



A statistically robust decomposition of mutual fund performance[☆]

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ABSTRACT

Previous decompositions of risk-adjusted mutual fund performance might deliver biased results. In this paper, we provide new reliable insights on the drivers of mutual fund performance by decomposing risk-adjusted performance of U.S. equity mutual funds using the Generalized Calendar Time regression model. According to our results, out of all previously considered fund characteristics, only the negative effect of lagged fund size and the positive effects of lagged performance and lagged family size remain highly significant. Our analysis further suggests that much of the variation in previous empirical results can be attributed to methodological issues.

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1. Introduction

Today's equity mutual fund industry leaves investors, academics, as well as asset management companies overwhelmed by the plentiful opportunities. In consequence, they frequently rely on various fund characteristics to assist their investment processes, performance evaluations or strategic decision making. Identifying skilled fund managers or deciding upon a fund's response to growth in assets under management are just some of the numerous challenges that are tackled by means of academic research on how fund characteristics relate to performance. In consequence, virtually all observable characteristics of equity mutual funds have been evaluated extensively with respect to their relations to risk-adjusted performance. Among others, the list of evaluated characteristics includes expenses, load fees, past performance, fund size, fund family size, fund age, inflows, diversification, and turnover.

Despite the large body of literature, the relations between fund characteristics and risk-adjusted performance remain a controversial topic, as existing research offers diverse results on the relations' signs or significances for all of the above-mentioned fund characteristics.¹ Naturally, some of these differences might be driven by deviations in the sampling period, the sampling universe, the measures of risk-adjusted performance, the measures of fund characteristics, or the choice of control variables. However, statisti-

cally insignificant differences might have easily been exacerbated to being significant by several methodological issues neglected in existing literature.

In particular, relying mainly on various two-step regression frameworks, previous decompositions of risk-adjusted performance might provide biased results. More specifically, by implicitly assuming cross-sectional independence and by ignoring first stage estimation errors, these analyses are likely to severely overstate the significance of their results (Hoechle et al., 2012; Driscoll and Kraay, 1998). Moreover, when risk-adjusted returns are computed using historical factor loadings, coefficient estimates on fund characteristics are biased as well if the resulting measurement error in factor loadings is correlated with variations in fund characteristics.

The relevance of these methodological issues is strengthened by prior literature's repeated indication of the existence of cross-sectional dependencies in risk-adjusted mutual fund returns (e.g. Wermers, 1999; Barras et al., 2010; Seasholes and Zhu, 2010) and correlations between changes in portfolio risk and fund characteristics (e.g. Huang et al., 2011).

To allow for an unbiased decomposition of risk-adjusted performance, Hoechle et al. (2012) suggest the Generalized Calendar Time portfolio approach (GCT-regression model). Generalizing a regression based replication of the calendar time portfolio approach, the GCT-regression model allows for robust statistical inference in the presence of temporal and cross-sectional dependence, while controlling for multiple time-varying fund characteristics that may also be continuous in nature.

This paper provides new reliable insights on the drivers of mutual fund performance by decomposing risk-adjusted

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¹ Table A.1 provides an overview of the existing literature.

performance of U.S. equity mutual funds using the GCT-regression model. We contribute to existing literature by performing the first statistically robust decomposition of mutual fund performance as judged by the methodological standards of Hoechle et al. (2012) and Driscoll and Kraay (1998). In addition, the importance of the addressed methodological issues is illustrated by performing the very same analysis by means of the previously used methodologies. A methodological hybrid further allows isolating the bias of ignoring cross-sectional dependence from those of ignoring first-stage estimation errors and using historical estimates of factor loadings to compute risk-adjusted performance. By means of this analysis, a large part of the variation in previous empirical results can be explained by methodological issues. Using a 2002–2012 dataset of more than 2,100 U.S. equity mutual funds, this study takes into account the recent developments on global financial markets by including the global financial crisis and the sovereign debt crisis.

When relying on the previously used methodologies, our dataset yields results largely consistent with prior research. However, once the above mentioned issues are resolved by using the GCT-regression model, our results indicate that only the negative effect of lagged fund size and the positive effects of lagged performance and lagged fund family size on risk-adjusted mutual fund performance remain significant at the 5% level. In particular, we provide evidence that previous findings of significantly negative relations of expenses (e.g. Sharpe, 1966; Carhart, 1997; Dahlquist et al., 2000; Prather et al., 2004; Kacperczyk et al., 2005; Pollet and Wilson, 2008; Cremers and Petajisto, 2009; Huang et al., 2011) to risk-adjusted performance, significantly positive relations of fund age (e.g. Cremers and Petajisto, 2009; Massa and Patgiri, 2009) and turnover (Grinblatt and Titman, 1994; Dahlquist et al., 2000) to risk-adjusted performance, as well as the findings of no significant performance-persistence (e.g. Jensen, 1969; Carhart, 1997; Dahlquist et al., 2000), could easily be driven by the above mentioned methodological issues. The larger part of these deviations in statistical inference is caused by the downwards bias on standard errors due to ignoring cross-sectional dependence and by the changes in coefficient estimates due to using historical estimates of factor loadings in computing risk-adjusted performance. These results are consistent with Hoechle et al.'s (2012) findings for the investment performance of private investors, that is, decomposing risk-adjusted performance in a statistically robust manner renders some of the most popular results on the determinants of risk-adjusted performance insignificant.

Our results support the popular hypothesis of past performance being an indication of future performance, as well as the hypothesis that mutual funds belonging to large fund families can profit from economies of scale. Furthermore, we provide evidence in favor of Berk and Green's (2004) hypothesis that allows reconciling fund manager skill with the lack of average mutual fund outperformance by suggesting that mutual funds receive money until they can no longer outperform passive benchmarks.

However, the findings of no highly significant relationships between expenses, loads, fund age, inflows, diversification, and turnover to risk-adjusted performance contrast with some of the prominent hypotheses on the drivers of mutual fund performance. In particular, we provide evidence that funds with higher expenses might actually recover those expenses in terms of higher performance.

The remainder of this paper is organized as follows. Section 2 describes the dataset used throughout this paper. Section 3 explains the methodology and outlines important aspects of how previous research might have generated biased results. The empirical results of our analysis are provided in section 4. Section 5 discussed implications for future research. Section 6 concludes.

2. Data

Our empirical analysis employs a survivorship-bias free sample of U.S. equity mutual funds from the Center for Research in Security Prices (CRSP) database. The sample covers the period from January 2002 to March 2012 and contains monthly data on fund net returns as well as quarterly data on several fund characteristics, including expense ratios, load fees, total net assets (TNA), fund family, fund age, portfolio weights and holdings, turnover ratio, and funds' investment objectives.²

We follow among others Carhart (1997) and Wermers (2000) in limiting the dataset to active U.S. diversified equity funds as stated by their Lipper classification,³ thereby excluding all international funds, bond funds, money market funds, sector funds, commodity funds, real estate funds, balanced funds, funds that are on average investing less than 50% of their assets in equities, as well as all passive and index funds. For funds with different share classes we merge returns and fund characteristics into a single portfolio based on a TNA-weighted measure for each variable (e.g. Wermers, 2000; Chen et al., 2004).

To compute risk-adjusted returns, we obtain monthly data on several risk factors from the website of Kenneth French.⁴ In particular, this data includes the market return defined as the value weighted return on all NYSE, AMEX, and NASDAQ stocks, the risk-free rate measured by the 1-month Treasury bill rate, the small minus big (SMB) factor measured as the difference in returns between small and large stocks, the high minus low (HML) factor measured as the difference in returns between high and low book-to-market ratio stocks, and the momentum factor (MOM) measured as the difference in returns between past winners and past losers.⁵

Our final dataset consists of 2111 mutual funds and 27,665 fund quarters for each of which the required (lagged) variables are available. Table 1 shows a description of the included variables, as well as the summary statistics for our dataset. The median U.S. diversified equity mutual fund in our dataset manages 294 million U.S.-Dollars and belongs to a fund family managing a further 4.7 billion U.S.-Dollars in U.S. diversified equities. It allocates these assets with a sum of squared portfolio weights of 0.0174, which implies about 59 stocks for an equally weighted portfolio. The annual turnover of the median fund amounts to 0.71. For its service and expenses, it charges a total expense ratio of 1.21% with 5.5% total loads in its most expensive share class. Each quarter, the median fund experiences an outflow of 1.74% of its asset, while still managing to have slightly growing TNA due to a quarterly excess return of 1.41% with a risk-free rate of 0.43%. The median fund is 11.2 years old. Lagged risk-adjusted returns (alphas) for the median fund are between −0.31% and −0.25% dependent on the specification of the risk factors, thereby indicating that the median fund does not outperform the market on a risk-adjusted basis and net of fees.

3. Methodology

3.1. Variables

For our main results, we employ the Fama–French (1993) and Carhart (1997) four-factor alpha as a measure of risk-adjusted performance, thereby controlling for style differences with respect

² A detailed documentation of the database is available from CRSP.

³ The Lipper classifications included in our sample are LCCE, LCGE, LCVE, MCCE, MCGE, MCVE, MLCE, MLGE, MLVE, SCCE, SCGE, SCVE, CE, GE, and VE.

⁴ We would like to thank Kenneth French for making his data publicly available.

⁵ For a detailed description of the factor specifications please visit the website of Kenneth French.

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