Portfolio Returns and Manager Activity

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We develop a new method for detecting portfolio manager activity. Our method relies exclusively on portfolio returns, and consequently avoids the challenges associated with disclosed portfolio holdings. We investigate the interrelation between activity and performance of actively managed US equity funds during years 2000–2007, and document robust evidence that performance is improved by security selection but worsened by market timing. Furthermore, we find that activity is persistent over time and that past activity is a significant predictor of future performance. Finally, our findings suggest that portfolio managers who enjoy a period of good performance become less active and vice versa.

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Looking at the empirical evidence from nearly half a century, it seems safe to conclude that very few portfolio managers display the characteristics of truly successful or unsuccessful activity when adjusting for costs and chance.[1] Compared to the extensive efforts invested into detecting the *success* of portfolio manager activity, relatively little attention has however been given to gauging the *magnitude* of portfolio manager activity. Detecting the magnitude of portfolio manager activity, security selection and market timing as defined by Fama (1972), has historically been constrained by limited disclosure of mutual fund holdings. It has recently been further complicated by evidence that disclosed mutual fund holdings are not representative of the actual investment activity.

We develop a new method for detecting portfolio manager activity by showing that the second moment of the equation residual from a standard portfolio performance evaluation model, commonly known as Tracking Error, can be disintegrated into a security selection and a market timing component. As both components can be estimated without knowledge of the portfolio holdings, our method consequently circumvents problems associated with disclosed portfolio holdings, in addition to having other apparent practical advantages. We apply our method on the daily returns of all actively managed US equity mutual funds in years 2000-2007 and find that that performance is improved by security selection but worsened by market timing. Our method and the direct empirical evidence of the adverse effects of market timing activity are new to literature.

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[1] See for instance Jensen (1968), Hendricks et al. (1993), Brown and Goetzmann (1995), Elton et al. (1996a) and Carhart (1997), Barras et al. (2010), and Fama and French (2010).

Grinblatt and Titman (1989) find that the gross returns of growth and aggressive growth US equity mutual funds are on average significantly positive and conclude that "this measured performance is at least partly generated by active management of the funds". Daniel et al. (1997) investigate the holdings of US equity mutual funds and find evidence of some security selection ability. Wermers (2000) shows that US equity mutual funds hold stocks that outperform the market, but that the outperformance is offset by costs and other frictions. Kacperczyk et al. (2005) find that US equity mutual funds whose holdings are more concentrated in certain industries outperform less concentrated mutual funds. Avramov and Wermers (2006) report that security selection and market timing activity enhances performance of US equity mutual funds, and that portfolio manager skill can be predicted. Kacperczyk and Seru (2007) find that US equity mutual fund portfolio managers who rely less on public information perform better and that their performance is primarily enhanced by security selection. Cremers and Petajisto (2009) conclude that US equity mutual funds which holdings are more dominated by idiosyncratic risk outperform their benchmark indices both before and after expenses. Furthermore, Ivkovic et al. (2008) investigate the trading activity of a large US discount broker's clients and conclude that individual investors that hold more concentrated portfolios achieve better performance. Finally, Brands et al. (2005) conclude that those Australian equity mutual funds that hold more concentrated positions perform better.

Turning our attention back to US equity mutual funds, Kacperczyk et al. (2008) however demonstrate that portfolio holdings disclosed in mandatory quarterly SEC filings are *not* representative of the portfolio holdings between disclosures. US equity mutual fund returns are for instance affected by daily market timing activity, as demonstrated by Bollen and Busse (2001). As all of the above mentioned research on US mutual fund portfolio manager activity has relied on disclosed portfolio holdings, the findings of Kacperczyk et al. (2008) hence raise some validity concerns. Furthermore, even though quarterly disclosed portfolios are readily available for mutual funds, this is often not the case for other portfolios, such as off-shore funds and private investment vehicles.

We develop a new method for detecting portfolio manager activity by showing that the second moment of the equation residual from a standard portfolio performance evaluation model, commonly known as Tracking Error, can be disintegrated into a security selection and a market timing component, which can be estimated without knowledge of the portfolio holdings. As our method relies on portfolio returns only, it consequently avoids the pitfalls associated with portfolio holdings. The method also has valuable practical advantages over methodologies that are based on portfolio holdings. We apply our method to daily return data for all actively managed US mutual funds from the Center for Research in Security Prices (CSRP) Survivor-Bias-Free US Mutual Fund Database for years 2000–2007 and find that the portfolio managers engage in both security selection and market timing activity. More precisely, we estimate that the average portfolio manager generates idiosyncratic returns with a 5.57 % annual standard deviation through security selection and performs market timing corresponding to a 1.83 annual standard deviation in the systematic equity market risk (beta).

We investigate the interrelation between portfolio manager activity and performance and document robust evidence that performance is improved by security selection activity and worsened by market timing activity. We also find that portfolio manager activity is stable over time and that past portfolio manager activity is a significant predictor of future performance. Furthermore, our findings suggest that portfolio managers who enjoy a period of good performance become less active and vice versa. Finally, we find that our method provides a considerable improvement to the Tracking Error activity measure, which is widely used in the managed portfolio industry.

II. Method

The performance evaluation methods developed by Treynor and Mazuy (1966), Jensen (1968), Henriksson and Merton (1981) and Carhart (1997) seek to attribute the first moment of portfolio returns r_p to security selection α_p, market risk $\beta_{p,m}$, other systematic risks $\Sigma\beta_{p,i}$ and market timing γ_p:[2]

$$r_{p,t} = \alpha_p + \beta_{p,m}r_{m,t} + \Sigma\beta_{p,i}r_{i,t} + \gamma_p\chi r_{m,t} + \varepsilon_{p,t} \tag{1}$$

Given that the model is correctly specified, the residual return ε_p will be depleted from information on returns due to systematic risk, as well as the outcome of portfolio manager activity. The second moment of the unexplained residual return ε_p, which is commonly referred to as Tracking Error, is frequently used as a proxy for the magnitude of portfolio manager activity, as it can only deviate from zero due to portfolio manager activity. Our insight is that the second moment of residual return ε_p contains information not only on the total magnitude of

[2] Where χ equals $r_{m,t}$ in the Treynor and Mazuy (1966) model, 1 when $r_{m,t}>0$ and 0 when $r_{m,t}\leq 0$ in the Henriksson and Merton (1981) model, and 0 in the Jensen (1968) and Carhart (1997) models. Also see Mamaysky et al. (2007, 2008) for discussion on improved models and estimation methods.

portfolio manager activity, but also on the proportions of security selection and market timing activity.

Let residual return ε_p in Equation 1 be attributed to the two different kinds of portfolio manager activity defined by Fama (1972): security selection and market timing. Security selection returns $\varepsilon_{\alpha,p}$ represent idiosyncratic risk of the portfolio, which is a result of under-diversification. Market timing returns $\varepsilon_{\beta,p}$ reflect excess systematic risk, which is a result of altering the systematic risk of the portfolio by $\Delta\beta_p$ from its average value. In total:

$$\varepsilon_{p,t} = r_{p,t} - \alpha_p - \beta_p r_{m,t} = (\alpha_p + \beta_p r_{m,t} + \varepsilon_{\alpha,p,t} + \varepsilon_{\beta,p,t}) - \alpha_p - \beta_p r_{m,t} = \varepsilon_{\alpha,p,t} + \varepsilon_{\beta,p,t} \quad (2)$$

$\varepsilon_{\alpha,p}$ is by definition not conditional on neither the excess systematic risk $\Delta\beta_p$ nor the excess market return r_m, whereas $\varepsilon_{\beta,p}$ by definition is strictly conditional on both:

$$\varepsilon_{p,t} = \varepsilon_{\alpha,p,t} + \varepsilon_{\beta,p,t} = \varepsilon_{\alpha,p,t} + \Delta\beta_{p,t} r_{m,t} \quad (3)$$

$\varepsilon_{\alpha,p}$ and $\Delta\beta_p$ as well as $\varepsilon_{\alpha,p}$ and r_m are by definition not correlated and hence $\varepsilon_{\alpha,p}$ and $\Delta\beta_p r_m$ are not correlated. The expected variance ε_p^2 of residual return ε_p hence becomes:

$$\varepsilon_p^2 = (\varepsilon_{\alpha,p} + \Delta\beta_p r_m)^2 = \varepsilon_{\alpha,p}^2 + 2\varphi\sqrt{\varepsilon_{\alpha,p}^2}\sqrt{\Delta\beta_p^2 r_m^2} + \Delta\beta_p^2 r_m^2 = \varepsilon_{\alpha,p}^2 + \Delta\beta_p^2 r_m^2 \quad (4)$$

where φ is the correlation between $\varepsilon_{\alpha,p}$ and $\Delta\beta_p r_m$ (zero in this case). Finally, according to the Law of large numbers we can estimate $\varepsilon_{\alpha,p}^2$ and $\Delta\beta_p^2$:

$$\varepsilon_{p,t}^2 = \varepsilon_{\alpha,p}^2 + \Delta\beta_p^2 r_{m,t}^2 + \rho_{p,t} \quad (5)$$

where ρ_p is the equation residual. $\sqrt{\varepsilon_{\alpha,p}^2}$ hence represents idiosyncratic residual return standard deviation, or security selection activity, and $\sqrt{\Delta\beta_p^2}$ represents excess systematic risk standard deviation, or market timing activity. For convenience reasons, we hereafter refer to $\sqrt{\varepsilon_{\alpha,p}^2}$ as ActiveAlpha, $\sqrt{\Delta\beta_p^2}$ as ActiveBeta and Equation 5 as the Residual Return Analysis Model. In conclusion, we can estimate the Fama (1972) security selection and market timing activity of a portfolio manager knowing only the portfolio and excess market returns.[3]

On a more general note, we can detect security selection activity by computing the unconditional statistical dispersion of residual return ε_p when excess market return r_m equals zero and market timing activity consequently does not contribute to the residual return ε_p's deviation from zero. This fraction of statistical dispersion of residual return ε_p by definition represents idiosyncratic risk, as it is unconditional on excess market return r_m. Furthermore, we can detect market timing activity by computing the statistical dispersion of residual return ε_p that is conditional on the magnitude of the excess market return r_m. This fraction of statistical dispersion of residual return ε_p by definition represents systematic risk, as it is conditional on excess market return r_m. The residual return plot for a randomly active security selection and market timing portfolio manager in Figure 1 visualizes this insight.

[INSERT FIGURE 1 HERE]

Our method is conceptually related to the Tracking Error decomposition proposed by Ammann et al. (2006). The critical difference is that the Ammann et al. (2006) method requires portfolio holdings. The portfolio holdings validity issues exposed by Kacperczyk et al. (2008) hence also burden the method by Ammann et al. (2006).

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[3] The model can easily be extended to additional or alternative systematic risks. For example, we can estimate portfolio manager timing with regards to the Carhart (1997) value, size and momentum risk factors.

III. Data

We use the CRSP Survivor-Bias-Free US Mutual Fund Database (March 2008 cut) to analyze the activity of a sample of US mutual fund portfolio managers. The database includes data from December 1961 for open-ended mutual funds of all investment objectives, including equity funds, taxable and municipal bond funds, international funds and money market funds[4]. Daily mutual fund returns (dret) are available from September 2 1998 to March 31 2008. We limit our sample to actively managed US equity funds by including funds with the following Lipper Classification Codes (lipper_class): LCCE (Large-Cap Core Funds), LCGE (Large-Cap Growth Funds), LCVE (Large-Cap Value Funds), MCCE (Mid-Cap Core Funds), MCGE (Mid-Cap Growth Funds), MCVE (Mid-Cap Value Funds), MLCE (Multi-Cap Core Funds), MLGE (Multi-Cap Growth Funds), MLVE (Multi-Cap Value Funds), SCCE (Small-Cap Core Funds), SCGE (Small-Cap Growth Funds), and SCVE (Small-Cap Value Funds). Lipper Classification Codes (lipper_class) are available from December 31 1999 to March 31 2008. For symmetry reasons, we restrict our main data sample to the time period beginning on January 1 2000 and ending on December 31 2007, which represents eight full calendar years. We also collect data for the control variables used by Cremers and Petajisto (2009): monthly total net assets (mtna), first offer date (first_offer_dt), expense ratio (exp_ratio), turnover ratio (turn_ratio) and manager inception date (mgr_dt).[5] Furthermore, we include the population standard deviation (volatility)

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[4] Please refer to http://www.crsp.com/products/mutual_funds.htm for a more detailed specification of the database.

[5] We use the arithmetic average of the values of the variables as of the beginning and end of the sample period, in order to represent their average values during the time period. For example, the Assets variable equals the average of the total net assets as of December 31 1999 and December 31 2007.

of daily returns as a control variable, as Wermers (2003) documents a positive relationship between fund volatility and performance. Following Elton et al. (1996b), we eliminate funds with average assets less than USD15 million to avoid introducing survivorship bias that are associated with reporting conventions.

Finally, we retrieve daily market portfolio excess returns, Fama and French (1993) size and value portfolio returns, Jegadeesh and Titman (1993) momentum portfolio returns and risk free returns from Professor Kenneth French's home page.[6] Altogether, this procedure leaves us with sufficient data for 4142 funds. The descriptive statistics displayed in Panel A of Table I confirm that the funds in our sample indeed are actively managed from a trading perspective, as the average annual turnover is 96.14 %. Furthermore, we note that the average annual expense ratio is 1.40 % which is considerably higher than in the sample used by Wermers (2000) which also included index funds.

IV. Analysis

We begin our analysis by estimating the Carhart (1997) model for each fund:[7]

$$r_{p,t} = \alpha_p + \beta_p r_{m,t} + \beta_{p,SMB} SMB_t + \beta_{p,HML} HML_t + \beta_{p,MOM} MOM_t + \varepsilon_{p,t} \quad (6)$$

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[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The stock return data origins from the CRSP US Stock Database. The risk free returns equal the one-month Treasury bill returns, which are from Ibbotson and Associates, Inc.

[7] We require each fund to have a constant Lipper Objective Code, a new model is estimated whenever the Lipper Objective Code changes. Furthermore, we correct for potentially erroneous returns by deleting returns that belong to the data sample with a probability less than 0.05/N (for instance 0.0002 for a sample of 250 returns), meaning that there is a 0.05 probability that we delete a valid return for each model that we estimate. CRSP has confirmed that a sample of potentially erroneous returns that we have detected, indeed are erroneous. We require at least 250 valid returns for a model to be estimated, corresponding to approximately one year of return data.

The descriptive statistics in Panel B of Table I reveal that the average R^2 statistics is just below 90 %, as can be expected for a valid model and a representative sample. We find that portfolio managers on average generate an insignificantly negative Carhart (1997) α of -0.67 % per annum, despite the average expense ratio equaling 1.40 %. This observation is in line with both the empirical findings by Wermers (2000), as well as the equilibrium market efficiency concepts of Grossman and Stiglitz (1980). Furthermore, we note that the Carhart (1997) α varies between -49.78 % and +136.92 % per annum, indicating that performance is rather heterogeneous.

Next, we use residual return ε_p from Equation 6 to estimate the Residual Return Analysis Model (Equation 5) for each fund.[8] The results in Panel C of Table I reveal that the portfolio managers engage in security selection and market timing activity, as we estimate that the average portfolio manager generates idiosyncratic returns with a 5.57 % annual standard deviation through security selection and performs market timing that generates a 1.83 annual standard deviation in the systematic equity market risk (beta). Furthermore, we notice that portfolio manager activity is rather heterogeneous, as the standard deviation of both ActiveAlpha and ActiveBeta are approximately two thirds of their averages.

[INSERT TABLE I HERE]

We investigate the interrelation between portfolio manager activity and contemporary mutual fund performance by estimating the following equation:

$$\alpha_p = \mu + \eta \text{ActiveAlpha}_p + \theta \text{ActiveBeta}_p + \text{control variables} + \rho_p \quad (7)$$

[8] We set ActiveAlpha and ActiveBeta to zero in cases where $\varepsilon_{\alpha,p}{}^2 < 0$ and $\Delta\beta_p{}^2 < 0$, respectively. This is done as negative parameter estimates clearly represent estimation errors. Altogether, we set three ActiveAlpha and 226 ActiveBeta estimates to zero for the 4142 models estimated.

The results reported in Panel A of Table II are striking. Firstly, we document a very significant positive (t-value 10.91) relation between ActiveAlpha and Carhart (1997) α, which suggests that mutual fund performance is improved by security selection activity. Secondly, we find a very significant negative (t-value -8.58) relation between ActiveBeta and Carhart (1997) α, indicating that mutual fund performance is worsened by market timing activity. The results for the control variables are largely consistent with those found in previous research: Expenses, Turnover and Age being significantly negatively related to Carhart (1997) α. We note that ActiveAlpha and ActiveBeta are the two most significant factor explaining performance. In conclusion, portfolio manager activity, as measured by ActiveAlpha and ActiveBeta, has considerable impact on mutual fund performance in our sample.

[INSERT TABLE II HERE]

Our empirical findings support and add to earlier research by confirming that performance benefits from security selection activity. Furthermore, we find that portfolio managers are not only unable to time the market, but destroy value while trying. This finding is new to literature.

Wermers (2003) documents a positive relationship between Tracking Error and α. Our attention is drawn to the opposite effects of ActiveAlpha and ActiveBeta on performance, implying that a large fraction of this information will be diluted in the Tracking Error measure. We investigate this hypothesis by estimating the interrelation between Tracking Error and contemporary performance:

$$\alpha_p = \mu + \eta \text{Tracking Error}_p + \text{control variables} + \rho_p \quad (8)$$

The results reported in Panel B of Table II support our hypothesis, as we document a very significantly positive (t-value 6.38) relationship between Tracking Error and Carhart (1997) α, however this is noticeably weaker than the corresponding t-value for ActiveAlpha and ActiveBeta. Our method hence seems to provide a considerable improvement to the widely used Tracking Error method, also from an empirical point of view.

Finally, Amihud and Goyenko (2009) suggest that there is a multiplicative effect between Tracking Error and Volatility, which would warrant the use of R^2 instead of Tracking Error and Volatility separately.[9] We consequently drop Volatility from the control variables and investigate the interrelation between R^2 and performance:

$$\alpha_p = \mu + \eta R^2_p + \text{control variables} + \rho_p \tag{9}$$

The results reported in Panel C of Table II do not lend support to R^2 as a measure of portfolio manager activity. Despite the very significantly negative (t-value -8.68) relationship between R^2 and Carhart (1997) α, the explanatory power of the model is considerably weaker than for the models that include Tracking Error or ActiveAlpha and ActiveBeta.

We investigate the economic implications of portfolio manager activity by arranging the mutual funds into 25 portfolios according to their ActiveAlpha and ActiveBeta parameter estimate quintiles for years 2000–2007. We then compute the average annualized Carhart (1997) α for each portfolio. The resulting portfolios' performance in Table III show that Carhart (1997) α increases in a rather linear fashion from -1.50 % to 1.06 % per annum when we move from the first to the fifth ActiveAlpha quintile. Furthermore, the opposite is true for

ActiveBeta quintiles, as the average Carhart (1997) α decreases from 0.15 % to -1.65 % per annum when we move from the first to the fifth quintile. The linear behavior of the quintile portfolios adds robustness to our analysis above by indicating that our results are not driven by outliers. Turning our attention to the individual portfolios, we note that the one that combines mutual funds belonging to the fifth ActiveAlpha quintile and first ActiveBeta quintile produced an average Carhart (1997) α of 2.55 % per annum in years 2000–2007, or 3.19 % more than the average actively managed US equity mutual fund per annum. The opposite corner portfolio, which includes mutual funds belonging to the first ActiveAlpha quintile and fifth ActiveBeta quintile, yielded an average Carhart (1997) α of -2.00 % per annum during years 2000–2007, or 1.37 % less than the average actively managed US equity mutual fund per annum.

[INSERT TABLE III HERE]

In conclusion, we find that ActiveAlpha and ActiveBeta provide highly significant information when monitoring portfolio manager activity and explaining its effects on mutual fund performance. Furthermore, we show that the economic implications of portfolio manager activity are considerable.

A. Robustness

We empirically evaluate the robustness by dividing the data sample into two time periods, years 2000–2003 and 2004–2007 and estimating Equations 6–7 for each sub sample. Our estimation results in Table IV indicate that, except for the Tenure and Volatility control variables, the two sub-samples are essentially equal to the full sample and consequently that our

[9] R^2, Tracking Error and Volatility are multiplicatively interrelated: $R^2 = 1 - \text{Tracking Error}^2 / \text{Volatility}^2$.

results seem robust. Volatility turns out to be very significantly positively related to Carhart (1997) α in years 2000–2003, as found by Wermers (2003), but very significantly negatively related to Carhart (1997) α in years 2004–2007. This finding seems to suggest that the relationship between Volatility and Carhart (1997) α lacks intrinsic robustness, probably due to the highly seasonal nature of equity market volatility.

[INSERT TABLE IV HERE]

We furthermore assess the robustness of our results by investigating portfolio manager specific activity persistence:[10]

$$ActiveAlpha_{p,2004\text{–}2007} = \mu + \eta ActiveAlpha_{p,2000\text{–}2003} + \text{control variables} + \rho_p \quad (10a)$$

$$ActiveBeta_{p,2004\text{–}2007} = \mu + \eta ActiveBeta_{p,2000\text{–}2003} + \text{control variables} + \rho_p \quad (10b)$$

where $ActiveAlpha_{p,2000\text{–}2003}$ and $ActiveBeta_{p,2000\text{–}2003}$ are the Residual Return Analysis Model parameter estimates for the 2000–2003 sub-sample and $ActiveAlpha_{p,2004\text{–}2007}$ and $ActiveBeta_{p,2004\text{–}2007}$ are the corresponding parameter estimates for the 2004–2007 sub-sample.

[INSERT TABLE V HERE]

Our results in Table V confirm that ActiveAlpha parameter estimates are extremely stable over time, as ActiveAlpha estimates for years 2004–2007 are predicted by the corresponding ActiveAlpha estimates for years 2000–2003 with very high significance (t-value 34.73), and the R^2 statistic of the equation equals 65.73 %. ActiveBeta estimates for years 2004–2007 are also significantly predicted by the corresponding ActiveBeta estimates for years 2000–2003 (t-value

[10] We add the Carhart (1997) α estimated for years 2000-2003 to the control variables in order to adjust for possible performance persistence, which is not related to the other exogenous variables.

2.60), however not nearly as reliably as ActiveAlpha estimates. In total, these findings indicate that portfolio managers tend to remain loyal to their strategies in general, but that security selecting managers are more consistent than market timing managers.

We find the very significantly negative relation between activity, as measured both by ActiveAlpha (t-value -5.69) and ActiveBeta (t-value -6.28) and lagged Carhart (1997) α very interesting. This relationship seems to suggest that portfolio managers who have performed well in the past become less active in the future. Less successful portfolio managers, on the other hand, become more active in the future. This finding could be a symptom of successful portfolio managers "locking in" their performance by clinging more closely to the passive index and unsuccessful portfolio managers being forced to become more active in order to improve their performance.

B. Predicting Performance

We have so far documented a robust contemporary relationship between portfolio manager activity and performance and furthermore demonstrated that portfolio manager activity is persistent over time. Our findings hence seem to suggest that past portfolio manager activity could not only explain but also predict future performance. We investigate how past ActiveAlpha and ActiveBeta predict future Carhart (1997) α by estimating the following equation:

$$\alpha_{p,2004\text{–}2007} = \mu + \eta \text{ActiveAlpha}_{p,2000\text{–}2003} + \theta \text{ActiveBeta}_{p,2000\text{–}2003} + \text{control variables} + \rho_p \quad (11)$$

Our results in Panel A of Table VI confirm that past portfolio manager activity predicts future performance, as ActiveAlpha and ActiveBeta estimated for years 2000–2003 significantly predict Carhart (1997) α for years 2004–2007 (t-values 7.87 and -2.39, respectively). We also document positive performance persistence, as lagged Carhart (1997) α is significantly positively related to future Carhart (1997) α (t-value 4.88). Expenses and Volatility are the only other significant variables. Volatility however displays an unexpected sign, which we view as a symptom of spurious correlation.

[INSERT TABLE VI HERE]

As benchmarks, we test how past Tracking Error and R^2 predicts future Carhart (1997) α by estimating the following equations:

$$\alpha_{p,2004–2007} = \mu + \eta \text{Tracking Error}_{p,2000–2003} + \text{control variables} + \rho_p \quad (12a)$$

$$\alpha_{p,2004–2007} = \mu + \eta R^2_{p,2000–2003} + \text{control variables} + \rho_p \quad (12b)$$

The results in Panels B and C of Table VI confirm that past Tracking Error and R^2 predict future performance with high significance (t-values 6.41 and -6.54, respectively). However, the predictive power is clearly weaker than the one for ActiveAlpha and ActiveBeta.

[INSERT TABLE VII HERE]

Finally, we investigate the economic implications of past portfolio manager activity by arranging the mutual funds in the sample into 25 portfolios according to their ActiveAlpha and ActiveBeta parameter estimate quintiles in years 2000–2003. We then compute the average annualized Carhart (1997) α in years 2004–2007 for each portfolio. The portfolios' performance in Table VII shows that average Carhart (1997) α in years 2004–2007 increases from -1.73 % per annum to -0.66 % per annum when we move from the first ActiveAlpha quartile to the fifth. Furthermore, the opposite is true for the ActiveBeta quartiles, where average Carhart (1997) α in years 2004–2007 decreases from -0.73 % per annum to -1.24 % per annum when we move from quintile one to quintile five. We conclude that the performance implications of past portfolio manager activity are worth noting also from an economic point of view.

V. Conclusions

Our method provides us with a new and efficient tool for detecting portfolio manager activity. This should be of interest to both the academic and professional communities, as it provides us with a better understanding of portfolio manager activity. Our empirical findings provide us with important insights into the roots of performance, as we find that performance is improved by security selection activity but worsened by market timing activity. On an academic note, our results imply that idiosyncratic information is less efficiently priced than systematic information, which resonates rather well with the equilibrium market efficiency concepts presented by Grossman and Stiglitz (1980). On a practical note, our findings imply that we should not only favor low expenses and turnover when selecting a portfolio manager: we should also give preference to portfolio managers who actively select securities but avoid timing the market. Our findings reveal that the most actively security selecting portfolio manager quintile succeed in producing true value added for their investors, accounting for expenses and known risk factors, whereas the average active portfolio manager fails in this task.

Finally, we find that future portfolio manager activity is conditional on past success, as more successful portfolio managers become less active in the future, and vice versa. This finding has important implications for the portfolio management industry: it calls for properly designed performance based fee structures that will better align the interests of portfolio managers and investors.

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Table I. Descriptive statistics

Panel A: Assets (MUSD)$_p$ is assets in millions of US Dollars. Expenses$_p$ expresses the annual expense ratio, including management and 12b-1 fees. Turnover$_p$ equals the ratio of securities that are purchased or sold per annum as compared to the average assets. Age$_p$ represents the number of years since inception. Tenure$_p$ corresponds to the number of years since the current portfolio manager was appointed. All variables are arithmetic averages of their values as of December 31, 1999 and December 31, 2007, except for Volatility$_p$, which is the population standard deviation of the daily returns between January 1 2000 and December 31, 2007. *Panel B:* α_p is the equation intercept, Tracking Error$_p$ the population standard deviation of the residual return, and R^2_p the coefficient of determination from Carhart (1997) models estimated on daily returns for years 2000–2007. *Panel C:* Results for Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2007.

	Average	Median	StDev	Minimum	Maximum
Panel A: Control variables					
Assets$_p$	704.0	118.3	2 705.2	15.1	75 450.4
Expenses$_p$	1.40 %	1.32 %	0.53 %	0.00 %	3.98 %
Turnover$_p$	96.14 %	73.00 %	107.16 %	0.00 %	2296.50 %
Age$_p$	10.52	7.40	11.15	1.26	81.18
Tenure$_p$	5.72	4.75	3.86	0.99	48.15
Volatility$_p$	1.24 %	1.11 %	0.49 %	0.27 %	7.22 %
Panel B: Carhart (1997) models					
α_p	-0.0027 %	-0.0045 %	0.0284 %	-0.2751 %	0.3456 %
Tracking Error$_p$	0.38 %	0.33 %	0.22 %	0.05 %	2.46 %
R^2_p	89.55 %	91.49 %	8.39 %	1.01 %	99.78 %
Panel C: Residual Return Analysis Models					
ActiveAlpha$_p$	0.35 %	0.30 %	0.20 %	0.00 %	2.26 %
ActiveBeta$_p$	0.12	0.10	0.08	0.00	0.81
R^2_p	2.50 %	1.47 %	3.29 %	0.00 %	41.05 %
Number of funds = 4142					

Table II. Determinants of contemporary performance

OLS estimation results for three alternative cross sectional models explaining contemporary performance. α_p is the equation intercept, Tracking $Error_p$ the population standard deviation of the residual return, and R^2_p the coefficient of determination from Carhart (1997) models estimated on daily returns for years 2000–2007. $ActiveAlpha_p$ and $ActiveBeta_p$ are parameter estimates from Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2007. $Volatility_p$ is the population standard deviation of the daily returns for years 2000–2007. All other variables are arithmetic averages of their values as of December 31, 1999 and December 31, 2007. t-values are displayed in italics below the corresponding parameter estimates.

	α_p		
	Panel A	Panel B	Panel C
μ	-0.000073	-0.000069	0.000454
	-1.54	*-1.43*	*6.53*
$ActiveAlpha_p$	0.040840		
	10.91		
$ActiveBeta_p$	-0.000597		
	-8.58		
Tracking $Error_p$		0.022238	
		6.38	
R^2_p			-0.000463
			-8.68
$LOG_{10}(Assets)_p$	0.000027	0.000019	0.000024
	0.74	*0.50*	*0.65*
$LOG_{10}(Assets)^2_p$	-0.000001	0.000000	0.000000
	-0.18	*0.04*	*-0.06*
$Expenses_p$	-0.005428	-0.005726	-0.004818
	-6.17	*-6.43*	*-5.38*
$Turnover_p$	-0.000025	-0.000031	-0.000021
	-5.96	*-7.31*	*-5.02*
Age_p	-0.000002	-0.000002	-0.000002
	-3.53	*-3.97*	*-3.92*
$Tenure_p$	0.000000	0.000000	-0.000002
	0.28	*0.19*	*-1.50*
$Volatility_p$	0.002699	0.003347	
	1.79	*2.15*	
R^2	8.44 %	5.97 %	3.35 %
Number of funds	4142	4142	4142

Table III. Contemporary performance of activity quintile portfolios

Annualized average equation intercepts from Carhart (1997) models estimated on daily returns for years 2000–2007 for 4142 active US equity mutual funds. The mutual funds have been arranged into 25 portfolios according to their $ActiveAlpha_{2000–2007}$ and $ActiveBeta_{2000–2007}$ quintile. $ActiveAlpha_{2000–2007}$ and $ActiveBeta_{2000–2007}$ are parameter estimates from Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2007.

$ActiveAlpha_{2000-2007}$ Quintile	$ActiveBeta_{2000-2007}$ Quintile 1	2	3	4	5	Average
1	-1.24 %	-1.43 %	-1.44 %	-1.39 %	-2.00 %	-1.50 %
2	-0.45 %	-1.14 %	-1.39 %	-0.89 %	-1.09 %	-0.99 %
3	-1.29 %	-0.49 %	-1.40 %	-0.96 %	-1.07 %	-1.04 %
4	1.18 %	0.41 %	-1.25 %	-1.45 %	-2.44 %	-0.71 %
5	2.55 %	1.26 %	3.00 %	0.12 %	-1.63 %	1.06 %
Average	0.15 %	-0.28 %	-0.49 %	-0.91 %	-1.65 %	-0.64 %

Table IV. Robustness of the determinants of contemporary performance

OLS estimation results for a cross sectional model explaining contemporary performance during two separate time periods. α_p is the equation intercept from Carhart (1997) models estimated on daily returns for years 2000–2003 and 2004–2007, respectively. $ActiveAlpha_p$ and $ActiveBeta_p$ are parameter estimates from Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2003 and 2004–2007, respectively. $Volatility_p$ is the population standard deviation of the daily returns for years 2000–2003 and 2004–2007, respectively. All other variables are arithmetic averages of their values as of December 31, 1999 and December 31, 2003, and December 31, 2003 and December 31, 2007, respectively. t-values are displayed in italics below the corresponding parameter estimates.

	α_p	
	2000–2003	2004–2007
μ	-0.000090	-0.000028
	-1.35	*-1.00*
$ActiveAlpha_p$	0.048659	0.018169
	11.05	*5.42*
$ActiveBeta_p$	-0.000816	-0.000134
	-8.10	*-2.73*
$LOG_{10}(Assets)_p$	-0.000003	0.000038
	-0.06	*1.84*
$LOG_{10}(Assets)^2_p$	0.000004	-0.000003
	0.41	*-0.77*
$Expenses_p$	-0.007196	-0.002667
	-6.00	*-5.47*
$Turnover_p$	-0.000034	-0.000007
	-7.01	*-2.31*
Age_p	-0.000002	-0.000001
	-2.79	*-2.91*
$Tenure_p$	0.000001	-0.000002
	0.74	*-3.72*
$Volatility_p$	0.004864	-0.004370
	2.56	*-2.65*
R^2	9.65 %	4.78 %
Number of funds	2990	2888

Table V. Activity persistence

OLS estimation results for a cross sectional model explaining future portfolio manager activity. The dependent variables $ActiveAlpha_{p,2004–2007}$ and $ActiveBeta_{p,2004–2007}$ are parameter estimates from Residual Return Analysis Models estimated on daily returns for years 2004–2007, and $ActiveAlpha_{p,2000–2003}$ and $ActiveBeta_{p,2000–2003}$ are their equivalents for years 2000–2003. Tracking $Error_p$ is the population standard deviation of the residual return and $\alpha_{p,2000–2003}$ is the equation intercept from Carhart (1997) models estimated on daily returns for years 2000–2003. The other variables are arithmetic averages of their values as of December 31, 1999 and December 31, 2003. t-values are displayed in italics below the corresponding parameter estimates.

	$ActiveAlpha_{p,2004–2007}$	$ActiveBeta_{p,2004–2007}$
μ	0.001370	0.055991
	7.35	*3.33*
$ActiveAlpha_{p,2000–2003}$	0.508041	8.703729
	34.73	*6.61*
$ActiveBeta_{p,2000–2003}$	-0.001202	0.087150
	-3.23	*2.60*
$LOG_{10}(Assets)_{p,2000–2003}$	-0.000227	-0.017523
	-1.66	*-1.42*
$LOG_{10}(Assets)^2_{p,2000–2003}$	0.000032	0.003003
	1.14	*1.20*
$Expenses_{p,2000–2003}$	0.011332	0.625023
	3.55	*2.17*
$Turnover_{p,2000–2003}$	0.000066	0.003415
	5.32	*3.05*
$Age_{p,2000–2003}$	0.000004	-0.000164
	2.33	*-1.17*
$Tenure_{p,2000–2003}$	-0.000003	0.000614
	-0.62	*1.37*
$Volatility_{p,2000–2003}$	-0.052664	-0.795633
	-7.30	*-1.22*
$\alpha_{p,2000–2003}$	-0.505478	-50.283436
	-5.69	*-6.28*
R^2	65.73 %	18.06 %
Number of funds	1267	1267

Table VI. Determinants of future performance

OLS estimation results for three alternative cross sectional models explaining future performance. $\alpha_{p,2004\text{–}2007}$ is the equation intercept from Carhart (1997) models estimated on daily returns for years 2004–2007. $ActiveAlpha_{p,2000\text{–}2003}$ and $ActiveBeta_{p,2000\text{–}2003}$ are parameter estimates from Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2003. $Tracking\ Error_{p,2000\text{–}2003}$ is the population standard deviation of the residual returns, $R^2_{p,2000\text{–}2003}$ the coefficient of determination, and $\alpha_{p,2000\text{–}2003}$ is the equation intercept from Carhart (1997) models estimated on daily returns for years 2000–2003. The other variables equal arithmetic averages of their values as of December 31, 1999 and December 31, 2003. t-values are displayed in italics below the corresponding parameter estimates.

	$\alpha_{p,2004\text{–}2007}$		
	Panel A	Panel B	Panel C
μ	0.000064	0.000054	0.000315
	1.62	*1.34*	*5.23*
$ActiveAlpha_{p,2000\text{–}2003}$	0.024484		
	7.87		
$ActiveBeta_{p,2000\text{–}2003}$	-0.000189		
	-2.39		
$Tracking\ Error_{p,2000\text{–}2003}$		0.017167	
		6.41	
$R^2_{p,2000\text{–}2003}$			-0.000338
			-6.54
$LOG_{10}(Assets)_{p,2000\text{–}2003}$	0.000007	0.000008	0.000011
	0.23	*0.29*	*0.36*
$LOG_{10}(Assets)^2_{p,2000\text{–}2003}$	0.000000	0.000000	-0.000001
	0.05	*-0.04*	*-0.13*
$Expenses_{p,2000\text{–}2003}$	-0.003611	-0.003509	-0.003327
	-5.32	*-5.12*	*-4.91*
$Turnover_{p,2000\text{–}2003}$	0.000002	0.000001	-0.000001
	0.63	*0.39*	*-0.49*
$Age_{p,2000\text{–}2003}$	0.000000	0.000000	0.000000
	0.03	*-0.11*	*-0.06*
$Tenure_{p,2000\text{–}2003}$	-0.000001	-0.000001	-0.000001
	-1.21	*-0.98*	*-0.92*
$Volatility_{p,2000\text{–}2003}$	-0.008483	-0.008020	
	-5.53	*-5.19*	
$\alpha_{p,2000\text{–}2003}$	0.092154	0.097847	0.100387
	4.88	*5.15*	*5.40*
R^2	10.05 %	8.46 %	8.46 %
Number of funds	1267	1267	1267

Table VII. Future performance of activity quintile portfolios

Average annualized equation intercepts from Carhart (1997) models estimated on daily returns for years 2004–2007 for 1267 active US equity mutual funds. The mutual funds have been arranged into 25 portfolios according to their $ActiveAlpha_{2000–2003}$ and $ActiveBeta_{2000–2003}$ quintile. $ActiveAlpha_{2000–2003}$ and $ActiveBeta_{2000–2003}$ are parameter estimates from Residual Return Analysis Models estimated on daily Carhart (1997) residual returns for years 2000–2003.

$ActiveAlpha_{2000-2003}$	$ActiveBeta_{2000-2003}$ Quintile					
Quintile	1	2	3	4	5	Average
1	-1.75 %	-1.66 %	-1.70 %	-1.62 %	-1.94 %	-1.73 %
2	-0.95 %	-0.97 %	-1.23 %	-2.01 %	-2.92 %	-1.62 %
3	0.46 %	-0.38 %	0.35 %	-0.85 %	0.51 %	0.02 %
4	-0.13 %	-0.32 %	-0.54 %	-1.85 %	-0.81 %	-0.73 %
5	-1.26 %	0.11 %	0.09 %	-1.16 %	-1.06 %	-0.66 %
Average	-0.73 %	-0.64 %	-0.61 %	-1.50 %	-1.24 %	-0.94 %

Figure 1. Residual return plot of a randomly active portfolio manager
The figure presents 1000 simulated daily residual returns of an actively managed portfolio. We assume a normally distributed excess market return with zero mean and 20% annual standard deviation. Additionally, we assume that the portfolio manager through random security selection activity generates idiosyncratic returns that are normally distributed with zero mean and 5% annual standard deviation. Finally, we assume that the portfolio manager through random market timing activity alters the systematic risk (beta) of the portfolio, so that the excess systematic risk is normally distributed with zero mean and 25% daily standard deviation.