



The prediction of fund failure through performance diagnostics [☆]



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ABSTRACT

Using an international database featuring 1624 mutual funds over 15 years, this paper analyses the joint abilities of performance measures to predict subsequent fund failure. We examine the probability of disappearance over a time window, and expected fund survival time, and study the circumstances of a fund's disappearance, its currency and domicile. By combining relevant measures, fund failure appears to a significant extent predictable, more than with single classical measures. Survivorship predictability has significant economic value. Such evidence suggests that past performance does not only influence investors' perception of fund quality, but also reflects managers' ability to sustain performance.

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1. Introduction

For different reasons, mutual fund survivorship has been an ongoing concern since the early 1990s. Many researchers have studied this phenomenon because of the so-called “survivorship bias”. Ignoring funds that disappear while analyzing their performance generates an important bias: since the funds that failed during the period are omitted, only the funds that stayed alive during the whole period are selected. Another collection of papers has focused on the assessment of the percentage of

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“graveyard” funds, i.e., those that disappear within a certain period. But only few studies have aimed to examine the determinants of fund terminations. Even though the field of performance measurement has considerably expanded since the turn of the century, no recent paper has related funds disappearance to an extensive review of their past risk-adjusted performance beyond the classical measures developed in the sixties and seventies.

A first stream of papers relates a fund's fate to its past returns. Through their analysis of the determinants of mutual funds survivorship, [Brown and Goetzmann \(1995\)](#) uncover the link between the likelihood of fund disappearance with its past returns, going back 3 years. [Carhart \(1997\)](#) even finds that dead funds underperform until 5 years before their disappearance. [Brown et al. \(1997\)](#), [Malkiel \(1995\)](#) and [Elton et al. \(1996\)](#) show that only the best performers survive for a long period of time, while weaker ones are likely to be closed. [Cameron and Hall \(2003\)](#) discover that excess returns relative to a market index are much better predictors of fund failure than gross returns. They obtain an asymmetric link between shocks and disappearance: positive shocks have a larger impact than negative shocks.

In parallel, some researchers have focused on the reasons underlying fund terminations. [Sawicki \(2001\)](#) and [Sirri and](#)

Tufano (1998) point out that investors base their fund purchase decisions on prior performance. However, in most studies following this approach, the authors solely focus on classical performance measures: gross return, return on excess of a market index, Jensen alpha (Jensen, 1968), Fama and French 3-factors alpha (Fama and French, 1993), Carhart 4-factors alpha (Carhart, 1997). Rohleder et al. (2011) compare the results given by the last four different measures to estimate the size of the survivorship bias obtained with different methods with US mutual fund data.

Recent research on mutual fund survival has largely diverged from the examination of past performance as a predictor of failure. Many other determinants of fund death have been investigated: size (Brown and Goetzmann, 1995; Carhart et al., 2002), age (Brown and Goetzmann, 1995; Lunde et al., 1999), style (ter Horst et al., 2001; Bu and Lacey, 2009), expense ratios (Carhart et al., 2002; Bu and Lacey, 2009) or incentives (Massa and Patgiri, 2009), among others. The interest in prior performance and risk as predictors of fund failure has migrated to the hedge funds literature. In their analysis, Liang and Park (2010) consider different risk measures to adjust performance. They show that semi-deviation, value-at-risk, conditional value-at-risk, expected shortfall and tail risk are better predictors than standard deviation (especially the latter two).

Other studies, such as Chapman et al. (2008) and Ng (2008), develop models aiming at forecasting hedge fund failure. They use the same performance metrics mentioned in the literature devoted to mutual fund analysis. Darolles et al. (2014) focus on the dependence in the liquidation risk. They consider two aspects: exogenous stochastic factors that can have a mutual influence in the liquidation intensities of the individual funds, and are often called frailties (Duffie et al., 2009). They can explain the high likelihood to observe a high percentage of default at a given date. On the other hand, a contagion effect appears when an event on a fund has an impact on other funds – for instance funds invested in other funds. It can be an answer to time series dependence on fund failure: high intensity in the closing during a given period followed by a high intensity during the next period.

In this paper, we refer to the intuition that past performance would naturally stand as a primary determinant of the decision to shut down a mutual fund. At the same time, we acknowledge that the literature on performance measurement has considerably evolved since the seminal studies in the field, and wish to take advantage of this progress. Our study aims to systematically investigate the drivers of past performance and to detect whether a multi-dimensional representation of a fund's performance reveals helpful in predicting its survival. We make full use of the spectrum of performance measures rather than sticking to the most classical and/or popular ones. By doing so, we investigate a specific research hypothesis: do the reasons for shutting down a fund go beyond the mere *perception* of past performance by investors – which would be the case if only a few set of measures sufficed to explain fund failure – or are they more likely related to the *intrinsic qualities* of the fund manager, as represented by a more sophisticated and multi-dimensional array of performance metrics?

To the best of our knowledge, ours is the first paper dedicated to the comprehensive analysis of the predictive properties of performance measures for fund survival. Our focus on forecasting the probability of survivorship rather than on persistence in performance is motivated by a hierarchical concern. For an investor, it is much more important to be able to anticipate a fund's death than to be able to pick superior future performers, because the consequences of making the wrong bet are far more penalizing in the first case. Consistent with this objective, we concentrate our analysis on the detection of the best predictive association of performance measures as a whole, rather than on the economic and statistical significance of each individual predictor. For the same

reason, we develop and test our model with non-overlapping time windows. This leads us to consider its in-sample fitting quality as well as its out-of-sample predictive capacity.

Our comprehensive analysis also introduces three improvements over previous studies, namely the use of weekly data, the coverage of different international fund markets,¹ and the consideration of dependence between liquidation times. Finally, we also distinguish the reason for a fund's disappearance and examine the predictability in specific market segments and conditions.

The paper is organized as follows: Section 2 presents the data and the construction of variables. In Section 3, we analyze the link between a fund's past performance and its probability of disappearance. Section 4 presents the concluding remarks.

2. Data and variable construction

2.1. Mutual fund and market data

2.1.1. Mutual fund data

We exploit a database of weekly² returns for 2794 open-ended accumulation³ mutual funds with major or full allocation in equities on a worldwide basis. The time window ranges from Friday December 30th 1994 to Friday January 8th 2010, so 15 years of returns. We extend the sample to July 2011 in order to gather observations of each fund's survival or attrition posterior to the data period. Returns are extracted from Thomson Reuters Datastream.⁴

The database is further contaminated with a number of potential sources of interferences. To mitigate their effects, we apply the following filters: (i) we exclude from the sample all funds for which the missing data or variability in the series of weekly prices are potentially suspicious. All funds having missing data in their price series, at least three times three consecutive identical prices, or at least eight times two consecutive identical prices, are rejected; (ii) if the shares of a fund have once been divided or regrouped, we recalculate the whole series of prices starting from the day of the event, to ensure coherency in the series; (iii) we perform a global check of the plausibility of the prices: in particular, for a dozen of cases, a manual research has been done to fix some prices in the series; (iv) we eliminate 140 “cousin” funds, by regressing the returns of funds suspected to be similar, and excluding one of them when the correlation is higher than 80%; (v) a return-based style analysis enables us to eliminate some funds invested in bonds or in short-term fixed income securities; and (vi) to obtain homogeneity in the asset pricing specifications used to compute multiple performance measures, we keep only the

¹ Most of the research focuses on US data or other national markets (e.g., Australia in Cameron and Hall (2003) and Sawicki (2001), and the United Kingdom in Lunde et al. (1999)).

² The choice of weekly data represents a compromise between the superior ability to detect market timing effects with higher frequency data (“Our results motivate the use of daily data in future tests of mutual fund performance”, Bollen and Busse, 2001) and evidence of higher potential bias due to benchmark misspecification with the use of daily fund returns (Coles et al., 2006). In parallel, we face a problem of operational efficiency. Many measures are regression-based, preventing the use of monthly data for short time windows. On the other hand, weekly data permits a quicker and therefore more precise detection of the delisting, inducing better precision when building the logistic function, and a more reactive and realistic impact portfolio rebalancing.

³ The type of the fund is cross-checked through a manual research in Bloomberg. We avoid the issue of the distribution of dividends, which may have a tax impact for investors in different countries, by restricting the sample to only open-ended accumulation funds without stated initial maturity.

⁴ Because of the international character of the study, we preferred relying on a single database instead of mixing non-US data from Thomson Reuters Datastream with the survivorship bias-free CRSP Mutual Fund database. Nevertheless, we manually ran a number of probes to ensure the consistency of data retrieved from Thomson Reuters Datastream with the corresponding CRSP returns.

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