Asset Allocation, Benchmarks, active management, performance attribution

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Outline

- **Strategic Asset Allocation**
- **Benchmarks**

Strategic Asset Allocation & Benchmarks

Strategic Asset Allocation

The Strategic Asset Allocation (SAA) is the discipline that brings together the risk profile of a portfolio (built with capital market expectations) with the objectives and constraints of an investor

Capital market expectations +
Investor's objectives and constraints $\Longrightarrow$
Strategic Asset Allocation

- The SAA must take into account all forms of capital.
  For individuals, it should also take into account human capital
- Capital market expectations are long term expectations and they do not depend on current asset prices: entry price is not a concern. The SAA has a 1-year to 3-year horizon

SAA is a process and a result at the same time.

The result provides with a set of benchmarks for the investor, i.e. the appropriate mix of assets to hold in normal market conditions, the desired exposures to systematic risks

Rebalancing of Strategic Asset Allocation

Trading can occur in the context of the SAA, mainly because of:

- A periodic revision in capital market expectations and thus a change in SAA's weights
- The need to bring back the portfolio weights towards the SAA when they have drifted:
  - Strategic asset allocation implies the set up of risky portfolios. Changes in the allocation can then occur because of variations in value or duration of risky assets, themselves stemming from the passage of time or the variation in expected returns/yields.
  - Bringing back portfolio weights towards the SAA is done via portfolio rebalancings.

Benchmark: definition

A benchmark is a portfolio of reference for management. It is a group of securities or risk factors that represent persistent characteristics of an asset class or an investment process:

- At the SAA level, a benchmark thus corresponds to the weights placed in the asset classes according to long term capital market return expectations
- At the portfolio manager (p.m.) level, a benchmark is a passive representation of the investment style of the manager, including for instance significant exposures to sources of systematic risk. A p.m.'s benchmark thus includes the p.m.'s fields of expertise

Benchmarks are used for risk management (overall risk budget of the portfolio) and for performance attribution (compute excess return of portfolio for identical risk). The choice of a benchmark is thus in itself an investment decision

Properties of a valid benchmark

A valid benchmark should possess a certain number of properties (Bailey et al, 1990, Bailey, 1992), which are:

- **Lack of ambiguity**: identities and weights of the securities or the risk factors are clearly defined.
- **Investability**: it is possible to cease active management and to simply hold the benchmark
- **Measurability**: the benchmark return is easily computable at a reasonable frequency
- **Appropriateness**: the benchmark corresponds to the management style or the fields of expertise of the manager
- **Ability to reflect the views of the investor**: the manager has an uptodate knowledge of securities or risk factors
- **Specified in advance**

Types of benchmarks (1/2)

A valid benchmark reflects the investment style that the manager should follow, and thus becomes the basis to assess the efforts of the managers. We can distinguish 7 categories:

- **Absolute**. Generally not valid
- **Management universe**, e.g. median fund in the investment universe. Not valid.
- **Large market indices**: S&P 500, Wilshire 5000, Russell 3000. Generally fulfil all the criteria, but are not appropriate
- **Style indices**. Produced by, among others, Russell, S&P, MSCI. For instance, for equities, Large Cap Growth, Large Cap Value, Small Cap Growth, Small Cap Value. They match all the criteria, except sometimes the appropriateness, because weights in certain securities are sometimes very high, and go much beyond what a manager would consider as prudent.

Types of benchmarks (2/2)

- **Based on multi factor models**. Its simplest form is the market model. They can be used for performance attribution. However, those benchmarks are not very intuitive for managers, who rarely think in terms of risk factors. In addition, they may not be investable
- **Returns-based** (Sharpe, 1988 and 1992).
- **Based on ad-hoc securities** from the manager investment universe, and weighted in a particular way. They reflect the unique approach of the manager in terms of weighting. This is the only category that satisfies all criteria, but is very expensive to build and to maintain.

Decomposition of portfolio return

A well known ad-hoc decomposition of the portfolio return in excess of the return benchmark return is provided by Bailey, Richard and Tierney (1990):

$$r_P = (r_P - r_B) + r_B = (r_P - r_B) + (r_B - r_M) + r_M$$

$$\begin{cases} r_M & = \text{return on the market index} \\ r_B \text{ - } r_M = r_S & = \text{benchmark - market return (}\textbf{style bias}\text{)} \\ r_P \text{ - } r_B = r_A & = \text{portfolio - benchmark return (}\textbf{active management}\text{)} \end{cases}$$

P and B have the same style bias with respect to M. The performance of P with respect to B should only be related to active management. Active management should not be related to the style of the p.m.

A lot of managers use as a benchmark a large market index, as if the manager had no style ($r_S = 0$). But this is usually not representative of their style, and this introduces biases in their evaluation.
Such biases can be detected by testing the quality of the benchmark adopted.

Tests of the quality of a benchmark (1/3)

Those tests can be carried out from the previous decomposition and include:

- **Detection of systematic biases**: over the long run, there should be no systematic biases between the portfolio and its benchmark.
  - This can be observed by calculating the historical beta of the portfolio with respect to its benchmark. On average, it should be close to 1.
  - A good benchmark should also have a correlation between r_A an r_S that is not statistically different from 0. Indeed, the capacity of a manager to identify attractive investment opportunities should not be related to the attractiveness of its style with respect to the overall market.
  - A valid benchmark should also display a statistically positive correlation between its style and its return in excess of the market return.

Tests of the quality of a benchmark (2/3)

- **Detection of active positive positions**: an active position happens when the weight of a security in a portfolio differs from its weight in the benchmark. A portfolio which has no views on a security included in the benchmark will not own that security, implying a negative relative position. A high proportion of negative positions actually means that the benchmark badly reflects the p.m.'s philosophy.
- **Coverage**: the proportion of the market value of a portfolio that is present in the benchmark.
- **Turnover**: the proportion of the market value of the benchmark that will be subject to trading during a rebalancing period. The benchmark should be easily replicable and its turnover is expected to be moderate.

Tests of the quality of a benchmark (3/3)

- **Risk characteristics**: over the long run, portfolio exposure to sources of systematic risk should be similar to those of its benchmark. The purpose of a benchmark is to reflect, but not to replicate the investment process of the manager. Since an active manager constantly makes active bets against its benchmark, a valid benchmark will exhibit sources of systematic risk sometimes higher and sometimes weaker than the portfolio. **But if risk characteristics of the portfolio are on average larger or lower than those of the benchmark, then the portfolio is biased vav its benchmark**.
- **Tracking Error (TE)**: a valid benchmark should reduce noise in the evaluation process. **The portfolio TE with respect to its benchmark should be weaker than the TE of the portfolio with respect to a market index**.

Tactical Asset Allocation

Tactical Asset Allocation (TAA) adjusts strategic exposures (to asset classes or risk factors) of the long term SAA with differential positions, to take advantage of market opportunities, from the observation of asset classes relative performances.

It is implemented by tilting the strategic allocation weights. In particular, negative weights or short selling can be used.

It has a short term horizon (3 to 6 months, depending on market conditions): once short term opportunities have been exploited, relative positions will be closed to return to the SAA.

Tactical Asset Allocation

Tactical asset allocation is based on short term expectations and the perception of imbalances:

- Long term views differ from short term views
- Look to exploit transitory deviations of asset classes from their long term values

Tactical asset allocation is generally based on 3 principles:

- From asset prices, one can infer market expected returns
- Cross asset expected returns reflect relative perceptions of risk
- Markets are rational and returns follow mean-reverting processes

Forms of Tactical Asset Allocation

The entry price is the main TAA decision criteria. It is implemented when a deviation from fair value is observed on a security. It can take the form of:

- Market timing
- Security selection

TAA is a form of active management. It creates active risk to generate an active return with respect to the benchmark defined by the SAA. It can be implemented by:

- Punctual, ad-hoc adjustments
- Frequent, model-based adjustments

SAA can also be considered as a form of active management, if the long term expectations of the SAA are diverging from the market consensus

Importance of SAA in total performance

What is the importance of strategic asset allocation in the overall performance compared to other investment decisions? The conclusions actually depend on the way strategic allocation is interpreted and measured.

Kritzman et Page (2003) measure the importance of strategic asset allocation with a theoretical model: they assume that asset allocation and security selection differ in terms of the capacity to affect investor's final wealth. What should the investor favor if he is skilled?

- Active security selection leads to a wider potential dispersion than changing the strategic asset allocation
- A skilled manager has the capacity to achieve a higher excess return if he favors security selection rather than strategic asset allocation

Importance of SAA in total performance

It can be measured with the % of the returns in the cross section explained by strategic asset allocation, i.e. the % of the variance between funds' performances explained by their respective asset allocations.

- This estimation allows to evaluate the extent to which differences in allocations explain differences in time-series returns for a group of investors
- The degree of diversity among allocations must affect the cross sectional importance of asset allocation
- If the group of investors has varied allocations and does not perform active management, then the allocation will explain a high % of cross sectional differences of returns
- Ibbotson and Kaplan (2000): asset allocation explains around 40% of the cross sectional variance of returns of Mutual Funds, over the period 1988-1998, for 98 US pension funds

Importance of SAA in total performance

Brinson, Hood and Beebower (1986) measure it as the % of variance of returns attributable through time to the SAA, based on a time-series regression. They examine the performances of 91 defined benefits pension funds of large size over the period 1974-1983

- The policy portfolio of each fund is considered as being the average strategic asset allocation over the period
- Market timing and asset allocation are considered as investment strategy, not investment policy
- R^2 of the variable portfolio policy is 93.6%: this is the % of the variance of pension funds returns explained by the strategic asset allocation returns
- Other similar studies have followed
- In addition, the contribution of security selection and market timing to the performance differential is negative on average. Resources invested in those activities may not be profitable.

Performance Attribution

Select a consistent benchmark to evaluate portfolio performance

Performance attribution consists in splitting the global portfolio performance into more specific components linked to active management decisions. It allows to understand portfolios sources of returns in excess of the benchmark, beyond the aggregate measure of active performance

Performance attribution: the Brinson & Fachler model

- We have shown that $r_A = r_P - r_B$. Performance attribution aims at highlighting the different sources of return from active management (Excess Return, ER). To do so different methods are available.
- Brinson and Fachler (1986) propose to split ER into:
  - **A sector allocation effect** (or macro, or market timing effect), which is the differential return from the manager allocation to the sectors in proportions different from the ones in the benchmark.
  - **A security selection effect** (or within sector effect), which is the differential return attributable to the security selection activity, that leads the manager to weigh securities in a given sector in proportions different from the ones in the benchmark

Performance attribution: the differential return

- First, we compute the portfolio return and the benchmark return (n encompasses the number of unique securities in portfolio and benchmark) over the period of interest from weights on the securities and their associated returns

$$R^P = \sum_{i=1}^{n} w_i^P . r_i \qquad R^B = \sum_{i=1}^{n} w_i^B . r_i$$

  The portfolio differential, or excess, return is then $R^P - R^B$, and is interpreted as the result of active management.

- The two sources of excess return according to Brinson Fachler decomposition are then calculated as follows:
  - **Sector allocation** is represented by the difference between the weight of the sectors in the portfolio and in the benchmark
  - **Security selection** is represented by the difference between the return on the portfolio in a given sector and the return on the benchmark in the same sector, for all sectors.

Performance attribution: the differential return from sector allocation

- **Here, we calculate the differential effect of tilting sector weights of portfolio with respect to benchmark**. This portfolio differs from the benchmark only because of sectors' weighting.
  - We start by identifying the S sectors and the securities within each sector in the portfolio and the benchmark. Then we compute the weight of each sector s in the portfolio and the benchmark:

$$w_s^P = \sum_{i \in s} w_i^P \qquad w_s^B = \sum_{i \in s} w_i^B. \tag{1}$$

  - The portfolio return can be rewritten as a the product of sector weights times sector returns as follows:

$$R^P = \sum_{i=1}^{n} w_i^P . r_i = \sum_{s=1}^{S} \sum_{j \in s} w_j^P . r_j = \sum_{s=1}^{S} w_s^P . r_s^P \quad \text{with} \quad \sum_{j \in s} w_j^P . r_j = w_s^P$$

A new expression of the return on the portfolio

$$\text{Thus } r_s^P = \frac{\sum_{j \in s} w_j^P . r_j}{w_s^P} = \frac{\sum_{j \in s} w_j^P . r_j}{\sum_{i \in s} w_i^P} = \sum_{j \in s} \frac{w_j^P}{\sum_{i \in s} w_i^P} . r_j$$

- We then create a fictive portfolio $P^{'}$ with the same sector weights than the real portfolio, but with the same within-sector securities weights than the benchmark. This portfolio differs from the benchmark only because of sectors' weightings.
- As weights of securities within each sector are the same in the fictive portfolio and the benchmark, the return of each sector in the fictive portfolio is actually the return on each sector in the benchmark, and the return on portfolio $P^{'}$ is given by:

$$r_{P'} = \sum_{s=1}^{S} w_s^{P'} . r_s^{P'} = \sum_{s=1}^{S} w_s^P . r_s^B$$

Performance attribution: the differential return from sector allocation

We can now compute the sector allocation effect by comparing the return on that fictive portfolio to the benchmark return:

$$AE = \sum_{s=1}^{S} w_s^{P'}.r_s^{P'} - \sum_{s=1}^{S} w_s^{B}.r_s^{B} = \sum_{s=1}^{S} w_s^{P}.r_s^{B} - \sum_{s=1}^{S} w_s^{B}.r_s^{B}$$
$$= \sum_{s=1}^{S} (w_s^{P} - w_s^{B}).r_s^{B} = \left(\sum_{s=1}^{S} w_s^{P}.r_s^{B} - r_B \right)$$

Sector differential weights should thus be multiplied by benchmark returns by sector, for all sectors.

Performance attribution: the differential return from security selection

- Next, we hold constant sector allocation to evaluate the effect of the differing weights in securities within each sector between portfolio and benchmark. We use the previous fictive portfolio again, but this time we compare it to the real portfolio return.
- **The difference between this fictive portfolio and the real portfolio returns is the within sector return differential named after security selection effect.**

Performance attribution: the differential return from security selection

$$SSE = \sum_{s \in S} w_s^P . r_s^P - \sum_{s \in S} w_s^P . r_s^B = \sum_{s \in S} w_s^P . (r_s^P - r_s^B)$$
$$= (r^P - \sum_{s \in S} w_s^P . r_s^B)$$

Here, we multiply sector portfolio weights by sector differential returns.

Eventually, the portfolio excess return writes:

$$ER = r^P - r^B = r^P - \sum_{s \in S} w_s^P . r_s^B + \sum_{s \in S} w_s^P . r_s^B - r^B = SSE + AE \quad (2)$$

Each element of the ER should stem from a p.m. investment decision.

Brinson Fachler, an example

Table 1: Portfolio and benchmark return by security

Security	Return	Sector	Weight in portfolio	Weight in benchmark
1	6%	S_1	13%	20%
2	7%	S_1	26%	20%
3	8%	S_2	11%	20%
4	9%	S_2	10%	20%
5	10%	S_3	40%	20%
Total			100%	100%

The return on the portfolio is worth 8.38% and the return on the benchmark is 8%, thus the Excess Return is worth 0.38%. Let us split it into market timing and security selection components.
$\boldsymbol{w_{s_i}^P}, \boldsymbol{w_{s_i}^P}$

Brinson Fachler, portfolio analysis

Table 1: Sector's weight in portfolio and associated return

Security	**Sector weight in portfolio**	Weight of portfolio's security in its sector	**Return on portfolio's sector**
i	$\boldsymbol{w_{s_i}^P}$	w_{i,s_i}^P	$\boldsymbol{r_{s_i}^P}$
1	**39%**	33%	**6.67%**
2		67%	
3	**21%**	52%	**8.48%**
4		48%	
5	**40%**	100%	**10%**

Brinson Fachler, benchmark analysis

Table 2: Sector's weight in benchmark and associated return

Security	**Sector weight in benchmark**	Weight of benchmark's security in its sector	**Return on benchmark's sector**
i	$\boldsymbol{w_{s_i}^B}$	w_{i,s_i}^B	$\boldsymbol{r_{s_i}^B}$
1	**40%**	50%	**6.50%**
2		50%	
3	**40%**	50%	**8.50%**
4		50%	
5	**20%**	100%	**10%**

Brinson Fachler, performance attribution

Figure 3: Market timing contribution

	Portfolio Weight	Benchmark Weight	Weights in excess	Benchmark Return	Contribution to performance (%)
S_1	39%	40%	-1%	6.67%	-0.0667
S_2	21%	40%	-19%	8.48%	-1.6112
S_3	40%	20%	20%	10%	2

Thus the contribution to performance due to market timing is 0.3221%.

Figure 4: Security selection contribution

	Portfolio Return	Benchmark Return	Return in excess	Portfolio Weight	Contribution to performance (%)
S_1	6.67%	6.50%	0.17%	40%	0.068
S_2	8.48%	8.50%	-0.02%	40%	-0.008
S_3	10%	10%	0%	20%	0

Thus the contribution to performance due to security selection is 0.06%.

References

- Bailey J. V. (1992), "Evaluating Benchmark Quality," *Financial Analysts Journal*, Vol.48 No. 3, pp. 33-39.
- Bailey J. V., Richards T. M., and Tierney D. E. (1990), "Benchmark Portfolios and the Manager/Plan Sponsor Relationship," *Current Topics in Investment Management, HarperCollins*.
- Brinson, G. P., Hood L. R., and G. L. Beebower (1986), "Determinants of Portfolio Performance," *Financial Analysts Journal*, Vol. 42, no. 4, pp. 39-48.
- Brinson, G. P., and N. Fachler (1985), "Measuring non-US equity portfolio performance," *Journal of Portfolio Management*, Vol. 11, pp. 73-76.

References

- Ibbotson R. G. P. D. Kaplan (2000), "Does Asset Allocation Policy Explain 40, 90, or 100 Percent of Performance?," *Financial Analysts Journal*, Vol. 56, no. 1, pp. 26-33.
- Kritzman, M. and S. Page (2003), "The Hierarchy of Investment Choice," *Journal of Portfolio Management*, Vol. 29, no. 4, pp. 11-23.
- Perold A. F. and Sharpe, W. F. (1988), "Dynamic Strategies for Asset Allocation," *Financial Analysts Journal*.
- Sharpe, W. F. (1988), "Determining a Fund's Effective Asset Mix," *Investment Management Review*, Vol. , pp. 59-69.
- Sharpe, W. F. (1992), "Asset Allocation: Management Style and Performance Measurement," *Journal of Portfolio Management*, Vol. 18, no. 2 , pp. 7-19.