Asset Allocation

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Two competing approaches are used in practice to build portfolios: bottom-up and top-down. The bottom-up approach is the older and the more traditional, and focuses on individual stock picking. The top-down approach gives more importance to the choice of different markets as opposed to individual security selection, and, as such emphasizes the importance of *asset allocation*.

Asset allocation consists of choosing the spread of different asset classes within the portfolio. There two separate steps in the asset allocation process. One first defines the long-term allocation, based on estimates of risk and return for each asset class. This is known as « strategic allocation ». Then, one can subsequently carry out dynamic adjustments based on short-term anticipations. This is known as « tactical allocation ».

Strategic Asset Allocation[1]

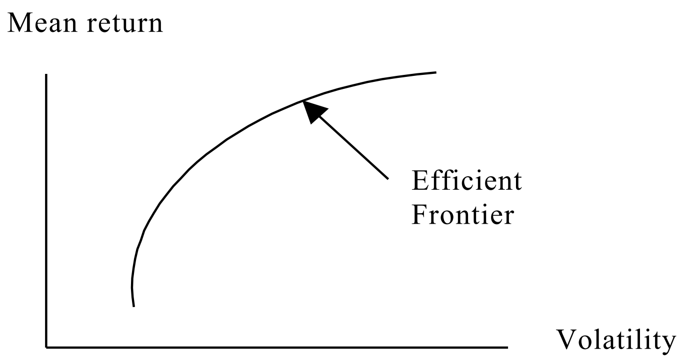
Strategic allocation is the first stage in the investment process. It involves choosing an initial portfolio allocation consistent with the investor's objectives and constraints. This is equivalent to defining the benchmark, or reference, portfolio.

Optimal asset allocation, which is based on long-term estimates of risk and return for each asset class, can be based on a quantitative approach, with the help of different methods that we now describe.

Applying Markowitz's Model to Asset Allocation[2]

The most widely quoted quantitative model in the strategic allocation literature is Markowitz's (1952) optimization model. The input data is the means and the variances, estimated for each asset class, and the covariances between the asset classes. The model provides the optimal percentage to assign to each asset class to obtain the highest return for a given level of risk, measured by portfolio volatility. The set of all optimal portfolios is known as the « efficient frontier » (see Figure below).

[1] For more detailed information, see Chapter 9 of Farrell (1997).
[2] See in particular Chapter 2 of Farrell (1997) or Chapter 28 of Fabozzi (1995).



Efficient Frontier Analysis

This quadratic optimization can be subject to a number of constraints, for example, holding a minimum or maximum allocation in a given asset class.

This model turns out to be particularly appropriate for handling the problem of asset allocation, because the number of asset classes is limited and therefore efficient estimation of the variance-covariance matrix becomes more tractable.

New Developments[3]

Even though Markowitz's optimal portfolio selection method provides, in theory, a satisfactory response to the problem of determining strategic allocation, it is actually not very widely used in practice for the following two reasons. Firstly, the optimal proportions are very sensitive to the estimates of expected return values; secondly, statistical estimates of expected returns are very noisy (see Merton (1980)). As a result, the model often allocates the most significant proportion to the asset class with the largest estimation error!

A pragmatic response to the problem of optimal strategic allocation in the presence of estimation risk involves focusing on the only portfolio on the efficient frontier for which the estimation of mean returns is not necessary, namely the minimum variance portfolio. Using appropriate statistical techniques to improve the estimation of the variance-covariance matrix, one can actually select an efficient portfolio with a volatility significantly lower than that of a naively diversified portfolio for a mean return that is not necessarily lower (see for example Chan, Karceski and Lakonishok (1999) or Amenc and Martellini (2002a)).

Black and Litterman (1990) have proposed an original approach that allows investors to directly address the problem of estimating expected returns. They first suggest generating implicit values for mean returns that are consistent with Sharpe's (1964) CAPM equilibrium allocations (i.e., allocations proportional to the market capitalization). Then,

[3] For more information on some of these new developments, see Michaud (2002).

they suggest that investors optimally combine these reference values with their own "views" (forward-looking bets on mean returns for each asset class).[4]

Another shortcoming of Markowitz's approach is that it is based on volatility as a measure of risk, which can only be rationalized at the cost of very simplifying assumptions, either on investors' preferences (quadratic preferences) or on return distribution (Gaussian distribution). To address this shortcoming of traditional mean-variance analysis, several authors have suggested adding a Value-at-Risk constraint in the mean-variance optimization for investors with non-trivial preferences about higher moments of returns distributions (see for example Alexander and Baptista (2001) or Sentana (2001)). Amenc and Martellini (2002b) argue that this is particularly needed when alternative asset classes, such as hedge funds, are included in an investor's asset allocation, as they are well known to exhibit fat tails (see for example Brooks and Kat (2001)).

Tactical Asset Allocation[5]

Tactical Asset Allocation (TAA) broadly refers to active strategies that seek to enhance portfolio performance by opportunistically shifting the asset mix in a portfolio in response to the changing patterns of return and risk

There is now a consensus in empirical finance that expected asset returns, and also variances and covariances, are, to some extent, predictable. Pioneering work on the predictability of asset class returns in the U.S. market was carried out by Keim and Stambaugh (1986), Campbell (1987), Campbell and Shiller (1988), Fama and French (1989), and Ferson and Harvey (1991). More recently, some authors started to investigate this phenomenon on an international basis by studying the predictability of asset class returns in various national markets (see, for example, Bekaert and Hodrick (1992), Ferson and Harvey (1993, 1995) or Harvey (1995)).

The literature on optimal portfolio selection has recognized that these insights can be exploited to improve on existing policies based upon unconditional estimates. Roughly speaking, the prescriptions of these models are that investors should increase their allocation to risky assets in periods of high expected returns (market timing) and decrease their allocation in periods of high volatility (volatility timing). Kandel and Stambaugh (1996) argue that even a low level of statistical predictability can generate economic significance and abnormal returns may be attained even if the market is successfully timed only 1 out of 100 times.

TAA can be regarded as a 3 steps process:

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[4] This approach has been extended by Cvitanic et al. (2002) to a dynamic setting with power preferences, correlated priors and learning

[5] We refer the reader to the essay on Tactical Asset Allocation by Martellini and Sfeir in this Encyclopedia for more detail.

- Step 1: forecast asset returns by asset classes
- Step 2: build portfolios based on forecasts (i.e., turn signals into bets)
- Step 3: conduct out-of-sample performance tests

TAA strategies were traditionally concerned with allocating wealth between two asset classes, typically shifting between stocks and bonds. More recently, more complex *style* timing strategies have been successfully tested and implemented. In particular, Kao and Shumaker (1999) and Amenc, El Bied and Martellini (2002) have built upon the seminal work by Fama and French (1992), who emphasize the relevance of size and book/market factors, to address the concept of *tactical style allocation* that involves dynamic trading in various investment styles within a given asset class (see also Fan (1995), Sorensen and Lazzara (1995), and Avramov (2000) for evidence of predictability in equity style returns).

Conclusion

Today, asset allocation tends to play a larger role in the investment management process[6]. The interest in asset allocation can be explained by important results established by modern portfolio theory. In particular, Brinson, Hood and Beebower (1986) and Brinson, Singer and Beebower (1991) argue that a significant share (90%) of portfolio performance can be attributed to the initial allocation decision.[7] On the other hand, in a context of liquid, efficient, markets, the possibility of obtaining substantial gains through stock picking alone is severely reduced.

References

Alexander, G., and A. Baptista, 2001, Economic Implications of Using a Mean-VaR Model for Portfolio Selection: a Comparison with Mean-Variance Analysis, *Journal of Economic Dynamic and Control*, forthcoming.

Amenc, N., and Martellini, L., 2001, It's Time for Asset Allocation, *Journal of Financial Transformation*, 3, 77-88, 2001.

Amenc, N., S. El Bied and L. Martellini, 2002, Evidence of predictability in hedge fund returns and multi-style multi-class style allocation decisions, *Financial Analysts Journal*, forthcoming.

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6 On this subject, see the introduction of Brown and Harlow (1990), who also discuss the role of modern portfolio theory in asset allocation.
7 The result of this study should however be considered with care, because it has often been incorrectly interpreted (see Amenc and Martellini (2001) and Nutall and Nutall (1998)).

Amenc, N., and Martellini, L., 2002a, Portfolio Optimization and Hedge Fund Style Allocation Decisions, *The Journal of Alternative Investments*, forthcoming.

Amenc, N., and Martellini, L., 2002b, The Risks and Benefits Associated with Investing in Hedge Funds, Working Paper, USC, 2002.

Avramov, D., 2002, Stock return predictability and model uncertainty, *Journal of Financial Economics*, forthcoming.

Black F., Litterman R., 1990, Asset Allocation: Combining Investor Views with Market Equilibrium, *Goldman Sachs Fixed Income Research*, September.

Bekaert, G., and R. Hodrick, 1992, Characterizing predictable components in excess returns on equity and foreign exchange markets, *Journal of Finance*, 47, 467-509.

Brinson G. P., Hood L. R., Beebower G.L., 1986, Determinants of Portfolio Performance", *Financial Analysts Journal*, July-August.

Brinson G. P., Singer B. D., Beebower G. L., 1991, Determinants of Portfolio Performance II: An Update, *Financial Analysts Journal*, May-June 1991.

Brooks, C., and Kat H., 2001, The Statistical Properties of Hedge Fund Index Returns and Their Implications for Investors, working paper, The University of Reading, ISMA Centre.

Brown K. C., and Harlow W. V., 1990, The Role of Risk Tolerance in the Asset Allocation Process: A New Perspective, CFA.

Campbell, J., 1987, Stock returns and the term structure, *Journal of Financial Economics*, 18, 373-399.

Campbell, J., and R. Shiller, 1988, Stock prices, earnings, and expected dividends, *Journal of Finance*, 43, 661-676.

Chan, L., J. Karceski, and J. Lakonishok, 1999, On Portfolio Optimization: Forecasting Covariances and Choosing the Risk Model*, Review of Financial Studies,* 12, pp. 937-74.

Cvitanic, J., A. Lazrak, L. Martellini, and F. Zapatero, 2002, Revisiting Treynor and Black (1973) – An Intertemporal Model of Active Portfolio Management, working paper, USC.

Fabozzi F. J., 1995, *Investments*, Prentice Hall International Editions.

Fama, E., and K. French, 1989, Business Conditions and Expected Returns on Stocks and Bonds, *Journal of Financial Economics*, 25, 23-49.

Fama, E., and K. French, 1992, The Cross-Section of Expected Stock Returns, *Journal of Finance*, 442-465.

Fan, S., 1995, Equity Style Timing and Allocation, chapter 14 from Equity Style Management, Irwin Publishing.

Farrell, J., 1997, *Portfolio Management, Theory and Application*, McGraw-Hill, 2nd edition.

Ferson, W., and C. Harvey, 1991, Sources of predictability in portfolio returns, *Financial Analysts Journal*, May/June, 49-56.

Ferson, W., and C. Harvey, 1993, The risk and predictability of international equity returns, *Review of Financial Studies*, 6, 527- 566.

Ferson, W., and C. Harvey, 1995, Predictability and time-varying risk in world equity markets, *Research in Financ*e, 13, 25-88.

Harvey, C., 1995, Predictable risk and returns in emerging markets, *Review of Financial Studies*, 773-816.

Kandel, S., and R. Stambaugh, 1996, On the predictability of stock returns: an asset allocation perspective, *Journal of Finance*, 51, 385-424.

Kao, D.-L., and R. Shumaker, 1999, Equity style timing, *Financial Analysts Journal*, January/February, 37-48.

Keim, D., and R. Stambaugh, 1986, Predicting returns in the stock and bond markets, *Journal of Financial Economics*, 17, 357-390.

Markowitz, H., 1952, Portfolio Selection*, Journal of Finance,* 7, pp. 77-91.

Merton, R., 1980, On Estimating the Expected Return on the Market: An Exploratory Investigation, *Journal of Financial Economics,* 8, pp. 323-362.

Michaud, R., 2002, Efficient Asset Management: A Practical Guide to Stock Portfolio Optimization and Asset Allocation, *Harvard Business School Press*, Financial Management Association Survey and Synthesis Series.

Nuttall J. A., Nuttall J., 1998, Asset Allocation Claims – Truth or Fiction?, Unpublished.

Sentana, E., 2001, Mean-Variance Portfolio Allocation with a Value-at-Risk Constraint, SEMFI, working paper 0105.

Sharpe, W., 1964, Capital Asset Prices: a Theory of Market Equilibrium under Conditions of Risk, *Journal of Finance*, 19, 425-442.

Sorensen, E., and C. Lazzara, 1995, Equity Style Management: the Case of Growth and Value, chapter 4 from Equity Style Management, Irwin Publishing.