turnover performance will provide such a framework.

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