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Interfaces with Other Disciplines

A robust nonparametric approach to evaluate and explain the performance of mutual funds ☆

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Abstract

The topic of the measurement of mutual funds' performance is receiving an increasing interest both from an applied and a theoretical perspective. Beside the traditional financial literature, a growing body of studies has started to apply the tools of frontier analysis for benchmarking comparisons in portfolio analysis. Our paper contributes to this literature proposing a robust nonparametric approach for analysing mutual funds. It is based on the concept of order-*m* frontier [Cazals, C., Florens, J.P., Simar, L., 2002. Nonparametric frontier estimation: A robust approach. Journal of Econometrics 106, 1–25] and on a probabilistic approach [Daraio, C., Simar, L., 2005. Introducing environmental variables in nonparametric frontier models: A probabilistic approach. Journal of Productivity Analysis 24 (1), 93–121] to find out the factors explaining mutual funds' performance. Within this framework, a decomposition of conditional efficiency is proposed, and its usefulness for economic interpretation analysed. Our approach is illustrated by using US mutual funds data, grouped for category by objective. Economies of scale, slacks and market risks are investigated. A comparison of traditional, nonparametric and robust performance measures is also offered.

Keywords: Economies of scale; Mutual funds; Nonparametric frontier; Portfolio analysis; Robust estimation

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1. Introduction

The literature on mutual funds performance evaluation is rich both from a methodological and an empirical point of view.

Treynor (1965) proposes to adjust the excess return of a portfolio (with respect to the risk-free return) by the portfolio's β, using the Capital Asset Pricing Model (CAPM) introduced by Markowitz (1952, 1959) and developed by Lintner (1965). Similarly, Jensen (1968)'s alpha (α) is defined as the difference between the actual excess portfolio return and the (estimated) expected excess benchmark return. The benchmark could be based on either the CAPM or on the Arbitrage Pricing Theory (APT) model developed by Ross (1976).

Some empirical applications (see e.g. Elton et al., 1993; Choi, 1995) have shown that the Jensen's alpha is sensitive to the choice of the benchmark model employed for comparison. It has been argued (see e.g. Admati and Ross, 1985) that the estimation of Jensen's alpha may be biased due to *market timing*, which is the ability of fund managers to systematically change the target risk of the fund. When portfolio managers change the target beta for the fund by moving money among different investments, estimation bias will be introduced into the benchmark model because it assumes a constant beta coefficient over the period considered.

The Sharpe (1966) index is defined as the ratio of the excess return of the portfolio (with respect to the risk-free return) to the standard deviation of its return. It measures the risk premium earned per unit of risk taken. With respect to Jensen's alpha, the Sharpe index avoids the problem of the specification of the benchmark model. The Sharpe index is more robust to the market index because it uses standard deviation as a risk measure, but it does not totally eliminate the market index. In fact, the final Sharpe index of a portfolio is compared to that-one of the market index. However, even this index does not take into account the *transaction costs*, i.e. the expenses associated with the purchase and sale of assets.

Since the pioneering studies by Treynor, Sharpe and Jensen, a lot of performance measures have been introduced and empirically applied for evaluating the performance of mutual funds.[1]

In recent years, there is a growing body of studies that apply efficiency and productivity techniques[2] for evaluating the performance of mutual funds. The problem of estimating monotone concave boundaries naturally occurs in portfolio management, as well as in the production setting. In Capital Assets Pricing Models (CAPM) the objective is to analyse the performance of investment portfolios. Risk (volatility or variance) and average return on a portfolio are analogous to inputs and outputs in model of production. In Capital Assets Pricing Models, the boundary of the attainable set of portfolios gives a benchmark relative to which the efficiency of a portfolio can be measured.

Studies which apply the parametric approach in frontier analysis to mutual funds include Briec and Lesourd (2000), where an application of the stochastic parametric approach is provided, and Annaert et al. (2003) which apply the stochastic bayesian approach (van den Broeck et al., 1994).

Among the nonparametric approaches[3], we can distinguish between a theoretical view (e.g. Sengupta, 1991; Sengupta and Park, 1993; Briec et al., 2001) and a more applied perspective (e.g. Murthi et al., 1997; Morey and Morey, 1999; Sengupta, 2000).

Sengupta (1991) and Sengupta and Park (1993) provide links between CAPM and nonparametric estimation of frontiers from a theoretical point of view. Briec et al. (2001) analyse the relation between the

[1] For a nice summary see Cesari and Panetta (2002) which report also an application on Italian Equity Funds. General surveys can be found in Shukla and Trzcinca (1992), Ippolito (1993) and Grinblatt and Titman (1995).

[2] Starting from the first empirical application by Farrell (1957), a huge literature has been developed. For a recent review on nonparametric approach models, see Cooper et al. (2004); for an updated description of parametric models, see Kumbhakar and Lovell (2000).

[3] For a review on the use of DEA in mutual funds evaluation see Joro and Na (2002).