A generalized performance attribution technique for mutual funds

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The paper will be presented by Antonella Basso

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Extended abstract

It is a common practice to evaluate mutual funds by measuring their past performances, even if nothing ensures that the same return paths will arise again in the future.

To this aim, some numerical indexes are widely used that take into account an expected return indicator and a risk measure and synthesize them in a unique numerical value. Among them, we find the well-known Sharpe, Treynor and Jensen indexes.

As it is known, the Sharpe index is defined as the ratio between the expected excess return and the standard deviation of the returns; in other terms, it measures the portfolio performance by means of the expected differential return per unit of risk. However, the standard deviation of the returns may be a proper risk measure when the investor holds only one risky asset and the returns probability distribution is symmetric.

In order to better define the portfolio risk, it is possible to take into account only the (undesirable) negative deviations from the mean or from a threshold value. In this way different performance indexes can be obtained which have the same ratio structure of Sharpe index. The reward to half-variance index measures the risk using the *half-variance* risk indicator that represents the average of the squared negative deviations from the mean. The reward to semivariance index measures the risk with *semivariance* which is the average of the squared negative deviations from a fixed threshold value; this value represents the minimum target for the returns to be considered desirable by the investor. The Treynor index measures the risk with the β of the portfolio, under the implicit assumption that the investor has diversified his investments so that they are equivalent to a quota of the market portfolio.

Jensen index, instead, is not defined as a ratio but finds inspiration in the volatility estimation of a risky portfolio obtained in the C.A.P.M. framework and measures the portfolio performance by means of the intercept of a linear

regression. A significantly positive value for this intercept means that the mutual fund management has obtained positive results that overcome those obtained by the market portfolio.

It is not clear which of these performance indicators represents the best performance measure, as each of them may be valid under some assumptions but, on the other hand, may be overcome by one of the other indicators in a different context, or even for different investors.

Moreover, the traditional performance indexes do not consider the subscription and redemption costs required by the investment, even if the overall return on the investment turn out to be affected by the initial and final costs.

In this contribution we propose a model which can be used to define a measure of the relative performance of mutual funds that takes into account all the different aspects considered by the traditional indexes. In addition, the model proposed can take into account also the subscription and redemption costs, and allows therefore to compute an indicator of the overall performance of the mutual fund investment.

This model adopts a data envelopment analysis (DEA) approach, which is an operational research methodology that enables to measure the relative efficiency of "decision making units". This technique can be applied to the measurement of mutual funds performance since each fund may be seen as a decision making unit which requires a set of "inputs" and supplies some "outputs" (Murthi, Choi and Desai, 1997, Basso and Funari, 2001).

In particular, among the inputs simultaneously considered by the model we may include different risk measures of the portfolio and, above all, the subscription costs and redemption fees. The set of outputs taken into account may comprise, besides the portfolio expected return, all the traditional indicators. In addition, we have included among the outputs also a stochastic dominance indicator which reflects both the investors' preference structure and the time occurrence of the returns. This indicator is computed by assigning a higher score to the mutual funds which are not dominated by other funds in the higher number of subperiods.

The generalized DEA efficiency measure proposed is computed by solving a fractional linear programming problem, where an efficiency ratio, made up of a ratio of weighted sum of outputs to weighted sum of inputs, is maximized. This optimization problem, which can be converted into an equivalent linear programming problem, comes from the idea to define the DEA efficiency measure by assigning to each decision making unit the most favourable weights (Charnes, Cooper and Rhodes, 1978, Cooper, Seiford and Tone, 2000). These optimal weights are computed by maximizing the efficiency ratio of the unit considered, provided that the efficiency ratios of all units, computed with the same weights, have a fixed

upper bound.

The generalized performance attribution technique proposed is tested using data of the Italian mutual funds market.

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