Asset Allocation, benchmarks, active management, performance attribution

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Outline

- **Strategic Asset Allocation & Tactical Asset Allocation**
- **Benchmarks**
- **Performance attribution: the Brinson Fachler model**

Strategic Asset Allocation

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, and the objectives and constraints of an investor**

- The SAA has a 3 to 5-year horizon, as it relies on capital market expectations. They are long term expectations which are not influenced by the most recent evolutions of asset prices. As a result, an SAA is implemented without considering entry prices.
- The SAA must take into account all forms of capital of the entity concerned.
  For individuals, it should also ideally take into account human capital

The 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. They translate into target weights around which fluctuations can be authorized.

Asset Only versus Asset Liability Management models

SAA can be built using:

- **An Asset-Only (AO) approach**: the investor's objectives are formulated with respect to its assets only. It is usually suited for a retail investor.
- **An Asset-Liability Management (ALM) approach**. Institutional investors usually follow this approach. Here, the investor's liabilities (see appendix for a list of them) are embarked alongside their assets into the objective function to be optimized (in the form of a Net Equity, a funding ratio, etc). We will study in this course a strategy which can be used as an ALM tool: CPPI.

Those two approaches can be implemented statically (**"buy & hold"**) or dynamically. In the latter, the model implies management actions referred to as **rebalancings**

SAA in a dynamic set up: fluctuations bands and rebalancings

In a dynamic set up, rebalancings should be periodically implemented to bring back asset classes' weights to their target weights as they have deviated. These deviations stem from:

- The relative performance of asset classes, sometimes consistent with expectations at inception.
- The passage of time, for instance on fixed income parts of the allocation, duration decreases with time ceteris paribus.

Such rebalancings achieve what is referred to as **Constant Mix portfolios** in the Perold & Sharpe terminology.

Tactical Asset Allocation

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 SAA 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.

The rationale for a TAA

Tactical asset allocation aims at exploiting the perception of imbalances in short term expectations:

- Short term expectations are seen as differing from long term ones
- Which create transitory deviations of asset classes prices from their long term values, that create short term opportunities

Tactical Asset Allocation is generally based on the following principles:

- From asset prices, one can infer market expected returns
- Markets are rational and returns follow mean-reverting processes

Thus the asset's entry price is the main TAA decision criteria.

Implementation of the TAA

TAA can take the form of:

- **Market timing**: at the sector or at the asset class level
- **Security selection**: at the security level

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

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

As tactical positions are transitory and do not intend to modify the SAA, they can be implemented without moving SAA weights, by using derivatives (overlay strategy). This reduces transaction costs. When the price deviation has reversed, the derivative position will be lifted.

NB: 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. In appendix we examine the role of SAA versus TAA in explaining realized returns

When should an SAA be revisited?

The set up of an SAA should not be concerned by current market imbalances and their effect on short term price volality, provided they do not affect long term expectations on asset classes' returns.

- The SAA should be set independently from those short term variations in prices. Trading short term volatility is the task of TAA.
- Only major "changes of regimes" which trigger changes in long term expectations of market returns call for a revision of the SAA before its horizon.

Asset Only versus Asset Liability Management models

Some of the models presented in this course are classified in the following table:

Table 1: Classification of portfolio management models depending on their nature

	Strategic	**Tactical**
AO	Markowitz framework	Roll model for index linked portfolios
		Black Litterman model
ALM	CPPI	

Why index tracking is not ALM and why it is tactical

A pitfall might be to classify index tracking portfolios models into ALM models.

- Actually, once they have determined their SAA, institutional investors can outsource part or all of its implementation to professional asset managers (either in the form of a mandate or by buying mutual funds), due to lack of expertise or resource for instance.
- Buying an index linked fund is one frequent example. The PM which uses an index as a benchmark is not performing ALM eventhough there is a benchmark to beat, which might stand for a proxy of its liabilities. While the benchmark given to the PM comes from the ALM exercise, the index linked PM is operating in an AO framework, not relying on balance sheet modelling. Here, the benchmark is out of control for the PM.

In addition, managing an index linked portfolio is rather a tactical exercise.

Benchmarks

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 assigned to 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 for assessing the skills of the managers. How valid are the following categories often cited?

- **Absolute returns (in the form of a hurdle rate)**. Not valid
- **Management universe**, e.g. median fund in the group of managers with similar investment disciplines. Not investable, as not known ex ante, thus cannot be replicated! Not valid.
- **Broad market indices**, such as MSCI World for global developed market equities. Generally fulfil all the criteria, but are not appropriate as do not represente investor's biases
- **Style indices**. Represent investment styles within asset classes. 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)

- **Factor-based**. Similar to style indices, but can be split into factors which are returns drivers. 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**. Derived by analyzing returns for various styles of stocks (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

Bailey, Richard and Tierney (1990) split a portfolio's return r_P as follows:

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

r_M is the return on a market index
r_B is the return on the benchmark of the portfolio

Thus the return on a portfolio can be viewed as the sum of three items:

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

Decomposition of portfolio return

P and B have the same style bias with respect to M.

- Thus the performance of P in excess of B (active management return) should not be explained by the investment style embedded in P, B has the same style, thus they offset in r_A.
- Active management positions 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 running some tests.

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.
  - The beta of the portfolio with respect to its benchmark should be on average close to 1 if the benchmark is valid.
  - The correlation between r_A an r_S should not be different from 0, as 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.
  - The correlation between r_B and r_S should be positive.

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

- **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**.

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

- **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.

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 disentangle the contribution of each P.M.'s decision to the portfolio's return in excess of the benchmark, beyond the aggregate measure of active performance

Performance attribution: the Brinson & Fachler model

- Performance attribution aims at quantifying the different sources of return from active management or Excess Return, $r_A = r_P - r_B$. There are many ways of splitting it, depending on the P.M.'s investment decisions.
- Brinson and Fachler (1986) propose to split ER at the asset class level into:
  - **A sector allocation effect** (also referred to as asset allocation, macro, or market timing effect), which is the differential return from the P.M.'s allocation to the sectors in the portfolio 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, as the P.M. can weigh securities in a given sector in proportions different from the ones in the benchmark

Performance attribution: returns by sector

First, we compute the portfolio return and the benchmark return (n stands for the overall number of 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 the result of active management.

Next we identify 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:

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

Expressing portfolio's return using sectors' returns

Then we rewrite the portfolio return as the product of sector weights times sector returns as follows:

$$R^P = \sum_{i=1}^{n} w_i^P . r_i = \sum_{s=1}^{S} \left(\sum_{j \in s} w_j^P . r_{s,j} \right) = \sum_{s=1}^{S} w_s^P . \left(\sum_{j \in s} \frac{w_j^P}{w_s^P} . r_{s,j} \right)$$

with $\frac{w_j^P}{w_s^P} = q_{j,s}^P$ and $\sum_{j \in s} q_{j,s}^P = 1$, by construction. The weight of security j in sector s is the weight of security j in the portfolio divided by the sum of the weights of all securities from sector s in the portfolio.

At last, $$R^P = \sum_{s=1}^{S} w_s^P . \sum_{j \in s} q_{j,s}^P . r_{j,s} = \sum_{s=1}^{S} w_s^P . r_s^P$$

With $r_s^P = \sum_{j \in s} q_{j,s}^P . r_{j,s}$

Performance attribution: the sector allocation effect on return

- **The first effect we want to quantify is the differential return due to tilting sector weights of the portfolio with respect to its benchmark**.
- To do so, we create a fictive portfolio P_A with the same within-sector securities weights than the benchmark, but the same sector weights than the real portfolio. This portfolio differs from the benchmark only because of sectors' weightings. Thus it is the active sector allocation portfolio.
- 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_A is given by:

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

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:

$$
\begin{aligned}
AE = r_{P_A} - r^B &= \sum_{s=1}^{S} w_s^{P_A}.r_s^{P_A} - \sum_{s=1}^{S} w_s^B.r_s^B \\
&= \sum_{s=1}^{S} w_s^P.r_s^B - \sum_{s=1}^{S} w_s^B.r_s^B \\
&= \sum_{s=1}^{S} (w_s^P - w_s^B).r_s^B \left(= \sum_{s=1}^{S} w_s^P.r_s^B - r_B \right)
\end{aligned}
$$

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

The security selection portfolio

- Next we quantify the differential return from tilting securities weights within each sector in the portfolio compared to the benchmark.
- To do so we create a second portfolio, the security selection portfolio P_S, with the same sector weights than the benchmark, but with the same within-sector securities weights than the portfolio.
- As weights of securities within each sector are the same as in the real portfolio, the return on each sector is the same than in the real portfolio, and the return on the security selection portfolio writes:

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

The security selection portfolio

The differential return from security selection then writes:

$$
\begin{aligned}
SSE = r_{P_S} - r^B &= \sum_{s=1}^{S} w_s^{P_S}.r_s^{P_S} - \sum_{s=1}^{S} w_s^B.r_s^B \\
&= \sum_{s=1}^{S} w_s^B.r_s^P - \sum_{s=1}^{S} w_s^B.r_s^B \\
&= \sum_{s=1}^{S} w_s^B.(r_s^P - r_s^B)
\end{aligned}
$$

The interaction term

We can now rewrite the portfolio excess return using all the previous fictive portfolios' returns as follows:

$$
\begin{aligned}
R^P - R^B &= \sum_{s=1}^{S} w_s^P . r_s^P - \sum_{s=1}^{S} w_s^B . r_s^B \\
&= \left(\sum_{s=1}^{S} (w_s^P - w_s^B) . r_s^P + \sum_{s=1}^{S} w_s^B . r_s^P \right) - \left(\sum_{s=1}^{S} w_s^B . (r_s^B - r_s^P) - \sum_{s=1}^{S} w_s^B . r_s^P \right) \\
&= \sum_{s=1}^{S} (w_s^P - w_s^B) . r_s^P + \sum_{s=1}^{S} w_s^B . (r_s^P - r_s^B) \\
&= \left(\sum_{s=1}^{S} (w_s^P - w_s^B) . (r_s^P - r_s^B) + \sum_{s=1}^{S} (w_s^P - w_s^B) . r_s^B \right) + \sum_{s=1}^{S} w_s^B . (r_s^P - r_s^B) \\
&= \sum_{s=1}^{S} (w_s^P - w_s^B) . (r_s^P - r_s^B) + AE + SSE = IE + AE + SSE
\end{aligned}
$$

The first element is referred to as the Interaction Effect (IE).

Brinson Fachler, an example

Table 2: Returns, sectors, weights in portfolios and benchmarks of securities

Security	Realized 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.
First we need to transform this table into a table of weights and returns of sectors for the portfolio and its benchmark

Brinson Fachler: weights and returns of sectors in the portfolio and the benchmark

Table 3: Sector's weight in portfolio and associated return

Security	w_s^P	$w_{i,s}^P$	r_s^P
1	**39%**	33%	**6.67%**
2		67%	
3	**21%**	52%	**8.48%**
4		48%	
5	**40%**	100%	**10%**

Table 4: Sector's weight in benchmark and associated return

Security	w_s^B	$w_{i,s}^B$	r_s^B
1	**40%**	50%	**6.50%**
2		50%	
3	**40%**	50%	**8.50%**
4		50%	
5	**20%**	100%	**10%**

Brinson Fachler, performance attribution

Table 5: Market timing contribution

Sector	w_s^P	w_s^B	Δw	r_s^B	Contrib. to perf. (%)
S_1	39%	40%	-1%	6.50%	-0.065
S_2	21%	40%	-19%	8.50%	-1.615
S_3	40%	20%	20%	10%	2

Thus the contribution to performance due to market timing is 0.32%.

Table 6: Security selection contribution

Sector	r_s^P	r_s^B	Δr	w_s^B	Contrib. to perf. (%)
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%.
The contribution from the interaction term is close to 0.

Generalization of the macro component

The split between macro allocation and security selection is relevant when one studies the relative performance of a portfolio invested in one asset class, or when one studies the relative performance of the portfolio at the asset class level. The model can be used at different layers of a portfolio and on different asset classes, which explain why the macro component has several names:

- **Asset allocation component** if the portfolio is invested in different asset classes
- **Sector allocation component**, as shown previously, which is for instance relevant for a portfolio of stocks, a portfolio of bonds, or a mix of the two
- **Maturity bucket/market timing component** if the portfolio is invested in fixed income securities only, of if one studies the portfolio at the asset class level

In any case they represent a broader component which contains individual securities on which bets are also implemented.

Appendix

Types of institutional investors

The main categories of institutional investors, with their specific liabilities, are listed below:

Table 7: Different types of institutional investors

Institutional Investor	**Liabilities**
Central Bank (for the non monetary policy portfolio)	Government deposits and Banknotes
Commercial Bank	Clients deposits of different maturities
Insurance Companies	Policyholders claims
Pension Funds	Pensionees claims
Endowments & Foundations	Donees claims

Importance of SAA in portfolio performance

What is the importance of strategic asset allocation in the overall performance compared to other investment decisions?

- For Kritzman et Page (2003), active security selection leads to a wider potential dispersion than changing the strategic asset allocation, and skilled P.M. should favor security selection to achieve higher excess returns.
- The importance of SAA can be measured with the % of the variance in the cross section in funds' performance explained by strategic asset allocation. For 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 portfolio performance

Brinson, Hood and Beebower (1986) measure it as the % of variance of funds' returns attributable through time to the SAA, based on a time-series regression. They examine the performances of 91 US 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 account for investment policy
- They conclude that the contribution of the latter to the performance differential is on average negative, and that P.M. should not allocate resources on those activities

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