Monthly Holdings Data and the Selection of Superior Mutual Funds[+]

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Abstract

This paper examines the use of holdings data to estimate mutual fund alphas and betas and to select funds that outperform index funds. The paper presents evidence of the stability of betas and the consistency of alphas across estimation techniques. It also presents evidence that using alphas estimated from mutual fund holdings greatly improves an investor's ability to predict future alphas and to select funds that outperform index funds. Finally, the paper has major implications both for the SEC's recent ruling on the required frequency of holdings reporting and for the information plan sponsors should collect from portfolio managers.

JEL Classification G11, G12

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There have been a number of studies that use mutual fund return data to compute performance measures and which show that funds that rank high on these performance measures perform well in the future.[1] In this paper we examine whether monthly holdings period data can be used to identify funds that will outperform other mutual funds, outperform passive portfolios, and outperform mutual funds selected by the most commonly used ranking devices. Two measures that we will use to rank funds are the alpha from the Fama and French three-factor model and the alpha from the four-factor Carhart model. Why might holdings data produce better estimates of betas and alphas than simply using the traditional method of obtaining betas and alphas by regressing past mutual fund returns on a set of indexes? Portfolio betas (mutual fund betas) are a weighted average of security betas. Thus we can compute the mutual fund beta from individual security betas using holdings data at a point in time. This is the beta on the mutual fund at that point in time. A big advantage of this technique compared to a time series regression of fund returns on indexes is that the fund beta will not be distorted by changes in the beta on the portfolio caused by changes in the composition of the portfolio over time.

This paper contributes to the literature in three ways by examining the following questions:

(1) Does the use of holdings data provide a better way to estimate sensitivities (betas) and alphas than simply using a time series regression on a fund's past return?

(2) Does the use of holdings data lead to a better selection of funds?

[1] See, for example, Elton, Gruber and Blake (1996), Gruber (1996), Zheng (1999), Bollen and Busse (2001), and Mamayski, Speigel and Zheng (2005).

(3) What is the effect of different frequencies of reporting holdings data, and how frequent should holdings data be reported to get most of the benefit?

Our primary results are that estimating alphas using betas computed from holdings data allows us to rank funds on alpha such that 1) the top two deciles formed from these rankings outperform index funds in the next period, 2) the performance in the next period of the deciles is almost perfectly correlated with the prior ranking, and 3) the performance in the top decile is considerably higher than that found by others in past research. These results hold whether we evaluate performance in the ex-post period using alphas estimated from holdings or estimated from a standard time series regression of fund returns on indexes. In addition, we show that ranking funds on the basis of alpha computed using monthly holdings data leads to better ex-post alphas than ranking on quarterly holdings and that both rankings are substantially better than ranking based on a time series regression on fund returns.[2] Demonstrating that monthly holdings lead to a better ranking of funds than quarterly holdings has important implications for investor behavior. The availability of monthly holdings data has been growing and is now available for about 18% of all domestic mutual funds. Our results indicate that when available, such information should be used and that public policy should encourage the move towards monthly reporting of holdings. In addition, administrators of institutions such as pension funds (plan sponsors) who should be able to obtain monthly holdings data from the managers who run these funds should do so.

There has been a lot of discussion about how often funds should be required to report holdings data. The law has changed, and probably will change again. In the 1970's

[2] Quarterly reporting misses about 18% of the mutual fund trades (see Elton, Gruber, Krasny and Ozelge (2006)).

and 1980's, funds were required to report holdings on a quarterly basis. Subsequently, funds were only required to report semi-annually, but recently the requirements were changed back to quarterly. The decision on how often funds should be required to report requires an analysis of the costs and benefits of more frequent reporting.[3] This article contributes to this debate by showing one benefit to investors of having holdings data at more frequent intervals.

The paper is divided into four sections. In the first section we discuss our sample of monthly holdings data. In the second section we discuss and present evidence on whether using holdings data can improve our ability to estimate the mutual fund alpha and, if it does, whether the improved estimate of alpha leads to better selection of desirable portfolios. This section is divided into four subsections: accuracy of beta measurement using various time frames and techniques, accuracy of estimated alpha, ability to select desirable mutual funds, and possible biases. As part of this section, we explore how frequently holdings data need to be reported in order to be useful in selecting funds. The third section uses the Grinblatt and Titman measure to select desirable funds. Three issues will be explored: does the Grinblatt and Titman measure allow the selection of active funds that outperform passive funds, how does the Grinblatt and Titman measure compare to the use of past alpha in picking desirable funds, and how much is lost when holdings are reported less frequently. The fourth section contains our conclusions.

[3] Several benefits in addition to those discussed in this article are analyzed in Elton, Gruber, Krasny and Ozelge (2007).

I. Sample

Data on the monthly holdings of individual mutual funds were obtained from Morningstar. Morningstar supplied us with all of its holdings data for all domestic (U.S.) stock mutual funds they followed during the period 1994 to 2004.

The only holding Morningstar does not report is that of any security that represents less than 0.006 percent of a portfolio. This had virtually no effect on our sample, since the sum of the weights almost always equaled one, and, in the few cases where it was less than one, the differences were tiny.[4]

Previous studies of holdings data have used the Thomson database as the source of holdings data. The Morningstar holdings data are much more complete. Unlike Thomson data, Morningstar data include not only holdings of traded equity, but also holdings of bonds, options, futures, preferred stock, non-traded equity and cash. Studies of mutual fund behavior from the Thomson data base ignore changes across asset categories such as the bond/stock mix and imply that the only risk parameters that matter are those estimated from traded equity securities.

From the Morningstar data we selected all funds that reported at least two consecutive years of monthly holdings at any time starting in January 1998 and that reported holdings in the December prior to the start of the sample period for each fund (giving us a minimum of 25 months of data for 436 funds).[5] We eliminated all index, international, and specialty funds from our sample (71 funds). We then eliminated all

[4] While Morningstar only reports the largest 199 holdings in a fund, this did not affect our results, since the funds that held more than 199 securities were index funds and were already eliminated from our sample.

[5] The data included monthly holdings data for only a very small number of funds before 1998, so we started our sample in that year. In 1998, 2.5% of the common stock funds reporting holdings to Morningstar reported these holdings for every month in that year. By 2004, the percentage had grown to 18%. The percentage would have been much higher if we had included funds reporting holdings for 10 or 11 months in the year.

funds that had less than 93% of their assets in cash plus stock in any month or held options or futures that represented more than 0.5% of the value of their portfolio (124 funds) in any month. This resulted in all but six funds in our sample averaging more than 99% in stock and cash and all but 16 averaging more than 99.5%. Thus our sample consists of funds that invest almost exclusively in equity and cash.[6] For plan sponsors, it is common to hire managers or hold funds that restrict their investments to domestic equities and cash. For individuals, this is a feasible constraint to implement, and, since roughly half of the equity funds reported by Morningstar hold exclusively equities and cash, it implies that the analysis is useful for about half the equity funds the individuals might consider. Finally, we eliminated funds that existed for less than a year prior to our first month of holdings data (26 funds). This was necessary in order to estimate betas using the funds' returns. Our final sample consists of 215 funds and 317 pairs of years.[7]

Ge and Zheng (2006) compare the characteristics of funds that voluntarily reported quarterly when the law only required reporting semiannually. They find those that voluntarily report charge 0.04 cents less expenses a year, have 10% less turnover, are less likely to commit fraud, and have different alphas. For purposes of this paper, the key variable is performance as measured by alpha. We discuss differences in performance between funds that report monthly and those that do not in a later section of this paper. The differences are neither economically nor statistically significant.

[6] Users of the Thomson database can study the equity portion of a fund but cannot determine the composition of the remaining assets and what impact they might have on portfolio sensitivities. The 93% cutoff rule was selected in conjunction with looking at the data to ensure that the portfolio was almost pure equity and cash while maintaining a reasonable sample size.

[7] Seventy-one funds entered in more than one pair of years of holdings.

In addition, we use CRSP and Morningstar for weekly and monthly return data on funds and the return on factors (described later in this paper) as compiled by Ken French and available on his web site.[8]

II. Measuring Performance

In this section we compare performance measurement using alpha computed with betas estimated both from holdings data and from mutual fund returns. We refer to the first as "bottom-up" betas and the second as "top-down" betas. The literature of financial economics contains extensive discussion of mutual funds performance based on comparing the return on a mutual fund to the returns on a set of indexes which spans the types of securities the mutual fund holds. The most frequently used multi-index measure of portfolio performance is the three-factor model developed by Fama and French. We use the Fama and French model, as follows:[9]

$$R_{it} - R_{ft} = \alpha_i + \beta_{iM} I_{Mt} + \beta_{iSMB} I_{SMBt} + \beta_{iHML} I_{HMLt} + \varepsilon_{it} \qquad (1)$$

where

R_{it} is the return on mutual fund *i* in period *t*

R_{ft} is the risk-free rate in period *t*

I_{Mt} is the excess return on the market (above the risk-free rate) in period *t*

I_{SMBt} is the return on the "small minus big" (SMB) factor in period *t*

I_{HMLt} is the return on the "high minus low" (HML) book-to-market factor in period *t*

β_{ik} is the sensitivity of fund *i* to the *kth* factor

[8] Weekly return series were constructed by compounding daily returns.

[9] The composition of the factors is described on Ken French's web site. In other studies we have included a bond index. In general this is important, since many stock funds hold a substantial number of bonds. Given that our sample averaged over 99% in cash and stock, a bond index was not used.

α_i is the excess return on portfolio *i* above that which can be earned on a portfolio of the three factors that has the same risk.

To make this study comparable to some other studies, we also included a momentum factor. The results were almost identical when we included a momentum factor and are discussed where interesting in footnotes and text.

The standard way to implement a model of this type is to estimate it using time series data on the returns of a mutual fund via either a regression analysis or a QPS approach (regression with added constraints).[10] We refer to this estimation technique as "top down."

A possible problem with this approach is that to the extent that management changes the sensitivity of a portfolio to any of the model's factors, e.g., changes sector, industry, or security exposure, the sensitivities (betas) can be seriously mis-estimated. Given a change in risk exposure, the betas that are produced can be quite different from the betas that exist at a moment in time or the average beta over time.[11]

One way to avoid this problem is to use the actual composition of a mutual fund to estimate its beta at a point in time by aggregating the estimated betas in each of the fund's underlying assets (bottom-up betas). This is appropriate, since we know from portfolio theory that the betas on the portfolio (mutual fund) are a weighted average of the betas on the securities that comprise it.[12] This is the best estimate of beta for a

[10] See Blake, Elton and Gruber (1993) and Sharpe (1992) for early developments of this technique.
[11] See Dybvig and Ross (1985) for a general discussion, and Elton, Gruber, Brown and Goetzmann (2007) for an example of this phenomenon in the single-index case.
[12] It is exactly the mutual fund beta, except for those cases where the betas on some securities in the fund are inaccurately measured. This occurs because of inadequate return data on a security. We have designed the sample to minimize this. Non-traded securities or securities with a short history of returns constitute less than 1.5% of the sample.

portfolio that can be arrived at any moment in time.[13] The application of the technique is limited by the frequency with which data on the composition of a mutual fund are available and whether the holdings data comprise a complete listing of the fund's portfolio. In the following section we explore differences in beta using top-down or bottom-up estimation as well as differences caused by the number of times per year betas are re-estimated.

A. Estimating Beta

In this section we describe alternative techniques for estimating fund betas as well as tests for comparing the results of these techniques. The two principal techniques use either holdings data (bottom-up forecasts) or time-series return data for mutual funds (top-down forecasts). We discuss the implementation of each of these methods in turn.

1. Bottom-Up Holdings-Based Estimation

Our sample allows us to estimate the mutual fund betas from holdings data as frequently as monthly. To do this at any point in time, we estimate a time series regression (equation (1)) using 36 months of past return data on each security in the fund. There are two problems. First, if less than 36 months of data are available; we use as much data as is available unless it is less than 12 months. If we have less than 12 months of data available we set the beta for the stock equal to the average beta for all other stocks in the portfolio. On average this had to be done for less than 1.4% of the securities in any portfolio. The second problem involves the estimation of equation (1) for securities other than common stock.

[13] Obviously, individual betas are estimated with error. However, it has been shown that a portfolio of past betas very accurately estimates the betas for the same portfolio in the future. This suggests that errors in estimating betas on individual securities tend to cancel out when securities are aggregated into a portfolio. See, for example, Blume (1971 or 1975). In the next section we will examine estimation error directly.

Recall that all but 16 mutual funds being examined averaged more than 99.5% in cash plus stock. Nevertheless, some held long-term bonds, preferred stock, convertibles, options and futures. For T-bills and bonds with less than one year to maturity we set all betas to zero. For each of the following categories of investments: long-term bonds, preferreds and convertibles, we used an index of that category and obtain estimated betas by running a regression of the category index against the three- or four-factor model. Each bond, convertible or preferred was assumed to have the same beta as the relevant index. Finally, for options and futures we assumed the same beta as the underlying instrument. These are approximations. However, these securities in aggregate represent a very small fraction of the overall portfolio (less than 0.09%).

The beta for any fund can be found at a point in time by weighting the beta on each security held in the fund at that time by the percent that that security represents of the fund's portfolio. While our data allow us to do this each month, the present law requires that holdings only be disclosed four times a year. (Previous law required disclosure twice a year.) One question we will examine is whether having more frequent data allows better estimates of betas and alphas. Thus we will compute beta from holdings on a quarterly, semi-annual and annual basis as well as on a monthly basis.

2. Top-Down Fund Returns Estimation

Mutual fund betas can be approximated by simply running a time series regression of the return for any mutual fund on the factors employed in equation (1). We use the standard 36 months of data in our estimates.[14] To get more frequent estimates we

[14] If 36 months of data are not available, we estimate equation (1) using the longest time period available that is at least 12 months. We had less than 36 months in only 8% of the cases.

perform the regression each month. We also examine the accuracy of the betas if the regressions are estimated quarterly, semi-annually, or annually.

3. Empirical Results

Before turning to an examination of the empirical results of estimating portfolio alphas and betas from the top-down or bottom-up approach, we will examine why they might differ from the true beta and alpha.

3.a Estimation Error

If a fund held the same proportion invested in each security over time, we would get the same estimate of betas and thus alphas whether we used the top down or bottom up approach. However, even if proportions are constant over time there will be estimation error in the portfolio betas. Since with constant proportions the two techniques produce the same betas, the difference between estimated betas and true betas in this case will be identical whether the top-down or bottom-up approach was used. The top-down approach has additional error because proportions do not remain constant over time. If proportions were held constant over time, the estimation error would be identical with the top-down or bottom-up approach. It is interesting to see how large that estimation error is and how it might impact our results. To examine this, we randomly selected 100 mutual funds (25 funds randomly selected on each of four dates).

For each security in a fund we estimated the beta as described earlier. To examine the magnitude of the estimation error we performed the following Monte Carlo simulation. For each security in the portfolio we computed a new return series by each month adding a random draw from the residuals of the above regression to the systematic

return in that month.[15] We then re-estimated security betas from this new series of returns and recomputed the portfolio betas. The results of these simulations show that while there are large differences in the estimates of individual security betas between simulations, these differences tend to cancel out at the portfolio level. In addition there is a second form of canceling out of errors that occurs. Our principal test is to see how funds ranked on yearly alpha perform in the future. In performing the ranking we compute monthly alpha and then average monthly alpha to get the annual alpha used in the ranking. When we compare the rankings over 12-month simulation periods, the average cross-sectional correlation in alpha is greater than 0.99. The high correlation in alpha occurs because average beta differences in the three Fama-French betas were less than 0.015. Thus, while there exists estimation error whether we use top-down or bottom-up techniques, assuming portfolio weights are constant, the estimation error has little effect on the results. Of course, using the top-down approach increases the imprecision of the estimated alphas and betas because weights do not remain constant over time.

3.b Differences in Beta

Since we have selected funds that are almost totally comprised of securities for which we can accurately estimate beta using individual security returns, the best estimate of the fund betas at a point in time is to estimate them by examining holdings at that point in time. We are also interested in the beta during a month. We can compute the portfolio betas at the beginning and the end of the month. If all trades took place near the end of

[15] The residuals were drawn with replacement. There were two techniques used to draw the residuals. In the first technique, each security's residuals were drawn independently. In the second technique, residuals from the same historical month were drawn for all securities in the portfolio. For example, if the residual for the third return of the 36 returns was from January 2000 for one security, the third residual is from January 2000 for all securities. The first technique is appropriate if any covariance among residuals is random, while the second is appropriate if the model is mis-specified and the correlation between residuals is systematic or a shock affects a subset of securities. The choice of technique used had little effect on our results, so we discuss only the first.

the month, the best estimate of the portfolio beta during the month would be that based on holdings at the beginning of the month. If all trades take place immediately after the beginning of the month, the best estimate would be based on holdings at the end of the month. Since we do not know the timing of trades during the month, we shall use an average of the beginning and end-of-month betas as our estimate of the beta on the portfolio over the month. Later, when we use the bottom-up approach to estimate betas using quarterly, semi-annual or annual periods, we will use as our estimate of beta for each month in the relevant period an average of betas measured at the beginning and end of the relevant period (e.g., beginning and end of six months for semi-annual).

Table 1 provides information about the distribution of betas estimated from the bottom-up approach across the funds in our sample. The average beta of the funds in our sample is slightly below one with the market factor. However, our sample includes funds with a large spread in their sensitivity to the market factor. When we examine the small-minus-big factor, we see that the average beta is 0.1628, demonstrating a general tendency for funds to hold small stocks. However, over 25% of our funds have a negative beta with the size factor, which indicates they overweight large stocks. Examining the third factor, we see a slight tendency on average to hold value stocks, although again over 25% of the funds overweight growth stocks.[16]

The next question we examine is the stability of betas. If betas do not change, then having more frequent data is not important. In Table 1, row 4, we present the average absolute difference in betas from month to month for all funds in this sample.[17]

[16] When we examine the four-factor model (adding a momentum factor), the average coefficients on the first three factors are almost identical, and the average coefficient on the fourth factor is very close to zero. The number of funds that trade on momentum appears similar to the number of funds that trade against it.

[17] An examination of mean square differences shows similar results.

The surprising result from this table is that the average absolute difference for each of the sensitivities is about the same size, a change from month to month of approximately 0.04. Not only is the average absolute difference in beta from month to month large, but the range of this statistic across funds is quite large (for example, an interquartile range of 0.273 for the market factor beta). Therefore, having frequent measures of the portfolio beta should be important.

Given that the monthly bottom-up beta is our best estimate of actual beta for each month, we will use this as the benchmark against which to judge all other beta estimates, namely at quarterly, semi-annual and annual intervals using both bottom-up estimates based on holdings data and top-down estimates. Denote the benchmark beta for fund *i* on factor *k* at time *t* as $\beta_{i,k,t}$ and an estimate from any other method as $b^{m}_{i,k,t}$ where the superscript *m* and using a lower case *b* signifies that an alternative estimation method is used.

For all alternative methods we compute the average error and the average absolute error. The average error for technique *m* is

$$\overline{E}^{m}_{i,k} = \frac{1}{T}\sum_{t=1}^{T} \left(b^{m}_{i,k,t} - \beta_{i,k,t}\right) \tag{2}$$

The average absolute error is

$$AAE^{m}_{i,k} = \frac{1}{T}\sum_{t=1}^{T} \left|b^{m}_{i,k,t} - \beta_{i,k,t}\right| \tag{3}$$

For each fund the average error and average absolute error are computed for each technique used to estimate betas, and the average results are reported. Table 3 shows the average difference between the beta for each forecasting technique and the monthly

average beta (equation (2)). This measures whether a technique over- or underestimates beta (bias). The average difference between computing bottom-up betas using quarterly, semi-annual or annual holdings rather than monthly holdings is very small and insignificantly different from zero. The average errors for top-down betas are larger but only significantly so for the high-minus-low factor. When we examine average absolute differences shown in Table 3 we see, as expected, larger errors for bottom-up betas estimated at longer intervals. Moving from quarterly to semi-annual intervals increases the average absolute error in bottom-up betas by more than 50% and moving to annual from semi-annual results in another 50% increase in absolute error for each of the betas in our model. All of the differences from adjacent intervals for bottom-up betas (e.g., quarterly versus semi-annual) are statistically significant at the 0.05 level. The errors from the time series regression are much larger, more than four times the error from using quarterly holdings data, and are statistically different from the estimates using holdings data. There is no difference in top-down errors whether we update the regression monthly, quarterly, semi-annually or annually. Thus, in what follows we will follow tradition and measure the top-down betas revising the regression at annual intervals.

B. Differences in Measurement of Alpha

In the prior section we discussed differences in estimates of the sensitivities (betas) due to both the frequency of the reporting interval and whether estimates were obtained from a time series regression of fund return on factors or were built up from portfolio holdings using betas on individual securities. In this section we will discuss the magnitude of the difference in estimates of portfolio performance (alpha) caused by the different estimates of sensitivity. This will allow us to judge whether the differences we

found in the last section matter for one of the major uses of the model, namely performance evaluation.

First, note that differences in alpha across the models will be completely due to differences in sensitivities times the realized return on the factors in the period. This occurs because alpha is the return on the portfolio minus the benchmark return. Since the return on the portfolio being evaluated is the same across all estimates of beta, alpha differences will be the same as benchmark differences which, in turn, depend completely on sensitivity differences and the realized return on the factors. We will calculate alpha for each fund for each year in which we have monthly holding period data. The procedures we use are as follows.

Assume we wish to calculate alpha over a year. With monthly holdings data we will calculate each month's alpha using an average of the sensitivities derived from holdings data at the beginning and end of each month. There will be a different set of betas each month. With quarterly weights we will calculate alphas each month over a quarter using sensitivities computed as the average of the beginning and end of quarter holdings betas. Unlike sensitivities derived from monthly holdings data, the sensitivities will remain constant over the quarter. Sensitivities will be fixed over six months when semi-annual holdings data are used and 12 months when annual data are used. Once the sensitivities are computed, the monthly alpha will be calculated as the difference between the fund's return and the benchmark return each month. The benchmark return is the sensitivities times the realized returns on the factors plus the riskless rate. The average monthly alpha is simply the sum of the monthly alphas divided by twelve.

We will estimate top-down betas using the regression of fund returns on factors. To be consistent with normal practice, and given that in Table 2 there was little difference in errors over different intervals, we will estimate sensitivities by running a three-year regression of fund returns on the factors including data from the year over which we are computing alpha. The average monthly alpha will be the alpha from the regression plus the average residual over that year.

We will take the alpha computed from monthly holdings as the best estimate of true alpha.[18] For each fund year we will compute for each technique the average absolute difference between the alternative technique and the alpha estimated from monthly holdings. These are then averaged across all fund years. The results are shown in Table 4.

Note that the average alphas produced by the three-year regression are consistent with other studies of mutual fund performance. Estimates of average yearly alpha for actively managed funds of from minus 90 basis points to minus 120 basis points per year are slightly less than expense ratios and are fairly typical of studies using this methodology and model specification.[19] The most notable result in Table 4 is how much lower alpha estimates are when the bottom-up method is used to estimate alpha. The difference arises because of the fact that betas estimated from the top-down method are consistently lower than betas estimated from fund holdings. For example, the average beta with the market is 0.017 lower, and the average beta with high-minus-low factor is

[18] Monthly alphas calculated from the bottom-up betas could miss the effect of intra-month trades. In Elton, Gruber, Krasny and Ozelge (2006) the extent of intra-month trades was examined. They found that the turnover measured using monthly data and that reported by the fund itself never differed by more than 6% and was on average close to zero. Some difference is expected since the price the trade took place at can only be approximated using monthly data. However, an average difference close to zero shows that there are very few intra-month round-trip trades.

[19] See, for example, Elton, Gruber and Blake (1996) and Gruber (1996). The estimates of alpha increase our confidence that the sample of funds reporting monthly data does not exhibit performance that differs from mutual funds in general. In a later section we examine this in more detail.

0.14 lower when fund returns rather than individual security returns are used to estimate betas. The last point to note from Table 4 is that the differences in the average alpha estimated from portfolio holdings change very little with the frequency with which holdings are observed.

Table 4 also shows the average absolute errors between techniques. The average absolute errors are much higher using the top-down procedure rather than the bottom-up procedure. A large part of this difference is due to the difference in the average alpha between these two methods. When we compare the bottom-up approach at different intervals, we see differences in the absolute error. The larger the interval between observed holdings, the larger the absolute error in alpha. These results occur not because of bias (the mean forecasts are almost identical), but because of different forecasts from the mean.

While the differences in mean alphas across various bottom-up techniques are small and the differences between the mean bottom-up alpha and the top-down alphas are large, the real issue for selecting mutual funds is whether the techniques rank funds in the same way. Of particular importance is whether the top funds and bottom funds are identified identically by different techniques. The first indication that bottom-up techniques rank similarly is seen in Table 5. Table 5 shows the rank correlation across techniques. The rank correlation across the bottom-up techniques is very high, ranging between 0.994 between monthly and quarterly to 0.968 between monthly and annual. Using bottom-up estimates of beta to compute alpha results in similar ranking independent of the difference in the interval. However, the correlation between alphas using bottom-up betas and alphas using top-down betas is not nearly as high. The rank

correlation between bottom-up alphas using monthly intervals and top-down alphas is 0.762. The same pattern is revealed when we look at similarity in deciles. Table 6 shows the number of funds in deciles 1, 2, 9 or 10 ranked using quarterly, semi-annual and annual bottom-up alphas and annual top-down alphas, where the funds are first ranked using monthly bottom-up alphas. These deciles are the most interesting, since investors would want to select funds in deciles 1 or 2 and avoid funds in deciles 9 or 10. The difference between monthly and quarterly rankings is small. Only four funds ranked in the top decile using alphas computed with quarterly bottom-up betas were not also ranked in the first decile using monthly bottom-up alphas, and these four were ranked in the second decile. On the other hand, differences between monthly and semi-annual or annual rankings are larger. For example, nine funds ranked in the first decile using annual holdings were in the second decile when ranked using monthly holdings. Finally, differences in ranking between the top-down and bottom-up techniques are still larger.

C. Forecasting

While we have been examining the ability of different techniques to measure past performance, the principal purpose (and some would argue the only important use) of performance measurement is selecting funds that will do well in the future. In this section we will examine whether alternative measures of past performance predict future performance and whether any techniques can be used to select active funds that outperform passive funds.

Throughout this paper we have argued that the best estimates of betas and alphas were those based on monthly holdings data. For the same reason that monthly holdings data provide the best estimate of past performance, they should provide the best measure

of future performance and thus serve as the standard against which all other measures should be judged. While this is the best standard, it is not the most commonly used standard. The more commonly used standard is the alpha from a time series regression of fund returns on factors. Thus we will use this as a second standard against which to judge other techniques. As we will soon show, ranking by bottom-up alphas produces the best ex-post performance even when the top down method is used to estimate ex-post alphas. We now turn to a more detailed description of the procedures we use.

Each year where we have at least 40 funds, each of the techniques discussed in the previous section will be used to rank funds. For each technique we will rank funds using the average alpha over the year. For each ranking criterion, funds will be divided into quintiles based on those average alphas. The ranking techniques include alphas computed using monthly, quarterly, semi-annual and annual bottom-up measures and the top-down annual measure. Because of the wide use of the four-factor model, we will not only rank using the three-factor model but also rank using the four-factor model. This yields a total of 10 ranks, five for each of the two models. Then the actual subsequent performance (in the evaluation period) for the funds in each decile will be computed where actual performance is defined in two different ways:

1. Alpha from the monthly holdings data (bottom up)
2. Alpha from a time-series regression of the fund return (top down)

We compute alpha in the evaluation period in a different manner than was done in prior sections. We do not have three years of data after the ranking is completed. To go back three years and compute alpha in the evaluation year would mean that much of the same data were used in ranking as were used in evaluation. Because of this, we estimate

betas using one year of weekly data in the evaluation period. This gives a reasonable amount of data and no overlap between the ranking and evaluation periods. Weekly mutual fund returns were used to compute top-down betas. For the bottom-up method, we estimated betas over the evaluation year for individual securities from weekly data and computed portfolio betas in any month using the average of beginning and ending weights.[20] The monthly alpha was the fund's excess return (fund return minus 30-day T-bill) less the return on the benchmark portfolio computed using these betas and the factor returns.

For any ranking technique, we examine the probability that the realized alpha on the top quintile is greater than zero and the bottom quintile is below zero, each at a statistically significant level. An alpha greater than zero is a clear indication that active mutual funds that outperform index funds with the same risk can be selected.[21]

Tables 7 and 8 show the average alpha of funds that ranked in the top 20% or the bottom 20% of funds in the prior year by each of our ranking techniques.[22] Table 7 shows the results when ranking is done by the three-factor model. Table 8 shows the subsequent alphas when ranking is done by the four-factor model. Examining Tables 7 and 8 together shows that for every ranking technique, for both the three-factor model and the four-factor model and for *every method of measuring alpha in the subsequent period*, funds in the top quintile outperform funds in the bottom quintile. All of these differences are statistically significant at the 1% level.

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[20] In any year, if a security had missing data but at least 26 weeks of complete return data, we estimated beta using the available data. If securities had less than 26 weeks of complete returns, we used the average beta on the portfolio. For securities other than common equity we used the same calculations as described in earlier sections of this paper, but applied to weekly data during the evaluation year.

[21] Since index funds have expense ratios, the test of alphas greater than zero is even clearer evidence. The real test should be alphas greater than minus the expense ratio of index funds.

[22] When funds are divided into deciles, the magnitudes of the top and bottom deciles are very similar to those of the top and bottom quintiles, but due to the smaller sample size the significance is reduced.

When we examine different ranking techniques, we see some significant differences in predicting performance. In what follows we concentrate on the results for the top quintile, since this is the group investors would want to hold.[23] In Table 7, Panel A, we present the alphas in the year subsequent to the ranking year when the ranking and evaluation are both based on the three-factor model. First note that, for bottom-up ranking based on the three-factor model, the subsequent bottom-up alphas are positive and all statistically significant at the 0.05 level. The results are also economically significant. For example, the average bottom-up alpha of the top quintile when ranking is done using the monthly bottom-up approach is greater than 1.8% per year. Furthermore, all the rankings using holdings data have better ex-post alphas than the ranking using the time series of fund returns. Although the top quintile is positive for all ranking techniques using holdings data, there are differences that depend on the frequency of the holdings data used to compute rankings. The general tendency is for the average alpha of the top quintile to be higher the more frequent the holdings data that are used. Not only are the numbers larger for more frequent data – the statistical significance of the numbers is larger. A big reduction in alpha occurs when we move from monthly to quarterly intervals and from quarterly to semi-annual or annual intervals. Examining Table 7, Panel A, we see that the semi-annual and annual alphas are about the same size. This is important, given the controversy over how often mutual funds should be required to report holdings. Recently the SEC shifted to requiring funds to report holdings quarterly rather than semi-annually. The higher alpha in the top quintile using quarterly data shows

[23] In addition, as the table shows, any technique of ranking funds identifies funds that will perform poorly and underperform both the average fund and index funds in subsequent periods. This raises the question of testing a portfolio that holds the top quintile and short sells the bottom quintile. We do not examine this strategy, because it is an infeasible strategy for investors since mutual funds can't be sold short.

that investors do gain from this requirement. The difference in alpha between using monthly ranking and quarterly ranking is about the same as that between quarterly and semi-annual ranking. Thus investors would gain about the same amount by moving to monthly data as they would by moving to quarterly.

All bottom-up techniques have higher alphas than those obtained from ranking using the traditional method of estimating betas and alphas from mutual fund returns. This is true even when the evaluation is done using the top-down method of evaluating performance. Thus, holdings data are very useful in selecting funds.

In Table 7, Panel B, we repeat the data in Table 7, Panel A, but we measure alphas in the subsequent period using the four-factor model. Many of the results discussed above continue to hold. However, the evaluation using the four-factor model produces results that are sometimes larger and sometimes smaller than evaluation using the three-factor model. Even if the four-factor model is used to compute ex-post alpha, all subsequent bottom-up alphas based on holdings data rankings are positive and statistically significant. Once again, ranking using holdings data dominates ranking techniques using top-down alphas. This holds true even when evaluation is done using top-down alphas in the evaluation period.

Table 8 examines what happens when ranking is done on the basis of the four-factor model. The results are similar to the results when the three-factor model is used to rank funds, but the alphas are much smaller in magnitude. Perhaps the most important result to note from this table is that better results (larger alphas) for the top group and larger negative alphas for the bottom group are produced by ranking using the three-

factor rather than the four-factor model, whether alphas are evaluated using a three- or four-factor model.

Tables 7 and 8 provide strong evidence that holdings data are useful in identifying funds with either positive or negative alphas in the subsequent period, and both tables give insight into the frequency of holdings data that is helpful. In Table 9 we examine the ability of the technique which works best in obtaining positive alpha in the top decile to differentiate future alphas not just in the tails but across all deciles. Table 9 shows ex-post alphas when funds are ranked by the bottom-up monthly three-factor model, where the future alphas are computed from the bottom-up alphas from the three- or four-factor model or from the three-factor top-down model. The rank correlation coefficients are shown in each column, and all are statistically significant at the 1% level. Thus the bottom-up monthly ranking not only produces tails with positive alphas for the highest decile and negative for the bottom decile, but also produces ex-post alphas for the deciles that are highly correlated with the ex-ante ranking. Once again the results hold even when evaluation is done using top-down alphas.

D. Possible Biases

The final question we address is whether either requiring monthly holdings data, which we did throughout this paper, or requiring two years of monthly data, which we did for ranking purposes, introduces a bias.

There are two possible sources of bias. First, funds that voluntarily provide monthly holdings data may be different from those that do not. Second, even if funds that provide monthly holdings are no different from those that do not, requiring two years of monthly holdings may bias the results. When we require two years of monthly holdings

data we are excluding funds that merged. Also, when we require two years of monthly holdings data we are excluding funds that reported monthly holdings data in the ranking period but did not report every month in the subsequent year. Each of these potential sources of bias will now be examined.

The first question is whether the characteristics of funds that voluntarily report holdings monthly are different from the general population. Ge and Zheng (2006) examine whether funds that report voluntarily on a quarterly basis are different from those that report semi-annually as required by law in the period they studied. They found that those that reported voluntarily had 0.04% lower expenses, 10% less turnover, were less likely to commit fraud, and differed somewhat in performance. For our study, it is the possibility of difference in performance that needs to be examined. To examine this, we performed the following analysis. For each fund in our sample, we randomly selected funds with the same investment objective that did not report monthly holdings data. We then computed alpha for each fund in the random sample in a manner identical to the method we used to compute the top-down alphas for our sample. The difference in average alpha between our sample and the matching sample was three basis points, which is not statistically significant at any meaningful level. Results are not due to an upward bias in mean alpha for our sample relative to the population.

The second possible source of bias is survivorship bias. To analyze this, we examined all funds that met our criteria for inclusion in the ranking period but merged in the evaluation period. There were 24 such funds. Typical of funds that merge, the performance in the period before the merger was poor. Thus almost all of these funds would have ranked in the bottom group. Of the 24 funds that had monthly data in the first

year and merged in the second, only one ranked in the top quintile (it was in the second decile). Since this is the quintile of interest to investors, we need to examine the effect of inclusion of this fund on the alpha of this quintile. We cannot compute bottom-up alpha for this fund in the evaluation period. However, we did compute its alpha in the evaluation period using the betas from the three-year time series regression computed through the last year of the ranking period. Its alpha in the evaluation period was positive and slightly above the alphas for the rest of the funds in the first quintile using the same calculation technique.[24] Including this fund in the first quintile would increase slightly the alpha earned by an investor who selected this quintile.[25]

A third bias could arise if funds that had one complete year of monthly holdings data but not a second year stopped reporting monthly data because their performance changed or they realized that they were performing not as well as the funds which continued reporting monthly data. The funds that continued to exist but did not have 12 months of reported holdings fell into two classes: those that switched to quarterly reporting and those that were missing a few months of data. Of the 104 funds that had 12 months of data in one year but less than 12 months of data in the subsequent year, only four switched to quarterly reporting.[26] Turning first to the 100 funds that did not switch to quarterly reporting, we find that about 75% of these funds have holdings reports for 10 or 11 months out of the possible 12. For the remaining funds, data appear to be missing at erratic intervals with no discernible pattern with respect to calendar months. The random

[24] With the inclusion of more funds, the definition of quintiles changes slightly. Examining funds that would be added to the top quintile shows this has little or no effect on our results.

[25] In calculating alphas for merged funds, we assumed that an investor liquidated the position when the fund merged and invested equally in all funds in the first quintile after the merger; the alpha is a combination of the alpha on the fund plus the after-merger alpha.

[26] In the case where observations were missing in one or more months towards the end of a year, data were examined in the following year to ascertain whether the funds were switching to quarterly reporting.

nature of reporting months suggests that missing months is a problem of data collection rather than a strategic decision by funds. As a final check, we examined directly whether funds that did not report every month in the second year have different alphas than those that did. We computed top-down betas for the 104 funds in the ranking and evaluation years. There was a general, but not significant, tendency for these funds to have slightly higher alphas in the evaluation period than the funds that reported monthly holdings data in that period (average of one basis point).

When we looked at the four funds which switched to quarterly reporting, we again found that they performed no worse than the funds that continued to report holdings on a monthly basis. Based on this data, there is no reason to believe that omitting funds that were missing some months of holdings data biased the results reported in this article.

III. The Grinblatt and Titman Measure

An alternative way to rank funds is to employ measures that use portfolio holdings directly to measure performance. The best known of these measures is the one developed by Grinblatt and Titman (1989). Grinblatt and Titman recommended ranking funds using the following measure for each fund:

$$m = \frac{\sum_t \sum_j \left(x_{jt} - x_{jt-k}\right) R_{jt+1}}{T} \qquad (4)$$

m is the performance measure

x_{jt} is the weight of stock j in period t

k is the number of periods over which changes are calculated

R_{jt} is the return on security j in month t

T is the number of time periods used to calculate m

The weights add up to one in every period. Thus the sum of the positive changes in weights is the same as the sum of the negative changes and the subsequent return can be viewed as the return on an arbitrage portfolio. The k controls how many periods are used to define the change in weights**.** The decision involves how many periods in the future the information that the trade was based on takes to be reflected in the markets. Grinblatt and Titman recommend three months and one year. Because of data limitations, we will only use three months.[27] In addition, since we have monthly holdings data as well as quarterly holdings data, we will re-estimate the measure monthly as well as quarterly.

[27] Grinblatt and Titman focus on the one-year results because the mean value of m is higher with this choice. They did not investigate the ability of m computed over different time horizons to rank funds.

The Grinblatt and Titman measure has a number of potential problems when it is used as a ranking device. First, note that the measure does not include transaction costs or expenses. Expenses and transaction costs affect future performance. In particular, high-expense funds are a disproportionate share of the poorer performing funds (see Elton, Gruber and Blake (1996) and references therein). Expense ratios change slowly. Since the Grinblatt and Titman measure does not incorporate expenses, the effect of expenses on performance will not be captured. This means that the G&T measure is at a disadvantage in predicting performance that is relevant for fund investors.

The second potential problem stems from the returns on securities that are not traded. Note that the Grinblatt and Titman measure is concerned with the return on the securities bought less the securities sold. Some funds will be actively trading 10% of their assets, others 50%. The impact of this on the fund return is quite different. In addition, the return on the assets which are not traded during a period can have a real effect on the overall portfolio return. Both of these problems should introduce a lot of random error in the ranking.

The question remains whether, given these potential problems, the Grinblatt and Titman (G&T) measure is a useful ranking device for identifying mutual funds that will perform well in the future. We examine this using monthly and quarterly holdings data. We examine the ability of ranking based on the G&T measure to predict future values of the G&T measure and to predict the alpha an investor would earn from these rankings. To accomplish this latter step, we will use the same ex-post measures as used earlier in this paper, three-factor alphas from both monthly holdings and from a time series of fund return. Since our data set, unlike Grinblatt and Titman's, reports holdings beyond traded

equity, we need to discuss how return is computed for these assets. For cash we used the return on the one-month T-bill. For bonds we used the return on the relevant bond index, for options and futures the return on the underlying index or security, and for non-traded assets the average return on the traded assets in the portfolio.

We computed the G&T measure for the same sample we used in the prior sections assuming that holdings were available every month and then assuming availability only over the quarter. The first change in holdings we can compute when we assume quarterly holdings is the change from December to March.[28] In order to compute the G&T measure for 12 months we need return data for 12 months beginning in the first month after we examine the first change in holdings. This means that we compute the G&T measure through March of the second year. We then rank funds. To evaluate their performance, we use data from January through December of the second year. We compute the standard measures used in the prior section, bottom-up alpha and top-down alpha. In addition, since G&T showed that their measure predicted future values of their measure, we also compute their measure in the second year. There is a three-month overlap in the ranking period and the evaluation period. Thus, some of the same mutual fund returns will be used in the ranking and evaluation period. This increases the probability that we will find that ranking on the G&T measure is related to future performance even if it is not.

In Table 10 we present the results of employing rankings based on the G&T measure to select funds that will perform well over a subsequent year. The strongest result arises from the use of the G&T measure computed monthly to select funds with

[28] Recall that we employ paired years of data with 25 months of data collected each year starting in December.

positive G&T measure in the next period. The rank correlation across the five quintiles using this evaluation criterion is 0.891, which is statistically significant at the 1% level. Computing the measure quarterly, the correlation is only 0.43, which is not statistically significant at any meaningful level. Note that whether computed monthly or quarterly, the G&T measure selects a top quintile of funds that has a positive average G&T measure in the evaluation period, while the bottom quintile has a negative value. If we judge the ability of the G&T measure to select funds that have positive alphas computed from either the top-down or the bottom-up three-factor model, the results are disappointing. There is only a very small amount of correlation between the G&T measure and the standard measures of performance. Furthermore, the top 20% of funds selected by the G&T measure have large negative alphas in the year after they were selected.

In summary, an investor can use the G&T measure to help select funds that will do well on this measure in the future, but the investor will find very little information in this measure for selecting funds that will outperform index funds in the future.

IV. Conclusions

In this paper we have explored the use of several alternative techniques for measuring performance to determine whether they lead to the identification of mutual funds that will outperform the average actively managed mutual fund and passive indexes in subsequent periods.

The ranking measures we investigate are based on the standard Fama and French three-factor model, a four-factor version including a momentum measure, and Grinblatt and Titman's Portfolio Change Measure. A unique part of this study was the use of data

on the monthly holdings of securities in each fund in our sample to estimate betas and alphas at a moment in time.

We find that the use of holdings data to compute betas and alphas can lead to superior selection of mutual funds compared to selecting on the basis of the alphas from a time series regression on fund returns or ranking using the Grinblatt and Titman measure. This result held whether we evaluated subsequent performance using alphas computed from holdings data on a monthly basis or alphas computed using a time series regression on mutual fund returns. Interestingly, ranking on the three-factor model led to better results than ranking on the four-factor model whether performance in the subsequent period was computed using either the three- or four-factor model.

When we compared results assuming holdings data were available at different intervals, we found the less frequently they were available, the poorer the predictive power. When quarterly data were used rather than monthly data, the performance of the top quintile was reduced. When semi-annual data were used rather than quarterly holdings, the decrease in performance was about the same size as that associated with the move from quarterly to monthly. There is almost no difference in performance between using semi-annual and annual data. The large difference in performance from moving from quarterly to semi-annual data provides strong evidence that the SEC added value by its recent decision to require quarterly holdings data. Our analysis suggests that a further gain of the same size could be achieved by requiring that monthly holdings be reported.

In the final section we examined whether the Grinblatt and Titman Portfolio Change Measure was a useful measure for selecting funds that perform well in the future. While the Grinblatt and Titman measure predicted the Grinblatt and Titman measure

well, the funds that ranked high on the Grinblatt and Titman measure did not outperform index funds in the future, whether we evaluated performance using bottom-up or top-down alphas.

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Table 1

Monthly Betas Estimated from Fund Holdings

	Market Minus Risk-Free Rate	Small Minus Big	High Minus Low
Average Beta	0.9843	0.1628	0.0853
Top 25%	1.1057	0.4115	0.2446
Bottom 25%	0.8329	-0.1388	-0.0295
Absolute Value of Monthly Change in Beta	0.0437	0.0397	0.0398
Standard Deviation of Monthly Beta	0.1064	0.1179	0.1076

For each fund we first compute an average beta using the data over all periods where we have monthly data. Likewise, for each fund we compute the average absolute change in beta between months and the standard deviation of the monthly betas. The numbers in the table are the average of these calculations or refer to the distribution across funds.

Table 2

Mean Error in Beta (Bias)

	Market Minus Risk-Free Rate		Small Minus Big		High Minus Low	
	Bottom-Up	Top-Down	Bottom-Up	Top-Down	Bottom-Up	Top-Down
Monthly		-0.0169		0.0133		-0.1395
Quarterly	-0.0045	-0.0167	0.0004	0.0147	-0.0024	-0.1413
Semi-Annual	0.0009	-0.0179	0.0037	0.0226	0.0005	-0.1480
Annual	0.0009	-0.0206	0.0084	0.0361	-0.0079	-0.1578

Error in beta is defined as the estimate produced by the techniques noted in the table minus the bottom-up monthly beta.

Table 3

Absolute Error in Beta

	Market Minus Risk-Free Rate		Small Minus Big		High Minus Low	
	Bottom-Up	Top-Down	Bottom-Up	Top-Down	Bottom-Up	Top-Down
Monthly		0.1304		0.1266		0.1958
Quarterly	0.0318	0.1297	0.0287	0.1257	0.0298	0.1955
Semi-Annual	0.0482	0.1284	0.0475	0.1260	0.0498	0.2004
Annual	0.0748	0.1276	0.0734	0.1256	0.0750	0.2065

This table shows the absolute value of the difference between the beta using the technique indicated and the beta estimated each month from security holdings (bottom-up).

Table 4

Average Alpha

	Average Alpha		Average Absolute Error	
	Bottom-Up	Top-Down	Bottom-Up	Top-Down
Monthly	-0.2280			
Quarterly	-0.2337		0.1825	
Semi-Annual	-0.2361		0.2903	
Annual	-0.2353	-0.1008	0.4271	0.7512

This table shows the average alpha produced by the technique indicated and the average absolute difference in alpha between the technique indicated in the first column and the alpha obtained from using security holdings each month (monthly bottom-up). This table is based on data from 1998-2004.

Table 5

Rank Correlations Between Techniques

	Bottom-Up				**Top-Down**
	Monthly	Quarterly	Semi-Annual	Annual	Annual
Bottom-Up					
Monthly	1	0.994	0.986	0.968	0.762
Quarterly		1	0.990	0.971	0.757
Semi-Annual			1	0.987	0.775
Annual				1	0.784
Top-Down					
Annual					1

This Table shows the Spearman rank correlation in alpha between each pair of techniques used to estimate alpha.

Table 6

Consistency of Alphas across Deciles

	Bottom-Up Quarterly		**Bottom-Up Semi-Annual**		**Bottom-Up Annual**		**Top-Down Annual**	
Upper Deciles	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
1	42	4	38	8	37	9	26	9
2	4	39	7	30	9	23	11	16
3		3	0	7		11	2	7
4			1	1		3		5
5								2
6-10							7	7
Lower Deciles	10	9	10	9	10	9	10	9
10	41	5	39	7	38	5	29	8
9	5	34	7	31	7	30	9	18
8		7		6	1	9	5	9
7				1		1	1	8
6						1	1	1
1-5							1	2

This table shows which decile a fund is ranked in using monthly holdings data (bottom-up monthly alphas) when a fund is first ranked in the decile by the technique indicated at the top of the table.

Table 7

Ex-Post Alpha Using the Three-Factor Model as a Ranking Device

Panel A: Evaluation Using the Three-Factor Model

		Top Quintile		**Bottom Quintile**	
Ranking Technique		Bottom-Up	Top-Down	Bottom-Up	Top-Down
Bottom-up mthly		0.158*	0.088***	-0.413*	-0.538*
Bottom-up qtly		0.125**	0.056	-0.435*	-0.567*
Bottom-up semi-ann		0.104**	0.031	-0.385*	-0.512*
Bottom-up annual		0.100**	0.028	-0.412*	-0.574*
Top-down annual		0.089***	0.015	-0.411*	-0.542*

Panel B: Evaluation Using the Four-Factor Model

		Top Quintile		**Bottom Quintile**	
Ranking Technique		Bottom-Up	Top-Down	Bottom-Up	Top-Down
Bottom-up mthly		0.132**	0.075	-0.333*	-0.436*
Bottom-up qtly		0.129**	0.050	-0.352*	-0.465*
Bottom-up semi-ann		0.122**	0.033	-0.300*	-0.405*
Bottom-up annual		0.124**	0.033	-0.322*	-0.469*
Top-down annual		0.063	0.012	-0.335*	-0.458*

This table shows the alpha earned in the period subsequent to the period used for ranking. Alphas in the columns labeled “bottom-up” are computed using monthly holdings and security betas computed over the year using weekly data. Alphas in the columns labeled “top-down” are computed using a time series regression of weekly fund returns. For both types of alphas, it is assumed that an equal amount is invested in each fund in the quintile indicated. Single asterisk indicates significance at 1% level, double asterisk at 5% level and triple asterisk at 10% level.

Table 8

Ex-Post Alpha Using Four-Factor Model as a Ranking Device

Panel A: Evaluation Using the Three-Factor Model

	Top Quintile		**Bottom Quintile**	
Ranking Technique	Bottom-Up	Top-Down	Bottom-Up	Top-Down
Bottom-up mthly	0.051	-0.060	-0.438*	-0.536*
Bottom-up qtly	0.054	-0.063	-0.410*	-0.522*
Bottom-up semi-ann	0.034	-0.089***	-0.444*	-0.565*
Bottom-up annual	0.027	-0.094***	-0.429*	-0.557*
Top-down annual	-0.035	-0.174*	-0.327*	-0.448*

Panel B: Evaluation Using the Four-Factor Model

	Top Quintile		**Bottom Quintile**	
Ranking Technique	Bottom-Up	Top-Down	Bottom-Up	Top-Down
Bottom-up mthly	0.091***	-0.041	-0.383*	-0.448*
Bottom-up qtly	0.085***	-0.049	-0.342*	-0.419*
Bottom-up semi-ann	0.072	-0.068	-0.385*	-0.469*
Bottom-up annual	0.054	-0.080	-0.354*	-0.461*
Top-down annual	-0.017	-0.142**	-0.274*	-0.373*

This table shows the alpha earned in the period subsequent to the period used for ranking. Alphas in the columns labeled "bottom-up" are computed using monthly holdings and security betas computed over the year using weekly data. Alphas in the columns labeled "top-down" are computed using a time series regression of weekly fund returns. For both types of alphas, it is assumed that an equal amount is invested in each fund in the quintile indicated. Single asterisk indicates significance at 1% level, double asterisk at 5% level and triple asterisk at 10% level.

Table 9

Decile Alphas from Monthly Bottom-Up alphas

Decile	Evaluated by Three-Index Monthly Estimate		Evaluated by Four-Index Monthly Estimate
	Top-Down	Bottom-Up	Bottom-Up
1	0.100	0.151	0.138
2	0.076	0.164	0.126
3	-0.083	0.010	0.045
4	-0.170	-0.020	-0.034
5	-0.071	0.072	0.033
6	-0.373	-0.216	-0.260
7	-0.301	-0.120	-0.082
8	-0.470	-0.214	-0.103
9	-0.551	-0.355	-0.334
10	-0.523	-0.472	-0.332
Spearman Rank Correlation	0.952*	0.915*	0.952*

* Significant at the 1% level.

This table shows the average ex-post alpha in each decile where the ex-ante ranking is done on the basis of the monthly bottom-up alphas and evaluation is bottom-up monthly and top-down using the three-index model and bottom-up using the four-index model. This table presents realized alpha for the years 2002, 2003 and 2004.

Table 10

Ranking using Quarterly and Monthly G&T Measures;
Evaluation Using G&T Measure and Three-Factor Alphas

G&T Rankings	Quarterly Ranking Evaluated By:			Monthly Ranking Evaluated By:		
	G&T	Bottom-up	Top-down	G&T	Bottom-up	Top-down
Top Quintile	0.027	-0.054	-0.236*	0.072**	-0.201*	-0.332*
Bottom Quintile	-0.007	-0.226*	-0.315*	-0.086*	-0.182* *	-0.284*
Rank Correlation	0.430	0.261	0.200	0.891*	0.055	0.152

This table shows the performance in the next year when funds are ranked by the Grinblatt and Titman (G&T) measure. Performance is measured by the G&T measure and alpha computed using monthly holdings and betas computed using weekly data or alpha computed using weekly returns. An equal amount is assumed invested in each fund in the quintile. Single asterisk indicates significance at 1% level, double asterisk at 5% level and triple asterisk at 10% level.