Modelling Active Management

VAN ALPHEN, JOERI

TOWERS PERRIN

P.O. BOX 12089, 1100 AB AMSTERDAM

TELEPHONE: +31 20 711 4054

FAX: +31 20 711 4050

EMAIL: JOERI.VAN.ALPHEN@TOWERS.COM

ABSTRACT

Active management considers additional return (alpha) and risk (tracking error) relative to a benchmark. This paper describes one method to model active management and how to include it in Asset Liability Management (ALM). It is shown that the inclusion of active performance has an impact on ALM results because the total investment risk (in terms of standard deviation) may increase. Using this framework, investors are able to evaluate the passed and future contribution of active management from their investment arrangements (risk budgeting). The framework may be used to consider different investment structures, addressing issues such as active versus passive management, balanced management versus core-satellite approaches and style diversification.

KEYWORDS

Asset Liability Management, Active management, Risk budgeting

Introduction

Investment strategies of institutional investors are often based on Asset Liability Management (ALM) studies. Risk and return profiles of different investment strategies are analysed in an integrated manner with the long-term liabilities.

If we assume an ALM study to be the basis of any investment strategy, the benchmark for all manager structures will be a passive policy at zero costs. Return and risk profiles of asset categories as assumed in an ALM study are almost always based on generally accepted market indices of providers like Morgan Stanley and Lehman Brothers. This implies passive and zero cost investment management. Clearly this is not the practice!

Consider an *active* manager structure, implemented to enhance expected return at the expense of increasing risk. How does this structure compare to the alternative of changing the investment strategy (based on *passive* management) by simply increasing the allocation of equities?

Absolute risk: standard deviation

Investment risk - the risk of an investment portfolio - is usually measured in terms of the standard deviation around a mean or expected return. This method of risk quantification is applied in ALM studies as well as many other areas of investment research and practice like option pricing models and value at risk calculations. The standard deviation measures the *absolute* risk of an investment portfolio.

Relative risk: tracking error

There is another risk measure that is applied in active investment management. It is the *tracking error* and it measures the risk of an investment portfolio relative to a benchmark. The tracking error actually measures the standard deviation of the return of an investment portfolio relative to a benchmark. The tracking error is applied in ex-post performance and style analysis, for example to calculate risk adjusted performance ratios like the information ratio[i]. The tracking error is also applied on an ex-ante basis in investment guidelines to define manoeuvrability and risk limits of active management versus the benchmark. The tracking error measures the *relative* risk of an investment portfolio.

Total portfolio return and risk

The return of an active portfolio R_p in this context is equal to return the benchmark R_b plus the outperformance relative to the benchmark (α):

$$R_p = R_b + \alpha$$

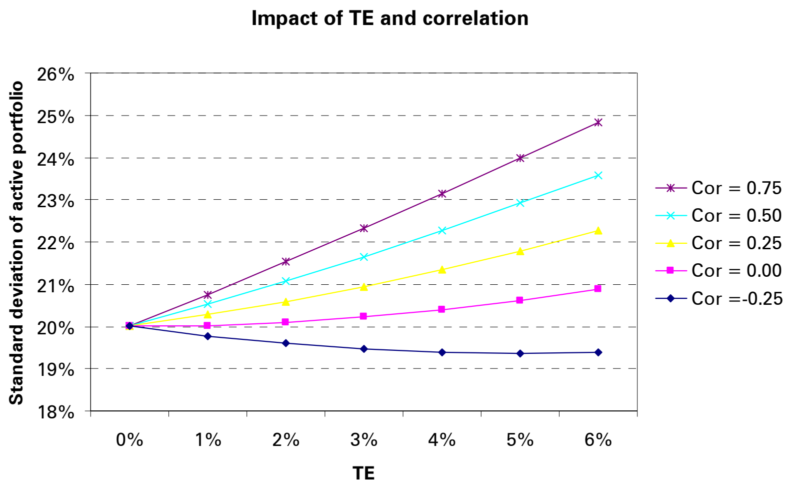
The absolute risk of an active investment portfolio, measured by the standard deviation of the return of the active portfolio can be measured as follows:

$$\sigma_p = \sqrt{\sigma_b^{\;2} + 2 * \sigma_b * TE * \rho_{b,\alpha} + TE^2}$$

In this equation, σ_b is the standard deviation of the benchmark, *TE* the tracking error relative to the benchmark (equal to the standard deviation of α) and $\rho_{b,\alpha}$ is the correlation between the benchmark and α. This equation makes it possible for any investment portfolio, to translate a risk measure in terms of tracking error (relative risk) into one of standard deviation (absolute risk).

This is a very powerful equation because it allows us to calculate the implications of active investment management versus the assumptions of (passive) investment management as defined in an ALM context. As can be seen from the formula, the correlation between the benchmark and outperformance has an impact on the standard deviation of the active portfolio return. If there is a significant positive correlation, the standard deviation of the portfolio will be higher than the benchmark's. On the other hand, if the correlation is significantly negative, the standard deviation of the portfolio return can be less than the benchmark's.

The graph below shows the impact the correlation and the tracking error have on the standard deviation of the active portfolio. This standard deviation will always be between $\sigma_p - TE$ (for correlation = -1) and $\sigma_p + TE$ (for correlation = 1). The graph below shows an example for an equity portfolio with $\sigma_b = 20\%$.



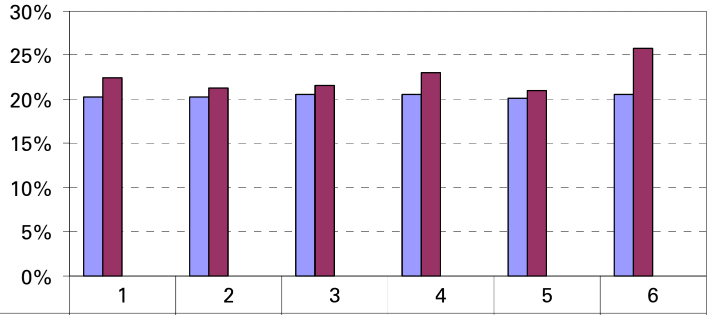
As can be clearly seen from the graph, in order to keep standard deviation as low as possible, TE should be as low as possible and/or the correlation should be as low as possible (preferably negative).

Active management is usually defined versus a benchmark in terms of a performance target and a tracking error. The correlation between relative returns and the returns of a benchmark can be measured relatively simply by performance analysis (ex-post). But as such the correlation can also be applied as a quantitative (ex-ante) criterion in manager structuring and selection processes. By any means with the above-defined equation it is possible to calculate the absolute risk of any investment portfolio.

As a result this equation makes it possible to measure and compare the risk and return profile of an (active) investment portfolio with the risk and return profile of the (passive) benchmark as defined in the ALM study. The expected return of an investment portfolio is simply the expected return of a benchmark plus the (relative) performance target. The risk of the investment portfolio is not a linear function of the risk of the benchmark and has to be calculated with the above-described equation.

Below is an example of the influence of tracking error and correlation between outperformance and benchmark on the standard deviation of the total (equity) portfolio. These are real-life examples of six investment managers for European equity portfolios.

Standard Deviation European Equities of Managers versus Benchmark



	1	2	3	4	5	6
Benchmark	20.3%	20.3%	20.5%	20.5%	20.1%	20.6%
Portfolio	22.5%	21.3%	21.6%	23.1%	21.1%	25.7%
TE	5.5%	6.0%	3.7%	4.5%	3.1%	8.6%
Cor	28.1%	2.3%	20.7%	49.2%	22.8%	46.3%

Application to Asset Liability Management

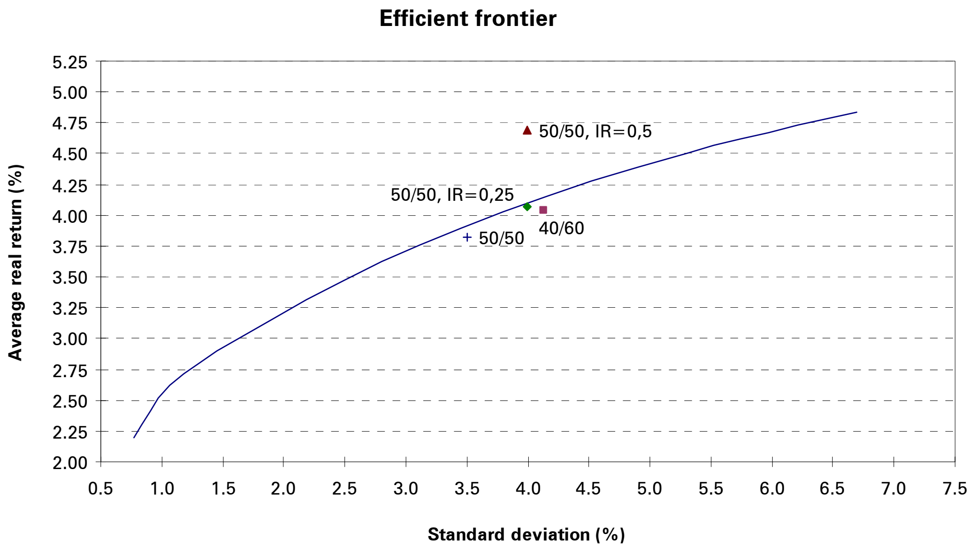
In this section, the possible impact on ALM outcomes is examined by way of illustration. The table below shows two examples of active management; the examples differ by assumed level of information ratio. An ex-ante information ratio of the active risk and return is generally presumed to be around 0.5. In reality, however, this level is often not attained so we also show the results for a less optimistic information ratio of 0.25. The asset mix consist of 50% bonds and 50% equities.

	Example 1 (IR = 0.5)		**Example 2 (IR = 0.25)**	
	Bonds (50%)	**Equities (50%)**	**Bonds (50%)**	**Equities (50%)**
Alpha	0.5%	2%	0.25%	1%
Tracking error	1%	4%	1%	4%
Correlation of alpha and benchmark	0	0.5	0	0.5

Next to these two asset mixes (one with information ratio of active management of 0.5, the other 0.25), we also consider two ‘passive’ (index) portfolios. One consists of 50% bonds and 50% equities; the other, for reference, 40% bonds and 60% equities. For all four asset mixes, investment management fees are accounted for.

The graph below shows the efficient frontier of all combinations of cash, bonds and equities, as well as the four asset mixes: the passive 50/50 and 40/60 portfolios and the two active 50/50 portfolios. Note that the two passive portfolios are below the frontier as management fees are subtracted.

The vertical axis represents 10-year average real return; the horizontal axis represents the standard deviation of 10-year average real returns. The main conclusion that can be drawn from the graph



is that including active risk increases the absolute standard deviation considerably — almost equal to a portfolio with an allocation to 10% more equities. A secondary conclusion is that in case active managers actually achieve an information ratio of 0.5, the efficiency of portfolios increases significantly in an optimisation context.

These results are also tested in an ALM context. Obviously, the outcomes in terms of funded ratio heavily depend on the initial level of the funded ratio and the time horizon considered. The conclusion is that the active 50/50 portfolios are more risky in the short term relative to the passive portfolio. In the longer run, the active portfolio for which IR = 0.5, the probability of shortfall is the lowest of all four mixes as the additional return boosted the funded ratio on average.

In the ALM framework considered, the performances only impacted funded ratio. In practice, it may also impact volatility and level of contributions and indexation of pensions. In reporting under IAS, it will also impact level and volatility of pension expense.

Other applications

Put the other way around, the active management framework may be used to set a maximum level of tracking error, based on some level of standard deviation of the total portfolio performance, or any other ALM criteria.

In our example, only two asset classes were considered, managed by one or two investment managers. The framework may be used to evaluate various investment manager structures, specifying ex-ante alphas, tracking errors and correlations of investment managers. In this way, various degrees of active risk can be modelled and evaluated, ranging from passive management (zero tracking error), to "index enhanced" (low tracking error) and finally active management.

Combinations of these may be modelled to evaluate core-satellite approaches. The framework may also be applied at the manager level: if correlations among managers are sufficiently low (because of different styles), diversification may decrease overall risk while keeping the same ex-ante alpha.

It should be stressed that the parameters of active management may not be stable over time; this makes the active management model less suitable for optimisation purposes. The stability of the parameters of the active management model is an important area for further research.

Conclusion

The example described above demonstrates that the inclusion of active performance has an impact on ALM results because the total investment risk (in terms of standard deviation) increases. Using this framework, investors are able to evaluate past performance of their investments and consider future risk and return contributions from their investment arrangements. Taken one step further, the framework may be used to consider different investment structures, addressing issues such as active versus passive management, balanced management versus core-satellite approaches and style diversification.

---

[i] A measure that is often used to describe the effectiveness of active management is the information ratio. The information ratio (IR) is defined as the additional return from active management relative to the additional risk taken, i.e., alpha divided by tracking error.