Internet Appendix for:
A Panel Regression Approach to Holdings-based Fund Performance Measures[1]

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Abstract

This Appendix presents ancilliary results and tables for the named paper.

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Overview

This Appendix provides ancilliary results for the named paper. Section A.1 and Table A.1 includes additional summary statistics. Table A.2 presents summary statistics using quarterly weight data. Section A.2 and tables A.3B, A.4C and A.6A address the robustness of results in the main paper with respect to the version of the reduced-bias estimator used in the panel regressions and with respect to the use of quarterly or monthly data. Table A.4 presents cross-sections sorted on the classical measures with various robustness checks. Table A.5 presents flow-performance regressions when performance is measured by ranked groups following Sirri and Tufano (1998). Table A.6A presents regressions of AAR measures on fund characteristics. Tables A.6B presents the regressions using quarterly data. Tables A.7A and A.7B present the results of sorting on measures of active management with various robustness checks. Table A.8 evalutes the measures using simulations when there are no fixed effects in the regressions. Section A.3 discusses time dummies and models with a common intercept in the panel regressions. Section A.4 discusses difference estimation for the panel regressions. Section A.5 discusses corrections for bias. Section A.6 discusses simulations of momentum and buy-and-hold strategies. Section A.7 discusses performance attribution. Table A.9 presents the simulation results for the momentum and buy-and-hold strategies. Table A.10 presents the performance attribution analyses.

A.1 Summary Statistics

Table A.1 presents correlations of the performance measures in the cross-section of mutual funds. It shows that the AAR measures are highly correlated with the classical performance measures and the Haj10 and DiffIV TSA estimates are highly correlated. The

AARs are negatively correlated with the Haj10 TSA measures. The correlations across funds between the classical and the Haj10 TSA measures are low.

A.2 Robustness of the Results for Individual Funds

Table A.3A shows that results of the main paper which use the Haj10 estimator, are robust to the use of the DiffIV estimator. Table A.3B shows that the results are robust to the use of quarterly instead of monthly data.

Panel A in Table A.4A replicates Table 5 in the main text using the DiffIV estimator instead of the Haj10 estimator. The classical GT measure is $(1/T)\Sigma_i \Sigma_t ((w^i_t - w^i_{t-\tau})r^i_{t+1})$, and its differenced IV measure is $(1/T)\Sigma_i \Sigma_t (((w^i_t - w^i_{t-\tau}) - (w^i_{t-\tau} - w^i_{t-2\tau+1}))(r^i_{t+1} - r^i_{t+\tau+1}))$. The difference between the original GT estimator and the GT_D, is the AAR measure, which dominates the performance of both the high and low-performance extreme quintiles.

The DGTW measure is examined in Panel B of Table A.4A. The classical measure is $(1/T)\Sigma_i \Sigma_t ((r^i_{t+1} - r^{i,D}_{t+1})w^i_t)$, where $r^{i,D}_{t+1}$ is the DGTW benchmark return, and its differenced IV measure is $(1/T)\Sigma_i \Sigma_t (r^{i,A}_{t+1} - r^{i,A}_{t+\tau+1})(w^i_t - w^i_{t-\tau}))$ where $r^{i,A}_{t+1} = r^i_{t+1} - r^{i,D}_{t+1}$. The difference between the original DGTW estimator and the $DGTW_D$, is the AAR.

Panel C of Table A.4A presents results for the conditional weight measure, CWM. The classical measure is $(1/T)\Sigma_i \Sigma_t ((r^i_{t+1} - r^{i,C}_{t+1})(w^i_t - w_{ibt})$, with the conditional mean of the stock returns as benchmark return: $r^{i,C}_{t+1} = \delta^{i\prime} Z_t$. To calculate this measure, we need to estimate the regression coefficient vector δ^i. Using monthly data for the conditional means in our simulations, we found large biases in the CWM, likely attributed to an induced correlation between the unexpected return estimates and the lagged weights when an overlapping sample is used to estimate the expected returns. The differenced IV measure shown in the table is $(1/T)\Sigma_i \Sigma_t (r^{i,A}_{t+1} - r^{i,A}_{t+\tau+1})[(w^i_t - w_{ibt}) - (w^i_{t-\tau} - w_{ibt-\tau})]$, where $r^{i,A}_{t+1} - r^{i,A}_{t+\tau+1} = r^i_{t+1} - r^i_{t+\tau+1} - \delta^{i'}(Z_t - Z_{t+\tau})$.

Panel D of Table A.4A presents results for the FM measure. The original measure can be written as $(1/T)\Sigma_i \Sigma_t (m_{t+1} r^i_{t+1} w^i_t)$, and the differenced IV measure is $(1/T)\Sigma_i \Sigma_t (r^{i,A}_{t+1} - r^{i,A}_{t+\tau+1})(w^i_t - w^i_{t-\tau}))$, where $r^{i,A}_{t+\tau+1} = m_{t+\tau+1} r^i_{t+\tau+1}$. The difference between these two estimates is the AAR. The parameters in $m_{t+1} = a - b' r_{Bt+1}$ are estimated separately using the benchmark returns and the fitted values of m_{t+1} are plugged in as described in the main text.

Tables A.4B-A.4F replicate Table 4 using various alternative approaches. In Table A.4B we use 29-day returns instead of month-end CRSP returns to avoid common price measurement errors in the both the weights and returns. Table A.4C uses quarterly instead of monthly data. Table A.4D includes funds' cash holdings, reported in CRSP in the hypothetical returns, paired with the return of a Treasury bill. Table A.4E uses Haj10 estimation where the forward and backward demeaning in the measures uses only returns-months for which the fund does not hold the stock, while Table A.4F uses only return-months for which the fund does hold the stock. The results are very similar.

Table A6.A presents an analysis of how the performance measures and their TSA components are related to fund characteristics, regressing the monthly measures as computed in Table 5, on a set of lagged fund characteristics. We include as fund characteristics, measures of funds' tendencies toward buy-and-hold and momentum trading, as our simulations reveal that buy-and-hold and momentum strategies can have large AARs. TBH is our measure of the tendency towards buy-and-hold:

$$TBH_t = 1 - (1/24)\Sigma_{s=0,\ldots,11} |\mathbf{w}_{t-s} - \mathbf{w}_{bht-s}|' \underline{1}, \qquad (A.1)$$

where $\mathbf{w}_{bht}$ is what the fund's weights would have been at time *t*, had the fund had the same share holdings as 12 months before, and $\underline{1}$ is the N-vector of ones. The monthly measure, TBH_t, is averaged over the past year to reduce noise. It takes a value between zero and one, and is equal to one if the fund exactly follows the buy-and-hold strategy relative to an annual asset allocation decision. LM is our measure of momentum trading, following Grinblatt, Titman and Wermers (1995):

$$LM_t = (\mathbf{w}_t - \mathbf{w}_{bht})'(\Sigma_{s=t-12,\ldots,t-2}\, \mathbf{r}_s). \qquad \text{(A.2)}$$

LM measures a relation between a fund's deviation from buy-and-hold weights and the average returns on the stocks over the previous 11 months, skipping the most recent lagged month. A positive LM means that the fund pursues a momentum trading strategy and a negative value indicates a "contrarian" strategy.

We include additional fund characteristics including the expense ratios, annual turnover, age and fund size, measured as the natural logarithm of its total net assets, Log(TNA). Log(Mkt_cap) is the natural logarithm of the portfolio weighted market capitalizations of the stocks held by the fund. A dummy variable, *Aggressive,* turns on if the fund is classified as an Aggressive Growth fund, motivated by the strong performance of such funds. All of these fund characteristics are lagged one month relative to the performance.

Table A6.A summarizes panel regression results. There are differences between the results for the original measures and their TSA components. The most striking finding is a strong negative relation of TSA to the fund TBH. The original measures present insignificant coefficients except for the GT measure which we know to be largely driven by its TSA component, and which shows a significant negative coefficient. We infer that the relation of TBH to the AAR component of performance is weakly positive (and confirm this in a separate analysis not shown in the table). These result seem intuitive.

Turnover presents a negative relation to TSA and to the GT measure, a weak positive coefficient on DGTW and FM, and we infer a weak positive association with AAR. With fund fixed effects in the regressions the coefficients are positive, expressing the average time-series relation for a fund. Without fund fixed effects the relation is weaker, but positive, with a t-ratio just below two. We estimate a version of Table A6.A that includes fund fixed effects. Now the coefficients on turnover are either positive or insignificant, with the exception of the CWM TSA which remains negative. We examine quintile sorts of fund performance on their lagged turnover. The high-low turnover portfolio return is positive for each of the original measures, with t-ratios larger than two in half of the cases.

A strong finding is the positive relation of performance to fund dividend yield. This appears for all of the measures, but is weaker in the TSA and in GT, indicating that the effect concentrates in the AAR component of performance. When we include fund fixed effects the strong positive relation of performance to dividend yield remains, and it remains stronger in the original measures than in the TSA. This motivates our use of dividend yield as a control variable in the main paper.

Table A.6B presents panel regressions of CSA measures on fund characteristics using quarterly data. It shows that the results are similar to those using monthly data. Table A.6C presents regressions in monthly data for the buy-and-hold drift bias on fund characteristics.

Table A.7A uses the DiffIV estimators, Table A.7B uses the Haj10 estimators. Funds are sorted measures of active management and on four alternative fund characteristics. The alternative fund characteristics include the portfolio weighted size, the rank gap, the backwards return gap and the reported fund turnover.

A.3 Time Dummies

If the panel regression is run with time dummies only, the model is:

$$r_{it+1} = a_t + \beta_{TD}\, w_{it} + \varepsilon_{it+1}, \qquad \text{(A.3)}$$

where a_t is the time fixed effect, estimated for each *t* by including dummy variables that take the value one if the current month is month *t*, and equal zero otherwise. By the Frisch-Waugh theorem, the numerator of the OLS slope coefficient in (A.3) is:

$$\beta_{TD,num} = (1/T)\, \Sigma_t\, \Sigma_i\, (w_{it} - w_{.,t})\, (r_{it+1} - r_{.,t+1}), \qquad \text{(A.4)}$$

where the cross-sectionally demeaned values are $w_{.,t} = (1/N)\, \Sigma_i\, w_{it} = (1/N)$ and $r_{.,t+1} = (1/N)\, \Sigma_i\, r_{it+1} = r_{EWt+1}$, the return of an equally-weighted portfolio. With time dummies in the model the panel slope coefficient is identified from cross-sectional covariance between the lagged weights and future returns, which is then averaged over time. In contrast, the AAR examined in the main text is based on the cross-sectional covariation in the time averages, and is a pure cross-sectional ability measure.

Decomposing the sum of squares, we find a decomposition of a classical performance measure in terms of the numerator of the slope in the regression with time dummies:

$$(1/T)\, \Sigma_t\, \Sigma_i\, (w_{it}\, r_{it+1}) = \beta_{TD,num} + \mu_{EW}, \qquad \text{(A.5)}$$

where μ_{EW} is the mean return on the equally weighted portfolio. The mean of the equally weighted portfolio should be similar across funds, so Equation (A.5) shows that the cross-fund variation in classical holdings-based measures of performance is essentially the same as the variation in the slope with time dummies. Thus, the measure with time dummies provides no more information about differences in fund performance than does the classical measure.

The model with time fixed effects may be criticized, similar to the baseline panel regression model in the main paper, for not accomodating different expected returns for different stocks. Consider a model with both time and stock fixed effects:

$$r_{it+1} = a_i + a_t + \beta_B\, w_{it} + \varepsilon_{it+1}, \tag{A.6}$$

where a_i is the stock fixed effect. The slope coefficient in this model may be estimated by writing (A.6) for any portfolio return, say an equally weighted portfolio with weights (1/N), and subtracting the two equations to eliminate the time effect. Estimation can then proceed as in the main paper. This shows that the coefficient β_B captures a form of time-series ability in a fund's portfolio weights, but it is the ability to predict the stocks' returns, over and above a market-wide return like that of an equally-weighted portfolio.

Hjalmarsson (2010) argues that a panel regression with a single intercept can avoid the lagged stochastic regressor bias. In that model the numerator of the slope coefficient may be written as:

$$\hat{\beta}_{\text{num, SI}} = \Sigma_i\, (1/T)\Sigma_t\, (r^i_{t+1} - r_{.,.})'(w^i_t - w_{.,.}) \tag{A.7}$$

$$= \Sigma_i\, (1/T)\Sigma_t\, (r^i_{t+1}\, w^i_t\,) - (1/T)\, \Sigma_t\, r_{EW,t+1}\ ,$$

where $r_{.,.}$ and $w_{.,.}$ are the grand means of the variables and $r_{EW,t+1}$ is the return of an equally weighted portfolio. Thus, a single intercept in this panel regression model has essentially the same impact on the coefficient as does a full set of time dummies. The mean of the equally weighted portfolio should be very similar across funds, so the cross-fund variation in classical holdings-based measures of performance is essentially the same as the variation in the slope with a single intercept, and the model with a single intercept provides no more information about differences in fund performance than does the classical measure.

Other types of dummy variables can be used in future research, such as style dummies, subperiod dummies, seasonal dummies and various interactions. These could generate new insights about performance. They will also raise questions about the fund sectors, benchmarks and stock universe to be employed.

A.4 Difference Estimation

Take the difference between the baseline panel regression and the same equation τ periods before, and the fixed effects cancel out: $r^i_{t+1} - r^i_{t+1-\tau} = \beta(w^i_t - w^i_{t-\tau}) + \varepsilon^i_{t+1} - \varepsilon^i_{t+1-\tau}$. The classical difference estimator is

$$\hat{\beta}^{diff} = \frac{\sum_t \sum_i ((w^i_t - w^i_{t-\tau})(r^i_{t+1} - r^i_{t+1-\tau}))}{\sum_t \sum_i ((w^i_t - w^i_{t-\tau})^2)}. \quad \text{(A.8)}$$

The classical difference estimator in Equation (A.8) suffers a Stambaugh bias for $\tau \geq 2$. To see this, plug $r^i_{t+1} = \alpha^i + \beta w^i_t + \varepsilon^i_{t+1}$ into the numerator of equation (A.8). The result is β plus:

$$\sum_t \sum_i ((w^i_t - w^i_{t-\tau})(\varepsilon^i_{t+1} - \varepsilon^i_{t+1-\tau})). \quad \text{(A.9)}$$

Using an AR(1) assumption for the weights,

$$w^i_t = \gamma^i (1 + \sum_{j=1}^{\tau-1} \rho^j) + w^i_{t-\tau} \rho^\tau + \sum_{j=1}^{\tau} \rho^j v^i_{t-j}. \quad \text{(A.10)}$$

and equation (A.9) becomes:

$$(w^i_{t-\tau}(1-\rho^\tau)-\gamma^i(1+\sum_{j=1}^{\tau-1}\rho^j)-\sum_{j=1}^{\tau}\rho^j v^i_{t-j})(\varepsilon^i_{t+1}-\varepsilon^i_{t+1-\tau}). \qquad \text{(A.11)}$$

If the innovations in the weights $v^i_{t+1-\tau}$ and the return innovations $\varepsilon^i_{t+1-\tau}$ are contemporaneously correlated, as seems highly likely, and if ρ is nonzero, the expected value of $(-\sum_{j=1}^{\tau}\rho^j v^i_{t-j})(\varepsilon^i_{t+1}-\varepsilon^i_{t+1-\tau})$ is not zero when $\tau \geq 2$. Thus, there is a Stambaugh bias in the classical difference estimator when $\tau \geq 2$. We evaluate the estimator for $\tau=1$ in our s

A.5 Corrections for Bias

Hjalmarsson (2008) proposes a parametric correction for the Stambagh bias in a panel regression. He makes a local-to-unity assumption for the autoregressive parameter of the portfolio weights, $\rho = 1 - c/T$, and he makes the assumption that the errors terms are independent across stocks. (We relax this assumption in our simulations.) Letting $R^i_{t+1} = r^i_{t+1} - r_{i,\cdot}$ and $W^i_t = w^i_t - w_{i,\cdot}$, the first bias-corrected estimator is:

$$\hat{\beta}_c = \Sigma_i \Sigma_t (R^i_{t+1} W^i_t - NT\, Cov(\varepsilon,v)\theta(c)) / \Sigma_i \Sigma_t (W^i_t W^i_{t'}), \qquad \text{(A.12)}$$

where $Cov(\varepsilon,v) = (1/NT)\, \Sigma_t \Sigma_i\, Cov(\varepsilon_{it},v_{it})$ is consistently estimated from the OLS residuals of the panel predictive regression system and $\theta(c) = -(e^c - c - 1)/c^2$. He proposes to estimate the parameter c as $T(1-\rho_{pool})$, where ρ_{pool} is the pooled estimator of ρ with no intercept in the regression.

Hjalmarsson (2010) proposes a recursively-demeaned estimator, which is the second estimator we examine. Let the backward and forward demeaned weights and the forward demeaned returns be $w^{bd}_{it} = w^{i}_{t}$ - $[1/(t\text{-}\tau)] \sum_{s=1}^{t-\tau} w^{i}_{s}$, $w^{fd}_{it} = w^{i}_{t}$ - $[1/(T\text{-}t+\tau)] \sum_{s=t+\tau}^{T} w^{i}_{s}$, and r^{fd}_{it} = r^{i}_{t} - $[1/(T\text{-}t+\tau)] \sum_{s=t+\tau}^{T} r^{i}_{s}$ (We use τ=12 months as the gap between the current and mean value). The Haj10 estimator is:

$$\hat{\beta}_H = \Sigma_i \, \Sigma_t \, (r^{fd}_{it+1} \, w^{bd}_{it}) \, / \, \Sigma_i \, \Sigma_t \, (w^{fd}_{it} \, w^{bd}_{it}). \qquad \text{(A.13)}$$

The backward demaning weight, w^{bd}_{it} , is used as an instrument. The recursive demeaning induces a moving average term in the errors of the demeaned model, which we control using in the panel version of Newey-West (1987) covariance matrix estimator as described above.

In our empirical work we sometimes use an *"up-to-t"* version of the Haj10 estimator, because the future demeaning in the $\hat{\beta}_H$ measure cannot be used for predictive purposes. We modifiy the measure for predictive purposes so that the measure to predict stock returns at month *t+1* uses only data for time-*t* and before. The "up-to-t" version replaces w^{fd}_{it} with w_{it1} - $[1/(t1\text{-}\tau)] \sum_{s=1}^{t1-\tau} w^{i}_{s}$ and $r^{fd}_{it} = r_{it1+1}$ - $[1/(t\text{-}t1\text{-}\tau)] \sum_{s=t1+\tau+1}^{t} r^{i}_{s}$ for $t1 < t - \tau$. We use τ=12 months as the gap between the current and mean value used to demean in all of our recursively demeaned estimators. When t1=t-13 the future demeaned return is just r_t, and the weight used to predict the return for time t+1 is based on holding data at time t-13.

We evaluate a *differenced IV* estimator following Anderson and Hsiao (1981) and Wang (2015). This estimator uses the lagged weight difference as an instrumental variable, with forward differences in the returns and weights:

$$\hat{\beta}^{DiffIV} = \frac{\sum_t \sum_i ((w_t^i - w_{t-\tau}^i)(r_{t+1}^i - r_{t+1+\tau}^i))}{\sum_t \sum_i ((w_t^i - w_{t-\tau}^i)(w_t^i - w_{t+\tau}^i))}. \quad (A.14)$$

Wang (2015) shows that the differenced IV estimator of Equation (A.14) is consistent. When number of stocks N is large, the differenced IV estimator converges in probability to β.

When applied to the CWM, the estimators need to accommodate the estimation of the regression coefficients, $\boldsymbol{\delta}^i$, of the returns on the lagged information $\mathbf{Z}_t$. For example, we modify the Diff IV approach for the CWM, replacing $(r^i_{t+1} - r^i_{t+1+\tau})$ with $((r^i_{t+1} - \boldsymbol{\delta}^i_t{}'\mathbf{Z}_t) - (r^i_{t+1+\tau} - \boldsymbol{\delta}^i_{t+\tau}{}'\mathbf{Z}_{t+\tau}))$, where the estimator of δ^i is $\boldsymbol{\delta}^i_t = (\mathbf{Z}_t^{T-1}\ \mathbf{Z}_t^{T-1})^{-1}\mathbf{Z}_t^{T-1\prime}\mathbf{r}^i_{t+1}{}^T$, with $\mathbf{r}^i_{t+1}{}^T = (r^i_{t+\tau+1}, \ldots, r^i_T)$ and $Z_t^{T-1} = (Z_{t+\tau}, \ldots, Z_{T-1})$. We cancel the common intercepts from the difference between the two regression estimates.

In the FM estimator we have to estimate the parameters of the SDF, [a;**b**]. We use monthly data on the benchmark factors to estimate these parameters, and evaluate the resulting two-step estimators by simulation. We find that the estimation error in the parameters [a;**b**] does not have a large impact on the performance measures.

A.6 Simulating Hypothetical Fund Strategies

Our simulated buy-and-hold strategies use only information about past stock returns. The momentum strategy weights also use only past return information, except they also "know" about the momentum effect. To make the strategies somewhat realistic we keep the weights between 0 and 1, and we keep the number of stocks in the portfolios similar to those in the real data.

In the real data, most stocks have returns that exist for a number of consecutive months; appearing and then disappearing. Funds' weights in the stocks will equal zero when the stock is not available. We wish to replicate these features in the simulations of hypothetical funds. We bootstrap the stock returns with the following method. Consider the DGTW model as an example. (The approach using the other benchmarks is similar.) The bootstrap is based on $r_t^i = r_t^{D_i(t-1)} + (r_t^i - r_t^{D_i(t-1)})$, where $r_t^i - r_t^{D_i(t-1)}$ are the DGTW benchmark adjusted returns, and the two parts of the returns are bootstrapped independently. The first step is to construct a pool of 125 DGTW benchmark adjusted returns, covering only those periods during which the stock return r^i_t exists. In each simulation draw we select all the 125 DGTW benchmark returns at a randomly selected time point from the benchmark pool, thus preserving the cross-sectional covariance between the benchmark returns. For each stock that exists at a point in calendar time in the real data, we independently bootstrap the corresponding benchmark adjusted return from the pool of adjusted returns for that stock, picking a separate time period at random. This is consistent with a regression residual being independent of the regressors in the factor model. If a stock does not exist on the (calendar) date, the adjusted return for that stock is set as missing, and the funds' weights in the stocks are zero. The bootstrapped stock return for its nonmissing dates is the summation of its bootstrapped benchmark return and the benchmark-adjusted return. This procedure captures the correlations of the stocks only through their benchmarks. The benchmark-adjusted returns capture the nonzero alpha of the stock relative to the benchmark.

Simulating Buy-and-hold strategy weights

The weights of a buy-and-hold strategy are simulated as follows. In each trial, we randomly select 1000 stocks and assume that the fund chooses stocks from this pool. At time $t = 120$ (which corresponds to 1984), the fund selects stocks and equally weights them. If a stock does not exist, the fund will not hold it. On average, 150 stocks in the pool exist at t=120, a similar number as the number of stocks held by funds in the real data. Next, for each time point $t > 120$, some new stocks in the pool start to exist and some old stocks disappear. For stocks in the pool that disappear, the fund will earn the delisting return and stop holding these stocks. For the new stocks in the pool, the manager will use the proceeds from delisting stocks to buy these stocks, with weights that are random numbers between 0% and 5%. For stocks that exist in the previous period and do not disappear, the fund continues to hold them without changing the holdings, except to reinvest dividends in the same stock. The simulated weights thus contain only past price information. The number of stocks in each subsequent portfolio is between 150 and 200.

The Investment Company Act of 1940 requires that the weight of each stock cannot be larger than 5% without triggering reporting requirements. As the simulation evolves we use the following procedure to adjust the weights. We select the stock with the highest weight and denote this weight by w_1 (by assumption, $w_1 > 5\%$). Next, we decrease the weight of this stock to 5%, and let the weights of lower-ranked stocks increase by $(w_1 - 5\%)/(N - 1)$, where N is the number of stocks in the portfolio. Next, we select the stock with the second highest weight (denote this weight by w_2). If $w_2 > 5\%$, we decrease the weight of this stock to 5% and let the weights of lower-ranked stocks increase by $(w_2 - 5\%)/(N - 2)$ (there are $N - 2$ stocks with lower rank). We repeat this process until all the stocks have weights less than or equal to 5%. The only exception is the rare case when there are less than 20 stocks in the portfolio. In this case, we do not reduce the weights to 5%.

Simulating Momentum strategy weights

Similar to the buy-and-hold strategy, the momentum strategy starts off holding all the stocks in the pool that have non-missing returns at time *t*=120. After the first month, the fund manager rebalances her portfolio. She ranks the stocks by average returns from the preceding 2 to 12 months, and removes 6% of the stocks with the lowest past returns. This is to match the average monthly turnover in the data of 6% per month[2]. The stocks that have been removed are replaced by the stocks with the largest average past returns. The stocks added are weighted in proportion to their average past returns. The momentum portfolios typically contain 150- 200 stocks. Using the bootstrapped returns and strategy weights we estimate the various performance measures and calculate the standard errors and t-statistics in each of 1,000 simulation trials. We have 1,000 point estimates, standard errors, and t-ratios for each case. The Average Measures in the first row are the averages across the 1,000 simulation trials, and proxy for the expected outcomes.

Discussion of Simulation Results

Table A.8 presents simulations where there are no fixed effects in the data generating model. The simulation procedure is the same as before, replacing the stock returns with either the DGTW adjusted returns, the conditional mean adjusted returns, where the conditional mean is $\boldsymbol{\delta}'\mathbf{Z}_t$, or the FM benchmark adjusted return, $m_{t+1}r^i_{t+1}$. The simulations incorporate the variability from estimating the parameters $\boldsymbol{\delta}$ in the CWM the SDF parameters (a,**b**) in the FM, by estimating them in each simulation trial.[3] The key step for

[2] We would expect that the momentum manager may have a higher turnover ratio than an average fund manager. Therefore, we also simulate the momentum strategy with a 10% or 20% turnover ratio and find similar results.

[3] To incorporate the estimation error in the parameters a and **b** we estimate them in each simulation trial based on simulated factors that we draw with each vector of return residuals. The estimated values of a and **b** from the original data serve as the true values to calibrate the simulations, which produces m_{t+1}, the SDF

the simulations in Table A.8 is to set the firm fixed effects equal to zero in the simulated returns. At the same time the "true" slope coefficients are controlled at specific values of nonzero TSA. It is clear that each of the four measures in Table A.8 are close to their corresponding true values of the TSA when there are no fixed effects and thus no AAR in the data. These results are also consistent with the findings of Hjalmarsson (2008, 2010)[4]. Of course, as Panel A shows, in the more realistic case where the data have fixed effects, it is necessary to use a bias adjusted estimator such as Haj10 or DiffIV.

Table A.9 summarizes the results for the simulated momentum and buy-and-hold strategies. The expected performance of Momentum according to the DGTW measure is 7.6% per year and the performance of buy-and-hold is 9.4%. The FM measures are larger than 9% per year for both momentum and buy-and-hold. The CWM does not have an AAR component, but it records a positive performance of 3.5% for the momentum strategy and -1.38% for buy and hold. The difference between a classical measure and its DiffIV or Haj10 estimate is the AAR. The average Diff IV and Haj10 estimators of the TSA are less than ten basis points per year for both strategies in most of the measures. Essentially, no TSA is attributed to either the Momentum or the buy-and-hold strategy. Their measured performance is completely driven by the AAR.[5]

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constructed using the true a and **b** and the original data. We resample the residuals from regressing the SDF adjusted returns, $m_{t+1}r^i_{t+1,}$ on the weights. Using these coefficients and simulated residuals, we construct the SDF adjusted returns in each simulation trial. Final, we multiply the SDF adjusted return in each simulation trial by a factor $m^{\wedge}_{t+1}$ / $m^{*}_{t+1,}$ where $m^{\wedge}_{t+1}$ is the SDF constructed using the estimated a and **b** with the simulated factors, and m^{*}_{t+1} is the SDF constructed using the true a and **b** with the simulated factors. To incorporate estimation error in $\boldsymbol{\delta}$, in each trial, we simulate stock returns by summing conditional mean adjusted returns and $\boldsymbol{\delta}'\mathbf{Z}_t$, where $\boldsymbol{\delta}$ is the estimated parameter from the real data, and $\mathbf{Z}_t$ is the simulated conditioning information based on an AR(1) model also estimated using the real data.

[4] The original CWM suffers a lag stochastic bias from the estimation of $\boldsymbol{\delta}$; thus, we estimate the corresponding Haj10 measure which will not suffer this issue.

[5] It is striking that the AARs in the simulations are so large. We find smaller effects in the mutual fund data. In the mutual fund data we examine averages: either portfolios of funds each month or the estimates for individual funds averaged within groups. One reason these averages show smaller effects is that the CSAs are negatively skewed in a cross-section of funds. We calculate the skewness

With 1000 T-ratios, we can study the distributional properties of the t-statistics for the various performance measures. We rank the 1,000 simulated t-ratios, select the values at the 25-th, 50-th, 950-th and 975-th positions and report them in Table A.9. The distributions of the Diff IV and the Haj10 t-ratios appear slightly more peaked than a normal, with slighly thinner tails, but the critical values are pretty close to the values for the standard normal distribution.

A.7 Performance Attribution

The usual approach in performance attribution is to express funds' returns as a benchmark return plus a security-specific component. The total holdings-based expected return is:

$$E(\mathbf{w'r}) = E(\mathbf{w})'E(\mathbf{r}) + Cov(\mathbf{w'; r}), \qquad (A.\ 15)$$

where $\mathbf{r}$ is the N-vector of returns, $\mathbf{w}$ is the N-vector of portfolio weights and we drop the time subscripts. Suppose we have a benchmark return for each stock so that $\mathbf{r} = \mathbf{r}_B + \mathbf{u}$ with $E(\mathbf{u})=\boldsymbol{\alpha}$. For example with betas and traded factors, $\mathbf{r}_B = \beta\ \mathbf{f}$. Each term in (18) breaks out into two pieces:

$$E(\mathbf{w'r}) = [E(\mathbf{w})'E(r_B) + E(\mathbf{w})'\alpha] + [Cov(\mathbf{w'; u}) + Cov(\mathbf{w'; r_B})]. \quad (A.16)$$

Most of the performance attributions in the literature correspond to parts of Equation (A.16). Denote $E(\mathbf{w})'E(\mathbf{r}_B)$ the "Normal" return, which follows Brinson, Hood and Bebower (BHB, 1986). They use the average weight as a proxy for the policy weight of a

to be -9.62 for the GT measure, -3.51 for DGTW and -6.6 for FM in our sample of funds. The negative skewness in funds' AARs shows up in lower mean values. This is likely exaccerbated by the short life span of many actual funds, whereas in the simulations a single hypothetical fund lives for the whole sample period.

fund. The normal return is a close cousin of the DGTW average style return.[6] In BHB, DGTW and in Table A.10, the normal return is the largest part of the total expected return.

The other three terms in (A.16) are "abnormal" returns. The AAR is E(**w**)'α. This is the expected value of BHB's selection return, as described in the Appendix, and is a component of expected selectivity performance in the measures of Fama (1972), Sharpe (1992), Grinblatt and Titman (1989a), FM and DGTW.

Cov(**w'; r**) has two parts: [Cov(**w'; u**) + Cov(**w'**; $\mathbf{r_B}$)]. The first is Selectivity, which uses information in the weights about the future nonsystematic security returns and the second is Timing, which refers to information about the future benchmark returns. The selectivity component of the TSA is a component of the selectivity measures from Fama (1972), Sharpe (1992), Grinblatt and Titman (1989a), FM and DGTW. The Appendix relates this performance attribution to those of BHB and DGTW in more detail.

Table A.10 presents the attribution of Equation (A.16) for funds' holdings-based returns over the 1980-2012 sample. The benchmark return for each stock, $\mathbf{r}_B$, follows DGTW (1997). We present both the average levels and the cross-sectional variances ($x10^4$) of the components across funds. T-ratios, following DGTW, are from the time-series variances of a monthly portfolio of funds in each group.[7] The units presented are

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[6] If the lagged weight in the DGTW definition of Average Style is orthogonal to future returns, then the expected value of their Average Style is the expected Normal Return. See the Appendix.

[7] For example, the standard error for the estimate of E(w)'E(r) is found as the sample standard error of the mean for the variable $v_t = w_t' r_{t+1} - (w_t - E_t(w))(r_{t+1} - E_{t+1}(r))$, where $E_t(w)$ and $E_{t+1}(r)$ are the recursive sample means as in the Hjalmarsson (2010) estimator. The standard error uses the Newey and West (1987) covariance matrix with 30 lags.

annual percent. US active equity funds are grouped following DGTW as Aggressive Growth (Agg.Grow), Growth (Grow) and All.

The Aggressive Growth funds in Table A.10 earn about 1% more per year than the All funds average. One goal of a performance attribution is to address the question: Why? Table A.10 shows it's not because their normal returns are higher; in fact, they are lower than the All funds average. About half of the Aggressive Growth funds' performance is attributed to AAR and half is TSA. Thus, both long term policy and short term TSA are important for Aggressive Growth performance.

The Average Abnormal return is $E(\mathbf{w})'\boldsymbol{\alpha}$. Its average is 0.52% overall and 1.05% for the Aggressive Growth funds. The AAR captures about 6.20/56.27=11% of the cross-sectional variance of the average returns of all funds. Janke's (1997) analysis suggests that the sum of the Normal return and the expected BHB selectivity (our AAR term) should explain most of the average *and* cross-sectional variation in fund returns. Here the sum of the Normal return and the AAR represents more than 96% of the average returns level and more than 94% of the cross-sectional variance of average returns for all funds.

The AAR is decomposed into the buy-and-hold drift (BH Drift), starting with the funds' initial weights, $E(\mathbf{w}_{BH})'\boldsymbol{\alpha}$ and the Average Abnormal return net of buy-and-hold drift, $E(\mathbf{w})'\boldsymbol{\alpha} - E(\mathbf{w}_{BH})'\boldsymbol{\alpha}$. The passive buy-and-hold drift explains virtually all of the average AAR and almost 85% of its cross-sectional variance. The AAR net of the buy-and-hold drift is negative, but small and insignificant, for each of the fund groups.

The return attribution in Panel A shows that the contribution of TSA to the average returns is only 0.39% per year for all funds and 0.72% for the Aggressive Growth funds. This small fraction is statistically insignificant for the levels in Table 5.

Panel B of Table A.10 presents a performance attribution using weight changes relative to the 12-month lagged weight, as in the GT performance measure. The differenced measure $E(\Delta\mathbf{w}'\mathbf{r})$ is much smaller than the average returns, as most of the average return $E(\mathbf{w'r})$, is common to the recent and one-year lagged weight. The expected $E(\Delta\mathbf{w}'\mathbf{r})$, is 1.32% per year for All funds and 2.55% for the Aggressive Growth funds. The t-ratios are all larger than two. In the earlier 1976-1994 sample, DGTW find the average GT measure to be 1.91% with a t-ratio of 5.19. Fund performance by most measures has weakened in more recent samples. The Normal return analog using weight changes, $E(\Delta\mathbf{w})'E(\mathbf{r}_B)$, is about 0.3% on average, with t-ratios larger than two for 2/3 of the fund groups.

We saw in Table 4 of the main paper that differences in the GT measures across funds mainly reflect TSA. Panel B of Table A.10 shows that TSA also represents the largest share of the expected level of the GT measure for each fund group. Its average is within 0.15% of the total GT measure in each case. According to the GT measure Aggressive Growth funds outperform All funds by 1.2% per year. This is almost fully attributed to TSA.

We use the DGTW benchmark on the returns to break the TSA in the GT measure down into two pieces in the last two rows of the table. Both timing and selection contribute to the TSA, although the selection component is not statistically significant. The AAR components of the GT measures are small and marginally significant. Breaking the AAR in the GT measure down using the buy-and-hold drift, the portion captured by the buy-and-hold drift is also small and insignificant.[8]

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[8] We also examine the impact of buy-and-hold drift in the TSA selection and timing components of the GT

measure. The contribution of buy-and-hold drift is small and we do not set it out separately in the tables.

Table A.1: Correlations of Measures Across Mutual Funds

Correlations between Two Reduced-bias Estimates of Performance:

	GT	DGTW	CWM	FM
Corr(DiffIV,Haj2010)	0.61	0.45	0.85	0.58

Correlations between Classical Measures and Haj10 Measures:

	GT	DGTW	FM
Haj10(GT)	0.57		
Haj10(DGTW)		0.23	
Haj10(FM)			0.17

Correlations between Classical Measures and AAR Measures:

	GT	DGTW	FM
CSA(GT)	0.39		
CSA(DGTW)		0.58	
CSA(FM)			0.87

Correlations between Haj10 Measures and AAR Measures:

	GT	DGTW	FM
CSA(GT)	-0.41		
CSA(DGTW)		-0.56	
CSA(FM)			-0.25

Correlations of Classical Measures Across Models:

	GT	DGTW	FM
GT	1.00	0.30	0.36
DGTW		1.00	0.26
FM			1.00

Correlations of Haj10 Measures Across Models:

	GT	DGTW	FM
GT	1.00	0.29	0.20
DGTW		1.00	0.71
FM			1.00

Correlations of AAR Measures Across Models:

	GT	DGTW	FM
GT	1.00	0.03	0.09
DGTW		1.00	0.22
FM			1.00

Table A.2: Summary Statistics Using Quarterly Data

Panel A: Descriptive statistics at the fund level

	Mean	**Std**	**Max**	**Min**
ρ1	0.83	0.10	1.00	0.03
ρ2	0.69	0.17	1.00	-0.61
ρ3	0.59	0.20	1.00	-0.63
ρ4	0.51	0.22	1.00	-0.63
Error Corr	-0.01	0.03	0.19	-0.38

Panel B: AR coefficients of the weights at the stock level

	Mean	**Std**	**Max**	**Min**
ρ1	0.81	0.08	0.99	0.02
ρ2	0.66	0.12	0.98	-0.22
ρ3	0.54	0.14	0.98	-0.54
ρ4	0.44	0.15	0.98	-0.45

Table A.3A: Performance Measures with and without Carhart Adjustment

DGTW is the holdings-based performance measure from DGTW (1997) and GT is the Grinblatt and Titman (1993) measure. The subscript *DIV* indicates a measure in a model with fixed effects, estimated using the DiffIV bias adjusted method. The Raw measures are without further adjustment, while the Carhart adjusted measures are the intercepts from regressing the monthly performance measures on the four Carhart (1997) factors. AAR is the difference between a classical and a DiffIV. T-ratios are on the second line in parentheses, calculated similar to DGTW (1997) as the time series standard errors of the monthly performance measures for the average taken across the funds in the group. The Index Funds in Panel B are a sample of 201 index funds, 1994-2012. The units are annual percent.

Panel A: 1980-1994

	GT	GT_{DIV}	AAR	DGTW	$DGTW_{DIV}$	AAR
Raw Measures:						
All Active funds	2.08	1.41	0.67	0.40	1.10	-0.70
	(5.89)	(5.02)		(1.76)	(4.89)	
Aggressive Growth	4.06	3.40	0.66	1.15	2.45	-1.30
	(6.97)	(5.36)		(1.66)	(5.48)	
Growth Funds	1.98	1.21	0.77	0.38	1.01	-0.63
	(5.74)	(4.39)		(1.77)	(4.13)	
Carhart Adjusted:						
All Active funds	0.58	0.48	0.10	0.49	0.67	-0.18
	(1.95)	(1.34)		(1.68)	(2.99)	
Aggressive Growth	1.90	2.16	-0.26	1.59	1.98	-0.39
	(3.28)	(2.92)		(2.35)	(4.52)	
Growth Funds	0.44	0.23	0.21	0.43	0.56	-0.13
	(1.48)	(0.61)		(1.31)	(2.34)	

Table A.3A page 2

Panel B: 1980-2012

	GT	GT_{DIV}	AAR	DGTW	$DGTW_{DIV}$	AAR
Raw Measures:						
All Active funds	1.32	1.47	-0.15	0.96	0.66	0.30
	(2.51)	(2.56)		(1.53)	(2.13)	
Aggressive Growth	2.55	3.33	-0.78	0.98	1.62	0.64
	(2.62)	(2.45)		(1.90)	(2.60)	
Growth Funds	1.28	1.34	-0.06	0.32	0.61	0.59
	(2.19)	(2.18)		(1.49)	(1.81)	
Index Funds	0.07	0.07	0.00	0.32	-0.34	0.66
	(0.14)	(1.09)		(1.13)	(-0.68)	
Carhart Adjusted:						
All Active funds	-0.34	0.18	0.52	0.07	0.01	0.06
	(-1.30)	(0.34)		(0.38)	(0.05)	
Aggressive Growth	-0.09	0.99	-1.08	0.69	0.48	0.21
	(-0.17)	(0.79)		(1.58)	(0.91)	
Growth Funds	-0.52	-0.17	-0.35	0.06	-0.11	0.17
	(-1.75)	(-0.28)		(0.29)	(-0.39)	
Index Funds	0.41	1.07	-0.66	0.32	-0.34	0.66
	(0.55)	(1.49)		(1.13)	(-0.68)	

Table A.3B Classical Performance Measures and their TSA and AAR Components in quarterly data

Panel A: 1980-1994

	GT	GT-TSA	GT-AAR	GT-BH	GT-net AAR	DGTW	DGTW-TSA	DGTW-AAR	DGTW-BH	DGTW-net AAR
Raw Measures:										
All	2.26	1.55	0.72	0.66	0.05	0.47	0.60	-0.13	0.12	-0.25
	(5.90)	(4.97)	(2.24)	(2.76)	(0.29)	(2.02)	(1.66)	(-0.40)	(0.36)	(-2.18)
Aggressive growth	4.15	3.07	1.08	0.85	0.23	1.15	1.64	-0.49	-0.09	-0.40
	(6.14)	(5.60)	(1.97)	(2.92)	(0.74)	(1.72)	(2.35)	(-0.57)	(-0.12)	(-1.87)
Growth	2.15	1.41	0.74	0.67	0.07	0.47	0.52	-0.05	0.09	-0.15
	(5.90)	(4.52)	(2.49)	(2.85)	(0.40)	(2.09)	(1.60)	(-0.16)	(0.29)	(-1.13)
Carhart Adjusted:										
All	0.57	0.50	0.07	0.15	-0.08	0.54	0.17	0.36	0.76	-0.39
	(1.65)	(1.36)	(0.18)	(0.74)	(-0.37)	(1.83)	(0.40)	(1.02)	(2.69)	(-2.94)
Aggressive growth	1.75	1.33	0.42	0.42	0.01	1.70	0.91	0.79	1.26	-0.46
	(2.59)	(2.16)	(0.63)	(1.53)	(0.01)	(2.35)	(1.06)	(0.86)	(2.32)	(-1.81)
Growth	0.42	0.37	0.06	0.13	-0.07	0.52	0.11	0.41	0.71	-0.30
	(1.20)	(1.00)	(0.16)	(0.65)	(-0.33)	(1.65)	(0.29)	(1.14)	(2.23)	(-1.95)

Panel B: 1980-2012

	GT	GT-TSA	GT-AAR	GT-BH	GT-net AAR	DGTW	DGTW-TSA	DGTW-AAR	DGTW-BH	DGTW-net AAR
Raw Measures:										
All	1.20	0.82	0.38	0.31	0.06	0.32	-0.23	0.55	0.74	-0.19
	(1.98)	(1.67)	(1.61)	(1.25)	(0.59)	(1.51)	(-0.61)	(1.62)	(2.18)	(-1.86)
Aggressive growth	2.25	1.74	0.50	0.48	0.02	0.90	-0.13	1.03	1.14	-0.11
	(2.14)	(1.83)	(1.48)	(1.99)	(0.09)	(1.75)	(-0.19)	(1.62)	(1.91)	(-0.51)
Growth	1.12	0.68	0.45	0.33	0.11	0.35	-0.29	0.64	0.78	-0.14
	(1.69)	(1.21)	(1.84)	(1.17)	(0.93)	(1.51)	(-0.71)	(1.73)	(2.06)	(-1.08)
Index fund	-0.15	-0.33	0.18	-0.03	0.22	0.42	-1.01	1.42	1.29	0.13
	(-0.26)	(-1.12)	(0.39)	(-0.07)	(1.36)	(1.23)	(-3.27)	(2.87)	(2.83)	(1.46)
Carhart Adjusted:										
All	-0.42	-0.32	-0.11	-0.01	-0.10	0.15	-0.71	0.86	1.23	-0.38
	(-1.31)	(-0.94)	(-0.49)	(-0.07)	(-0.79)	(0.74)	(-2.11)	(2.71)	(5.40)	(-3.06)
Aggressive growth	-0.18	-0.22	0.04	0.28	-0.24	0.79	-0.69	1.48	1.71	-0.23
	(-0.28)	(-0.31)	(0.12)	(1.72)	(-1.13)	(1.68)	(-1.02)	(2.24)	(4.20)	(-0.96)
Growth	-0.62	-0.65	0.03	0.15	-0.11	0.15	-0.80	0.95	1.35	-0.40
	(-1.68)	(-1.76)	(0.15)	(0.79)	(-0.81)	(0.67)	(-2.22)	(2.74)	(5.04)	(-2.53)

Index fund	-0.53	-0.45	-0.08	-0.35	0.27	0.51	-1.21	1.72	1.60	0.12
	(-0.77)	(-1.22)	(-0.14)	(-0.81)	(1.30)	(1.24)	(-3.12)	(2.76)	(2.99)	(1.17)

Table A.4A:

Cross-sections of Holdings-based Performance Measures using DiffIV

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The second column, subscripted with D, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the differenced IV estimator. The third column is the AAR extracted by the fixed effects. The units of the performance measures are percent per year. The sample period is from 1984 to 2012, and the number of funds is 3596. Data for the Wilshire 5000 index fund cover July, 1999 through June, 2012.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	GT	GT_D	AAR
Low	-3.49	-0.05	-3.66
2	-0.72	0.02	-0.92
Median	0.19	0.07	-0.03
4	1.20	0.18	0.81
High	4.19	0.40	3.54
HML	7.69	0.45	7.20
All Index Funds	-0.84	0.09	-1.07

Table A.4A, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	DGTW	$DGTW_D$	AAR
Low	-3.65	-0.09	-3.56
2	-0.80	0.01	-0.80
Median	0.04	0.01	0.03
4	0.82	-0.01	0.84
High	2.97	0.08	2.88
HML	6.61	0.17	6.44
All Index Funds	0.31	0.05	0.26

Panel C: Conditional Weight-based Measure

Fund Quantile:	CWM_D
Low	0.21
2	0.52
Median	0.64
4	1.28
High	2.36
HML	2.16
All Index Funds	-0.15

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	FM	FM_D	AAR
Low	-19.36	-1.55	-17.82
2	-5.29	-1.26	-4.03
Median	-1.30	-0.75	-0.55
4	1.56	-0.43	1.99
High	8.36	0.52	7.84
HML	27.72	2.06	25.66
All Index Funds	-11.53	-1.65	-9.88

Table A.4B: Cross-sections of Holdings-based Performance Measures Using Hjalmarsson (2010) with 29 days returns

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The second column, subscripted with H, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the Hjalmarsson (2010) method. The third column is the AAR extracted by the fixed effects. The units of the performance measures are percent per year. The sample period is from 1980 to 2012, and the number of funds is 3596.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	GT	GT_H	AAR
Low	-3.44	-1.24	-2.41
2	-0.73	-0.57	-0.33
Median	0.20	0.03	0.01
4	1.23	0.79	0.23
High	4.27	3.23	0.79
HML	7.70	4.47	3.19

Table A.4B, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	DGTW	$DGTW_H$	AAR
Low	-5.24	-1.15	-4.09
2	-2.43	-0.87	-1.56
Median	-1.36	-0.78	-0.57
4	-0.25	-0.59	0.35
High	2.38	0.00	2.38
HML	7.62	1.15	6.47

Panel C: Conditional Weight-based Measure

Fund Quantile:	CWM_H
Low	-0.97
2	-0.36
Median	0.06
4	0.40
High	0.99
HML	1.97

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	FM	FM_H	AAR
Low	-18.42	-2.05	-16.38
2	-6.58	-2.08	-4.50
Median	-2.52	-1.60	-0.92
4	0.42	-1.10	1.51
High	7.26	-1.10	8.36
HML	25.68	0.94	24.74

Table A.4C: Cross-sections of Holdings-based Performance Measures Using Hjalmarsson (2010) with quarterly returns

The various performance measures are estimated for each fund in the sample using panel regressions over the full sample period. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The next two columns report estimates for funds sorted on the estimates in the first column. The second column, subscripted with H, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the Hjalmarsson (2010) method. The third column is the AAR extracted by the fixed effects. The units of the performance measures are percent per month. The sample period is from 1980 to 2012, and the number of funds is 3596.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	GT	GT_H	AAR
Low	-3.90	-1.26	-2.85
2	-0.99	-0.75	-0.42
Median	0.00	-0.13	-0.02
4	0.90	0.51	0.18
High	3.65	2.44	0.97
HML	7.55	3.70	3.83

Table A.4C, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	DGTW	$DGTW_H$	AAR
Low	-3.63	-1.68	-1.95
2	-0.81	-1.18	0.37
Median	0.04	-0.77	0.80
4	0.82	-0.57	1.39
High	2.94	-0.14	3.08
HML	6.57	1.54	5.03

Panel C: Conditional Weight-based Measure

Fund Quantile:	CWM_H
Low	-1.11
2	-0.33
Median	-0.02
4	0.26
High	0.68
HML	1.79

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	FM	FM_H	AAR
Low	-18.85	-2.80	-16.06
2	-5.46	-2.91	-2.56
Median	-1.50	-2.23	0.73
4	1.35	-1.53	2.88
High	8.05	-1.42	9.47
HML	26.90	1.38	25.53
All Index Funds	-11.73	-2.19	-9.54

Table A.4D: Cross-sections of Holdings-based Performance Measures Using Hjalmarsson (2010) with cash holdings included

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The second column, subscripted with H, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the Hjalmarsson (2010) method. The third column is the AAR. The units of the performance measures are percent per year. The sample period is from 1980 to 2012, and the number of funds is 3596.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	GT	GT_H	AAR
Low	-3.42	-1.03	-2.60
2	-0.68	-0.57	-0.29
Median	0.21	0.02	0.04
4	1.20	0.75	0.24
High	4.39	3.20	0.92
HML	7.81	4.23	3.52

Table A.4D, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	**DGTW**	**$DGTW_H$**	**AAR**
Low	-3.54	-1.35	-2.19
2	-0.77	-0.99	0.22
Median	0.03	-0.67	0.71
4	0.79	-0.60	1.39
High	2.86	-0.01	2.87
HML	6.40	1.34	5.06

Panel C: Conditional Weight-based Measure

Fund Quantile:	**CWM_H**
Low	-0.88
2	-0.19
Median	0.08
4	0.48
High	1.00
HML	1.89

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	**FM**	**FM_H**	**AAR**
Low	-18.63	-2.05	-16.57
2	-5.13	-2.39	-2.74
Median	-1.27	-1.60	0.33
4	1.48	-0.87	2.35
High	8.09	-1.20	9.29
HML	26.72	0.85	25.87

Table A.4E: Cross-sections of Holdings-based Performance Measures Using Hjalmarsson (2010) with demeaning based on return-months where a stock is not held by the fund

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The second column, subscripted with H, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the Hjalmarsson (2010) method. The AAR in the third column is the difference between the first two columns. The units of the performance measures are percent per year. The sample period is from 1980 to 2012, and the number of funds is 3596.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	GT	GT_H	AAR
Low	-3.49	-0.78	-2.92
2	-0.72	-0.33	-0.56
Median	0.19	0.25	-0.21
4	1.20	1.04	-0.05
High	4.19	3.31	0.64
HML	7.69	4.09	3.56

Table A.4E, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	DGTW	$DGTW_H$	AAR
Low	-3.65	-1.56	-2.09
2	-0.80	-1.03	0.23
Median	0.04	-0.60	0.63
4	0.82	-0.44	1.27
High	2.97	0.32	2.65
HML	6.61	1.88	4.73

Panel C: Conditional Weight-based Measure

Fund Quantile:	CWM_H
Low	-1.76
2	-1.22
Median	-0.83
4	-0.50
High	-0.01
HML	1.75

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	FM	FM_H	AAR
Low	-19.36	-2.29	-17.07
2	-5.29	-2.46	-2.83
Median	-1.30	-2.03	0.73
4	1.56	-1.40	2.96
High	8.36	-0.79	9.15
HML	27.72	1.50	26.22

Table A.4F: Cross-sections of Holdings-based Performance Measures Using Hjalmarsson (2010) where demeaning is based on return-months where a stock is held by a fund

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The second column, subscripted with H, indicates a within estimator that includes stock fixed effects in the panel regression, estimated using the Hjalmarsson (2010) method. The third column is the AAR, the difference between the first two columns. The units of the performance measures are percent per year. The sample period is from 1980 to 2012, and the number of funds is 3596.

Panel A: Grinblatt Titman Portfolio Change Measure

Fund Quantile:	**GT**	**GT_H**	**AAR**
Low	-3.49	-0.95	-2.75
2	-0.72	-0.51	-0.38
Median	0.19	0.06	-0.03
4	1.20	0.83	0.16
High	4.19	3.14	0.81
HML	7.69	4.10	3.55

Table A.4F, page 2

Panel B: DGTW Characteristic Selectivity Measure

Fund Quantile:	DGTW	$DGTW_H$	AAR
Low	-3.65	-1.52	-2.12
2	-0.80	-1.09	0.30
Median	0.04	-0.74	0.78
4	0.82	-0.59	1.42
High	2.97	-0.09	3.05
HML	6.61	1.44	5.17

Panel C: Conditional Weight-based Measure

Fund Quantile:	CWM_H
Low	-1.00
2	-0.05
Median	0.05
4	0.37
High	0.63
HML	1.63

Panel D: Ferson and Mo Stochastic Discount Factor Measure

Fund Quantile:	FM	FM_H	AAR
Low	-19.36	-1.70	-17.66
2	-5.29	-1.81	-3.48
Median	-1.30	-1.43	0.13
4	1.56	-1.31	2.87
High	8.36	-1.38	9.74
HML	27.72	0.32	27.40

Table A.5: Fund Flows, AAR Effects and Characteristics

Annual new money flows are regressed on various performance measures over the past year. The AAR, AAR buy-and-hold and AAR excess buy-and-hold are estimated as in Table 3 and are used to form ranked performance measures within each of five performance quintiles, as in Sirri and Tufano (1998). In panel C various fund characteristics are included as control variables. The sample period is 1980-2012. DGTW is the performance measure from DGTW (1997) and GT is the Grinblatt and Titman (1993) measure, FM is the Ferson and Mo (2016) measure. TBH is a measure of the tendency towards buy-and-hold, measured as the average absolute difference between the funds' portfolio weights and what they would have been had the fund had the same holdings as they did 12 months ago. The monthly measure is averaged over the past year to reduce noise. LM is the lagged momentum measure of Daniel, Titman and Wermers (1995), capturing the relation between a fund's deviation from buy-and-hold weights and the average returns on the stocks over the last 12 months. Div Yield is a fund portfolio weighted average of the dividend per share of a stock during the past 12 months divided by its price per share. HLDSize is the portfolio weighted market capitalizations of the stocks held by the fund. Aggressive is a dummy variable indicating an aggressive growth style fund. Log(TNA) is the log of total net assets, Fund Age is the log of number of month from fund's first offering date, Exp is the expense ratio, turnover is the reported annual turnover, style flow is the aggregate flows of funds within the same style, and return std and autocorrelations are standard deviation and autocorrelation of the fund returns. T-ratios are on the second line in parentheses, calculated by clustering by time and using Newey-West (1987) covariance terms to 30 lags. The units of the flows are annual percent.

Panel A: Classical measures

Measure	**GT**	**DGTW**	**FM**
Const	0.20	2.51	2.45
	(0.45)	(1.29)	(2.16)
measure Bottom	0.38	-16.61	**-8.49**
	(0.12)	(-1.64)	**(-2.18)**
measure 2nd Quantile	4.00	**10.08**	-2.36
	(0.93)	**(6.56)**	(-0.55)
measure 3rd Quantile	7.33	3.84	2.13
	(0.68)	(1.29)	(0.66)
measure 4th Quantile	-8.34	**-6.26**	**3.51**
	(-1.10)	**(-2.71)**	**(2.91)**
measure top	1.21	**5.68**	2.24
	(1.38)	**(2.29)**	(1.26)

Panel B1: AAR

Measure	GT	DGTW	FM
Const	1.37	1.38	1.39
	(3.62)	(3.61)	(3.65)
CSA Bottom	**-10.30**	**-9.71**	**-6.37**
	(-4.91)	**(-3.92)**	**(-2.19)**
CSA 2nd Quantile	**11.95**	**7.96**	**4.23**
	(2.63)	**(4.58)**	**(5.37)**
CSA 3rd Quantile	-2.77	**2.75**	-1.94
	(-0.51)	**(2.14)**	(-0.71)
CSA 4th Quantile	-3.32	**-6.95**	1.08
	(-1.72)	**(-3.56)**	(0.87)
CSA top	-0.20	**4.08**	-1.25
	(-0.20)	**(4.86)**	(-1.23)

Panel B2: BH drift

Measure	GT	DGTW	FM
Const	1.38	1.40	1.40
	(3.61)	(3.64)	(3.59)
CSA Bottom	-3.27	**-9.49**	-1.73
	(-0.73)	**(-3.69)**	(-0.35)
CSA 2nd Quantile	0.38	**11.48**	-3.52
	(0.09)	**(4.66)**	(-0.60)
CSA 3rd Quantile	-1.66	**-5.80**	0.84
	(-1.41)	**(-3.64)**	(0.25)
CSA 4th Quantile	1.29	-1.06	-0.96
	(1.05)	(-0.81)	(-0.54)
CSA top	**-2.95**	0.29	**2.38**
	(-2.27)	(0.22)	**(3.39)**

Panel B3: AAR net BH

Measure	**GT**	**DGTW**	**FM**
Const	1.37	1.38	1.39
	(3.62)	(3.64)	(3.66)
CSA Bottom	**-10.21**	**-8.99**	**-9.19**
	(-4.89)	**(-3.68)**	**(-3.83)**
CSA 2nd Quantile	**10.90**	**6.36**	**6.45**
	(5.26)	**(4.81)**	**(3.38)**
CSA 3rd Quantile	-0.77	**5.78**	**4.53**
	(-0.39)	**(4.07)**	**(2.26)**
CSA 4th Quantile	**-4.68**	**-10.16**	**-7.04**
	(-2.39)	**(-4.41)**	**(-3.36)**
CSA top	0.07	**3.76**	1.07
	(0.07)	**(4.51)**	(0.89)

Panel C1: AAR Effects with Fund Characteristics Included

Measure	**GT**	**DGTW**	**FM**
Const	4.03	4.13	4.23
	(5.70)	(5.80)	(5.73)
Fund Age	-0.93	-0.95	-0.97
	(-4.62)	(-4.67)	(-4.80)
Fees	1.80	1.77	1.71
	(0.91)	(0.90)	(0.86)
Log(TNA)	0.39	0.39	0.39
	(2.52)	(2.51)	(2.51)
Style flow	1.36	1.36	1.36
	(25.51)	(25.54)	(25.57)
Return std	-1.35	-1.37	-1.39
	(-1.91)	(-1.94)	(-1.96)
Autocorrelation	0.19	0.20	0.20
	(1.21)	(1.22)	(1.23)
Turnover	0.91	0.91	0.91
	(6.35)	(6.36)	(6.35)
Aggressive	8.26	6.16	6.95
	(0.41)	(0.31)	(0.35)
Div yield	-1.30	-1.39	-1.38
	(-1.77)	(-1.95)	(-1.89)
HLDSize	-8.69	-8.50	-8.47
	(-3.45)	(-3.39)	(-3.37)

BHL	0.04	0.08	0.11
	(0.06)	(0.12)	(0.16)
LM	-6.81	-6.80	-6.80
	(-1.89)	(-1.89)	(-1.88)
CSA Bottom	**-11.14**	**-11.25**	**-8.60**
	(-5.15)	**(-4.38)**	**(-4.18)**
CSA 2nd Quantile	7.65	**5.28**	2.07
	(1.64)	**(2.20)**	(1.84)
CSA 3rd Quantile	-2.28	1.32	-1.40
	(-0.47)	(1.06)	(-0.53)
CSA 4th Quantile	-0.11	**-3.48**	1.48
	(-0.05)	**(-2.17)**	(1.07)
CSA top	-1.36	**4.80**	2.00
	(-1.44)	**(3.74)**	(1.65)

Panel C2: BH drift with Fund Characteristics Included

Measure	**GT**	**DGTW**	**FM**
Const	4.10	4.12	4.07
	(5.74)	(5.79)	(5.82)
Fund Age	-0.95	-0.95	-0.94
	(-4.79)	(-4.75)	(-4.77)
Fees	1.78	1.81	1.80
	(0.90)	(0.91)	(0.90)
Log(TNA)	0.39	0.39	0.39
	(2.54)	(2.51)	(2.54)
Style flow	1.36	1.36	1.36
	(25.57)	(25.54)	(25.55)
Return std	-1.33	-1.33	-1.36
	(-1.89)	(-1.89)	(-1.92)
Autocorrelation	0.19	0.20	0.19
	(1.22)	(1.22)	(1.21)
Turnover	0.91	0.91	0.91
	(6.38)	(6.40)	(6.40)
Aggressive	7.70	5.75	7.14
	(0.38)	(0.29)	(0.36)
Div yield	-1.36	-1.37	-1.34
	(-1.83)	(-1.89)	(-1.80)
HLDSize	-8.54	-8.52	-8.57
	(-3.32)	(-3.37)	(-3.33)
BHL	0.05	0.07	0.05
	(0.07)	(0.11)	(0.08)
LM	-6.77	-6.79	-6.76
	(-1.88)	(-1.89)	(-1.89)

CSA Bottom	-6.87	**-11.04**	-5.28
	(-1.93)	**(-4.33)**	(-1.36)
CSA 2nd Quantile	0.82	**7.42**	-1.83
	(0.23)	**(2.62)**	(-0.34)
CSA 3rd Quantile	-0.73	**-3.87**	-0.04
	(-0.79)	**(-2.46)**	(-0.01)
CSA 4th Quantile	0.17	0.55	-1.82
	(0.19)	(0.47)	(-1.17)
CSA top	-2.26	0.34	**3.74**
	(-1.91)	(0.30)	**(2.33)**

Panel C3: AAR net BH with Fund Characteristics Included

Measure	GT	DGTW	FM
Const	4.03	4.08	4.15
	(5.75)	(5.80)	(5.67)
Fund Age	-0.93	-0.94	-0.96
	(-4.66)	(-4.75)	(-4.76)
Fees	1.82	1.79	1.74
	(0.91)	(0.90)	(0.88)
Log(TNA)	0.39	0.39	0.39
	(2.52)	(2.52)	(2.50)
Style flow	1.36	1.36	1.36
	(25.52)	(25.54)	(25.55)
Return std	-1.35	-1.35	-1.36
	(-1.92)	(-1.91)	(-1.93)
Autocorrelation	0.19	0.19	0.20
	(1.21)	(1.22)	(1.22)
Turnover	0.91	0.91	0.91
	(6.35)	(6.36)	(6.37)
Aggressive	8.10	6.18	6.37
	(0.41)	(0.31)	(0.32)
Div yield	-1.30	-1.37	-1.35
	(-1.77)	(-1.90)	(-1.86)
HLDSize	-8.69	-8.54	-8.52
	(-3.46)	(-3.41)	(-3.42)
BHL	0.04	0.07	0.09
	(0.06)	(0.11)	(0.13)
LM	-6.81	-6.82	-6.80
	(-1.89)	(-1.89)	(-1.88)
CSA Bottom	**-11.12**	**-10.35**	**-10.89**
	(-5.35)	**(-4.27)**	**(-4.51)**
CSA 2nd Quantile	**7.41**	**3.75**	**4.69**

	(3.08)	**(2.05)**	**(2.55)**
CSA 3rd Quantile	**-2.04**	**3.18**	0.96
	(-1.97)	**(3.02)**	(0.69)
CSA 4th Quantile	-0.13	**-5.47**	-1.77
	(-0.07)	**(-2.57)**	(-0.75)
CSA top	-1.22	**4.96**	2.37
	(-0.88)	**(4.17)**	(1.53)

Table A6.A: Fund Characteristics and Performance

Components of holdings-based performance measures are regressed in a panel on lagged fund characteristics. TSA is estimated using the Haj10 estimator. DGTW is the performance measure from DGTW (1997) and GT is the Grinblatt and Titman (1993) measure, FM is the Ferson and Mo (2016) measure. TBH is a measure of the tendency towards buy-and-hold, measured as the average absolute difference between the funds' portfolio weights and what they would have been had the fund had the same holdings as they did 12 months ago, measured as a decimal fraction. The monthly measure is averaged over the past year to reduce noise. LM is the lagged momentum measure of Daniel, Titman and Wermers (1995), the relation between a fund's deviation from buy-and-hold weights (decimal fractions) and the average returns on the stocks over the last 12 months (in percent). Div Yield is a fund portfolio weighted average of the dividend per share of a stock during the past 12 months divided by its price per share, in decimal fraction. Aggressive is a dummy variable indicating an aggressive growth style fund. Log(TNA) is the log of fund total net assets in millions of dollars, Exp is the expense ratio in percent, Fund Age is the number of month from fund's first offering date divided by 100, and turnover is the reported annual turnover in decimal fraction. T-ratios are on the second line, calculated by clustering by time and using Newey-West (1987) covariance terms to 30 lags. The units of the performance measures is annual percent.

	GT	DGTW	FM	GT TSA	DGTW TSA	FM TSA	CWM TSA
Const	18.26	-0.79	-20.00	**28.60**	-2.02	-14.37	18.33
	(1.49)	(-0.26)	(-0.60)	**(2.20)**	(-0.42)	(-1.14)	(1.41)
Fund age	-0.77	-0.01	-0.43	-1.17	0.50	2.70	-0.29
	(-0.87)	(-0.01)	(-0.19)	(-1.37)	(0.91)	(1.35)	(-0.13)
Turn ratio	**-1.93**	0.48	0.11	**-2.04**	**-1.58**	**-4.33**	-2.01
	(-3.31)	(0.79)	(0.04)	**(-2.16)**	**(-2.90)**	**(-2.86)**	(-1.87)
Aggressive	**9.82**	4.43	12.50	9.33	1.49	2.85	3.93
	(3.10)	(1.83)	(0.91)	(3.04)	(0.48)	(0.53)	(0.74)
Expense ratio	0.23	-1.26	-0.50	0.48	-0.92	-1.43	1.69
	(0.23)	(-1.50)	(-0.09)	(0.32)	(-0.72)	(-0.67)	(0.73)
log(TNA)	0.88	-0.64	**-6.07**	0.58	-0.28	-0.50	0.41
	(1.44)	(-1.48)	**(-2.68)**	(0.90)	(-0.47)	(-0.33)	(0.20)
Div yield	3.99	**5.46**	**37.12**	0.25	0.24	**0.82**	0.78
	(1.71)	**(6.23)**	**(2.80)**	(0.99)	(1.99)	**(3.08)**	(1.68)
log(Mkt_cap)	-0.25	0.05	-0.48	-0.19	0.07	0.25	-0.62
	(-1.19)	(0.34)	(-0.53)	(-0.80)	(0.29)	(0.42)	(-0.77)
TBH	**-27.13**	-0.13	17.64	**-35.47**	**-11.39**	-21.65	**-25.60**
	(-2.57)	(-0.05)	(0.38)	**(-2.88)**	**(-2.91)**	(-1.31)	**(-2.79)**
LM	10.64	1.01	3.46	13.68	1.80	-4.96	9.70
	(1.53)	(0.27)	(0.41)	(1.99)	(0.51)	(-0.65)	(1.55)

Table A.6B: Fund Characteristics and Components of Performance – Quarterly measures

The components of performance in classical performance measures are regressed in a panel on lagged fund characteristics This table shows results for the AAR measures. DGTW is the performance measure from DGTW (1997) and GT is the Grinblatt and Titman (1993) measure, FM is the Ferson and Mo (2016) measure. TBH is a measure of the tendency towards buy-and-hold, measured as the average absolute difference between the funds' portfolio weights and what they would have been had the fund had the same holdings as they did 12 months ago. The monthly measure is averaged over the past year to reduce noise. LM is the lagged momentum measure of Daniel, Titman and Wermers (1995), capturing the relation between a fund's deviation from buy-and-hold weights and the average returns on the stocks over the last 12 months. Div Yield is a fund portfolio weighted average of the dividend per share of a stock during the past 12 months divided by its price per share. HLDSize is the portfolio weighted market capitalizations of the stocks held by the fund. Aggressive is a dummy variable indicating an aggressive growth style fund. Log(TNA) is the log of fund total net assets, Exp is the expense ratio, Fund Age is the number of month from fund's first offering date, and turnover is the reported annual turnover. T-ratios are on the second line, calculated by clustering by time and using Newey-West (1987) covariance terms to 10 lags. The units of the Average Alpha Effects are annual percent.

Panel A: 1980-1994

	GT	DGTW	FM
Const	1.94	-19.90	-132.52
	(0.08)	(-0.98)	(-2.38)
Fund age	0.09	-1.57	-8.10
	(0.10)	(-1.21)	(-1.67)
Turn ratio	1.50	0.42	-18.46
	(0.48)	(0.11)	(-0.72)
Aggressive_ind	-2.27	-8.77	-20.22
	(-0.35)	(-0.44)	(-0.53)
Expense ratio	-1.75	6.10	25.36
	(-0.44)	(0.84)	(0.75)
log(TNA)	-0.84	0.97	-13.70
	(-0.76)	(0.39)	(-1.50)
Div yield	**1.05**	0.76	**8.22**
	(5.35)	(1.75)	**(2.05)**
log(Mkt_cap)	-0.95	-1.42	-6.70
	(-1.36)	(-0.94)	(-0.83)
TBH	6.12	**40.55**	**270.46**
	(0.30)	**(3.37)**	**(3.16)**
LM	-5.51	-1.13	29.57
	(-1.51)	(-0.23)	(1.76)

Panel B: 1980-2012

	GT	**DGTW**	**FM**
Const	0.80	8.65	52.48
	(0.08)	(0.51)	(0.58)
Fund age	2.44	-1.29	-7.42
	(1.30)	(-0.74)	(-0.75)
Turn ratio	-1.09	3.42	8.09
	(-0.59)	(1.91)	(1.06)
Aggressive_ind	-3.81	7.34	14.49
	(-1.28)	(0.68)	(0.36)
Expense ratio	-0.04	-0.70	10.35
	(-0.02)	(-0.16)	(0.53)
log(TNA)	0.13	-2.49	**-16.77**
	(0.19)	(-1.27)	**(-2.44)**
Div yield	**6.29**	**7.77**	**83.33**
	(2.27)	**(2.20)**	**(2.50)**
log(Mkt_cap)	-0.53	0.62	-3.64
	(-1.39)	(0.76)	(-0.79)
TBH	1.05	**29.87**	62.76
	(0.12)	**(2.35)**	(0.54)
LM	**-11.60**	-1.80	24.68
	(-3.64)	(-0.73)	(2.83)

Table A.6C: Fund Characteristics and Average Alpha Effects – BH drift

The components of classical performance measures are regressed in a panel on lagged fund characteristics. This table summarizes results for the buy and hold drift. DGTW is the performance measure from DGTW (1997) and GT is the Grinblatt and Titman (1993) measure, FM is the Ferson and Mo (2016) measure. TBH is a measure of the tendency towards buy-and-hold, measured as the average absolute difference between the funds' portfolio weights and what they would have been had the fund had the same holdings as they did 12 months ago. The monthly measure is averaged over the past year to reduce noise. LM is the lagged momentum measure of Daniel, Titman and Wermers (1995), capturing the relation between a fund's deviation from buy-and-hold weights and the average returns on the stocks over the last 12 months. Div Yield is a fund portfolio weighted average of the dividend per share of a stock during the past 12 months divided by its price per share. HLDSize is the portfolio weighted market capitalizations of the stocks held by the fund. Aggressive is a dummy variable indicating an aggressive growth style fund. Log(TNA) is the log of fund total net assets, Exp is the expense ratio, Fund Age is the number of month from fund's first offering date, and turnover is the reported annual turnover. T-ratios are on the second line, calculated by clustering by time and using Newey-West (1987) covariance terms to 10 lags. The units of the Average Alpha Effects are annual percent.

Panel A: 1980-1994

	GT	DGTW	FM
Const	3.78	-3.58	-24.25
	(0.86)	(-0.76)	(-1.28)
Fund age	0.08	1.02	-0.46
	(0.58)	(2.34)	(-0.28)
Turn ratio	0.85	2.73	5.07
	(1.57)	(1.87)	(0.71)
Aggressive_ind	1.20	-1.64	-5.25
	(1.47)	(-0.31)	(-0.51)
Expense ratio	-2.89	-0.57	6.03
	(-3.61)	(-0.22)	(0.54)
log(TNA)	-0.40	0.20	-5.12
	(-0.97)	(0.20)	(-1.70)
Div yield	0.22	-0.06	1.68
	(3.75)	(-0.66)	(1.42)
log(Mkt_cap)	-0.03	-0.38	-3.07
	(-0.16)	(-0.61)	(-1.17)
TBH	0.40	**14.83**	**104.81**
	(0.12)	**(8.06)**	**(5.39)**
LM	0.14	-0.21	9.41
	(0.20)	(-0.13)	(1.61)

Panel B: 1980-2012

	GT	DGTW	FM
Const	7.81	-5.76	-5.99
	(1.52)	(-1.86)	(-1.22)
Fund age	-0.33	0.02	0.16
	(-1.31)	(0.05)	(0.23)
Turn ratio	0.10	-0.25	0.02
	(0.33)	(-1.03)	(0.06)
Aggressive_ind	-2.69	0.95	4.05
	(-2.22)	(0.91)	(1.49)
Expense ratio	0.47	0.42	0.42
	(1.01)	(0.86)	(0.44)
log(TNA)	-0.07	0.29	0.97
	(-0.28)	(0.78)	(2.93)
Div yield	0.02	0.06	0.25
	(0.42)	(1.44)	(3.00)
log(Mkt_cap)	-0.06	-0.04	-0.61
	(-0.41)	(-0.25)	(-2.07)
TBH	-5.79	4.25	0.79
	(-1.40)	(1.22)	(0.16)
LM	-3.91	-2.18	-0.31
	(-3.81)	(-4.39)	(-0.47)

Table A.7A: Estimates of Holdings-based Performance Measures sorted by fund-Characteristics using DiffIV Estimation

The funds are sorted by return-gap, R-square, active weight and volatility of returns in quantiles. Eight weight-based measures are calculated, and T-statistics are estimated. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, and FM is the Ferson and Mo SDF-based total alpha measure and CWM is the conditional weight based measure, which is estimated using the panel regression (11). For each measure the second column, subscripted with D, indicates a difference IV estimator that includes stock fixed effects in the panel regression.

Panel A: Return-gap (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_D	$GT-GT_D$	$DGTW-DGTW_D$	$FM-FM_D$
High	2.37	0.45	1.69	2.54	2.18	0.45	0.68
	(2.74)	(1.22)	(0.53)	(3.11)	(2.50)	(1.30)	(0.23)
2	1.50	0.51	1.70	1.67	1.43	0.55	1.25
	(2.60)	(2.05)	(0.53)	(3.43)	(2.27)	(2.24)	(0.41)
3	1.02	0.29	1.43	1.21	0.84	0.26	1.47
	(2.05)	(1.48)	(0.45)	(2.52)	(1.58)	(1.31)	(0.49)
4	0.96	0.51	1.29	1.16	1.25	0.75	1.52
	(1.94)	(1.65)	(0.40)	(2.61)	(2.19)	(1.98)	(0.49)
Low	1.38	0.18	0.85	1.61	1.28	0.19	0.95
	(2.45)	(0.85)	(0.27)	(2.97)	(2.09)	(0.78)	(0.32)
Low-High	-0.98	-0.38	-0.70	-0.91	-0.91	-0.27	0.28
	(-2.45)	(-1.36)	(-1.13)	(-2.39)	(-2.21)	(-0.94)	(0.61)

Panel B: R-square (1999-2012)

Fund Quantile	GT	DGTW	FM	CWM_D	$GT-GT_D$	$DGTW-DGTW_D$	$FM-FM_D$
Low	0.64	0.96	-0.65	0.92	0.40	0.91	0.36
	(0.92)	(1.88)	(-0.11)	(1.70)	(0.53)	(1.83)	(0.06)
2	-0.52	0.80	-1.52	0.40	-0.75	0.74	0.80
	(-0.68)	(1.41)	(-0.26)	(0.91)	(-0.84)	(1.46)	(0.14)
3	-0.77	0.24	-2.75	0.67	-0.97	0.17	-0.34
	(-1.01)	(0.46)	(-0.48)	(1.12)	(-1.05)	(0.33)	(-0.06)
4	-1.04	0.02	-3.46	0.66	-1.30	-0.07	-0.82
	(-1.37)	(0.03)	(-0.62)	(1.19)	(-1.40)	(-0.13)	(-0.14)
High	-0.87	0.01	-4.22	0.60	-1.09	-0.08	-2.29
	(-1.43)	(0.04)	(-0.74)	(1.11)	(-1.42)	(-0.21)	(-0.39)
High-Low	-1.50	-0.94	-3.58	-0.32	-1.49	-0.99	-2.66
	(-2.47)	(-1.84)	(-3.28)	(-0.91)	(-2.11)	(-1.88)	(-2.33)

Panel C: Active weight (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_D	$GT-GT_D$	$DGTW-DGTW_D$	$FM-FM_D$
Low	0.94	-0.14	0.24	1.36	0.74	-0.17	0.40
	(1.51)	(-0.73)	(0.08)	(2.38)	(1.15)	(-0.83)	(0.13)
2	0.78	0.24	0.71	1.50	0.97	0.35	0.84
	(1.57)	(1.09)	(0.22)	(2.61)	(1.73)	(1.37)	(0.27)
3	1.25	0.23	0.95	1.44	1.14	0.28	0.98
	(2.49)	(1.09)	(0.30)	(2.61)	(1.97)	(1.17)	(0.32)
4	1.13	0.38	1.22	1.41	0.77	0.33	1.46
	(2.06)	(1.43)	(0.38)	(2.10)	(1.31)	(1.21)	(0.48)
High	1.69	0.75	2.07	1.55	1.56	0.82	1.53
	(3.23)	(2.00)	(0.63)	(2.97)	(2.86)	(2.07)	(0.49)
High-Low	0.75	0.89	1.82	0.19	0.82	0.98	1.13
	(2.06)	(2.95)	(2.49)	(0.65)	(2.33)	(3.14)	(1.83)

Panel D: Return volatility (1999-2012)

Fund Quantile	GT	DGTW	FM	CWM_D	$GT-GT_D$	$DGTW-DGTW_D$	$FM-FM_D$
Low	0.35	0.42	-1.53	0.64	0.16	0.38	-0.52
	(0.75)	(0.88)	(-0.28)	(1.47)	(0.32)	(0.79)	(-0.09)
2	-0.45	0.40	-2.33	0.47	-0.59	0.39	-0.69
	(-0.86)	(0.97)	(-0.43)	(1.00)	(-0.98)	(0.93)	(-0.13)
3	-0.54	0.28	-3.16	0.66	-1.01	0.19	-1.27
	(-0.80)	(0.78)	(-0.55)	(1.25)	(-1.21)	(0.48)	(-0.22)
4	-0.82	0.54	-2.96	0.80	-0.98	0.45	-0.50
	(-0.94)	(0.86)	(-0.50)	(1.24)	(-0.96)	(0.83)	(-0.08)
High	-1.15	0.35	-2.68	0.64	-1.34	0.23	0.68
	(-1.09)	(0.26)	(-0.42)	(1.03)	(-1.09)	(0.19)	(0.10)
High-Low	-1.50	-0.06	-1.15	-0.01	-1.51	-0.14	1.20
	(-1.60)	(-0.04)	(-0.45)	(-0.02)	(-1.44)	(-0.09)	(0.39)

Table A.7B: Estimates of Holdings-based Performance Measures sorted by fund-Characteristics Using Hjalmarsson (2010) Estimation

The various performance measures are estimated for each fund in the sample using panel regressions. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, FM is the Ferson and Mo SDF-based measure and CWM is the conditional weight based measure. Funds are sorted into five groups on the basis of the original measures, shown in the first column. The third quintile is denoted Median. The second column, subscripted with H, indicates an average of the estimates for the funds in each original measure quintile, including stock fixed effects in the panel regression and using the Hjalmarsson (2010) method. This captures the time series ability (TSA). The third column is the difference between the first two columns, and captures the cross-sectional ability (CSA). The CSA is decomposed into the buy-and-hold drift (BH effect) and the CSA in excess of buy-and-hold (CSA-BH). The units of the performance measures are percent per year. HML is the difference between the top and bottom quintile measures. The sample period is from 1980 to 2012, and the number of active funds is 3596.

The funds are sorted by return-gap, R-square, active weight and volatility of returns in quantiles. Eight weight-based measures are calculated, and T-statistics are estimated. GT is the portfolio change measure, DGTW is the DGTW characteristic selectivity measure, and FM is the Ferson and Mo SDF-based total alpha measure and CWM is the conditional weight based measure, which is estimated using the panel regression (11). For each measure the second column, subscripted with H, indicates a Hajmarlsson (2010) estimator that includes stock fixed effects in the panel regression. Portfolio weighted size is the fund portfolio weighted market capitalization. Rank gap and Backwards return gap are window dressing measures, which are defined following Agarwal, Gay and Ling (2014).

Panel A: Return-gap (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	GT-GT_H	DGTW-$DGTW_H$	FM-FM_H
High	2.37	0.45	1.69	1.32	0.32	0.49	2.39
	(2.74)	(1.22)	(0.53)	(1.37)	(1.12)	(1.07)	(0.89)
2	1.50	0.51	1.70	0.99	0.41	0.70	2.20
	(2.60)	(2.05)	(0.53)	(1.19)	(1.63)	(1.92)	(0.82)
3	1.02	0.29	1.43	0.75	0.34	0.74	2.28
	(2.05)	(1.48)	(0.45)	(0.98)	(1.91)	(2.15)	(0.86)
4	0.96	0.51	1.29	0.72	0.14	0.90	2.19
	(1.94)	(1.65)	(0.40)	(0.87)	(0.75)	(2.34)	(0.81)
Low	1.38	0.18	0.85	1.03	0.36	0.48	1.78
	(2.45)	(0.85)	(0.27)	(1.15)	(1.34)	(1.32)	(0.67)
Low-High	-0.98	-0.38	-0.70	-0.28	0.04	0.00	-0.61
	(-2.45)	(-1.36)	(-1.13)	(-0.89)	(0.22)	(-0.01)	(-1.41)

Panel B: R-square (1999-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	GT-GT_H	DGTW-$DGTW_H$	FM-FM_H
Low	0.64	0.96	-0.65	0.12	0.29	1.80	1.57
	(0.92)	(1.88)	(-0.11)	(0.10)	(0.91)	(3.32)	(0.31)
2	-0.52	0.80	-1.52	-0.40	-0.09	2.41	2.19
	(-0.68)	(1.41)	(-0.26)	(-0.37)	(-0.16)	(2.93)	(0.39)
3	-0.77	0.24	-2.75	-0.09	-0.82	1.67	1.58
	(-1.01)	(0.46)	(-0.48)	(-0.10)	(-0.94)	(2.49)	(0.28)
4	-1.04	0.02	-3.46	-0.03	-0.98	1.56	0.93
	(-1.37)	(0.03)	(-0.62)	(-0.04)	(-1.03)	(2.37)	(0.17)
High	-0.87	0.01	-4.22	-0.26	-0.62	1.44	-0.61
	(-1.43)	(0.04)	(-0.74)	(-0.36)	(-0.87)	(2.27)	(-0.11)
High-Low	-1.50	-0.94	-3.58	-0.38	-0.91	-0.36	-2.18
	(-2.47)	(-1.84)	(-3.28)	(-0.54)	(-1.34)	(-0.83)	(-1.80)

Panel C: Active weight (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	GT-GT_H	DGTW-$DGTW_H$	FM-FM_H
Low	0.94	-0.14	0.24	0.67	0.10	0.40	1.17
	(1.51)	(-0.73)	(0.08)	(0.49)	(0.55)	(0.99)	(0.49)
2	0.78	0.24	0.71	0.65	0.20	0.82	1.93
	(1.57)	(1.09)	(0.22)	(0.52)	(1.10)	(2.23)	(0.79)
3	1.25	0.23	0.95	0.55	0.45	0.69	1.79
	(2.49)	(1.09)	(0.30)	(0.41)	(3.19)	(1.89)	(0.74)
4	1.13	0.38	1.22	0.62	0.28	0.90	2.14
	(2.06)	(1.43)	(0.38)	(0.49)	(1.82)	(2.43)	(0.88)
High	1.69	0.75	2.07	1.53	0.60	0.75	2.18
	(3.23)	(2.00)	(0.63)	(1.18)	(2.96)	(1.79)	(0.89)
High-Low	0.75	0.89	1.82	0.86	0.50	0.35	1.01
	(2.06)	(2.95)	(2.49)	(1.44)	(2.65)	(1.44)	(2.44)

Panel D: Return volatility (1999-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	$GT-GT_H$	$DGTW-DGTW_H$	$FM-FM_H$
Low	0.35	0.42	-1.53	-0.08	0.37	1.49	0.78
	(0.75)	(0.88)	(-0.28)	(-0.14)	(1.48)	(2.91)	(0.16)
2	-0.45	0.40	-2.33	-0.08	-0.18	1.70	0.43
	(-0.86)	(0.97)	(-0.43)	(-0.12)	(-0.48)	(2.62)	(0.09)
3	-0.54	0.28	-3.16	-0.08	-0.66	1.63	0.42
	(-0.80)	(0.78)	(-0.55)	(-0.09)	(-1.07)	(2.46)	(0.08)
4	-0.82	0.54	-2.96	-0.03	-0.80	2.01	1.28
	(-0.94)	(0.86)	(-0.50)	(-0.02)	(-0.93)	(2.31)	(0.23)
High	-1.15	0.35	-2.68	-0.42	-1.00	2.05	2.72
	(-1.09)	(0.26)	(-0.42)	(-0.32)	(-0.81)	(1.70)	(0.40)
High-Low	-1.50	-0.06	-1.15	-0.33	-1.37	0.57	1.94
	(-1.60)	(-0.04)	(-0.45)	(-0.43)	(-1.24)	(0.39)	(0.57)

Panel E: Portfolio Weighted Size (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	$GT-GT_H$	$DGTW-DGTW_H$	$FM-FM_H$
Low	1.32	-0.37	-0.59	0.61	0.49	0.24	0.70
	(1.98)	(-1.37)	(-0.17)	(0.74)	(1.97)	(0.57)	(0.24)
2	1.89	0.54	1.67	1.15	0.49	0.63	2.22
	(2.94)	(1.88)	(0.51)	(1.32)	(2.10)	(1.56)	(0.82)
3	1.43	0.52	1.72	0.88	0.32	0.64	2.30
	(2.65)	(2.06)	(0.55)	(1.03)	(1.56)	(1.65)	(0.86)
4	1.25	0.41	1.47	0.84	0.25	0.48	1.99
	(2.43)	(1.77)	(0.46)	(1.06)	(1.23)	(1.46)	(0.74)
High	0.94	0.50	1.71	0.83	0.30	0.68	2.26
	(2.10)	(2.30)	(0.55)	(1.22)	(1.43)	(2.50)	(0.83)
High-Low	-0.38	0.87	2.30	0.23	-0.19	0.44	1.56
	(-0.94)	(2.75)	(1.33)	(0.37)	(-1.00)	(1.37)	(1.08)

Panel F: Rank gap (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	$GT\text{-}GT_H$	$DGTW\text{-}DGTW_H$	$FM\text{-}FM_H$
Low	1.71	0.63	1.29	1.25	0.41	0.58	1.67
	(2.84)	(2.20)	(0.40)	(1.58)	(1.71)	(1.76)	(0.61)
2	1.68	0.34	1.23	1.26	0.40	0.42	1.69
	(2.67)	(1.24)	(0.38)	(1.52)	(1.82)	(1.09)	(0.62)
3	1.77	0.31	1.15	1.01	0.31	0.36	1.94
	(2.86)	(1.16)	(0.35)	(1.22)	(1.34)	(0.89)	(0.70)
4	1.60	0.46	1.24	1.03	0.43	0.53	2.00
	(2.59)	(1.49)	(0.39)	(1.26)	(1.95)	(1.34)	(0.74)
High	1.48	0.23	1.02	0.94	0.37	0.52	1.87
	(2.39)	(0.80)	(0.32)	(1.22)	(1.65)	(1.62)	(0.69)
High-Low	-0.23	-0.40	-0.27	-0.31	-0.04	-0.06	0.21
	(-1.68)	(-2.71)	(-1.07)	(-3.30)	(-0.41)	(-0.65)	(1.13)

Panel G: Backwards return gap (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	$GT\text{-}GT_H$	$DGTW\text{-}DGTW_H$	$FM\text{-}FM_H$
Low	1.70	0.50	1.64	1.11	0.45	0.48	1.66
	(3.63)	(2.38)	(0.54)	(1.65)	(2.14)	(1.64)	(0.64)
2	0.85	0.34	1.27	0.81	0.38	0.59	1.81
	(2.18)	(1.73)	(0.41)	(1.22)	(2.53)	(1.67)	(0.68)
3	1.23	0.36	1.24	0.87	0.31	0.52	1.85
	(2.40)	(1.97)	(0.39)	(1.21)	(1.85)	(1.54)	(0.69)
4	1.40	0.28	0.94	0.79	0.42	0.62	1.92
	(2.30)	(1.05)	(0.29)	(0.94)	(1.75)	(1.77)	(0.70)
High	1.70	0.17	0.93	0.85	0.33	0.44	2.06
	(2.14)	(0.41)	(0.27)	(0.87)	(1.10)	(1.05)	(0.72)
High-Low	0.00	-0.34	-0.71	-0.26	-0.12	-0.04	0.40
	(0.00)	(-0.87)	(-1.10)	(-0.66)	(-0.74)	(-0.13)	(0.54)

Panel H: Turnover (1980-2012)

Fund Quantile	GT	DGTW	FM	CWM_H	$GT\text{-}GT_H$	$DGTW\text{-}DGTW_H$	$FM\text{-}FM_H$
Low	0.50	0.11	1.17	0.26	0.28	0.73	1.98
	(1.54)	(0.65)	(0.38)	(0.34)	(2.19)	(2.67)	(0.77)
2	0.79	0.19	0.82	0.40	0.36	0.69	1.83
	(1.97)	(1.06)	(0.27)	(0.52)	(2.41)	(2.07)	(0.72)
3	1.30	0.24	1.15	0.84	0.51	0.58	1.90
	(2.57)	(1.17)	(0.36)	(1.09)	(2.61)	(1.50)	(0.70)
4	1.55	0.33	0.92	1.02	0.30	0.47	1.90
	(2.31)	(1.09)	(0.29)	(1.15)	(1.03)	(1.21)	(0.70)
High	2.28	0.71	1.32	1.65	0.21	0.62	2.21
	(2.61)	(1.66)	(0.39)	(1.73)	(0.64)	(1.33)	(0.79)
High-Low	1.78	0.60	0.14	1.39	-0.07	-0.11	0.24
	(2.91)	(1.31)	(0.20)	(2.48)	(-0.28)	(-0.32)	(0.30)

Table A.8 Simulations to Assess Stochastic Regressor Bias when there are No Fixed Effects

The table reports the average across 1000 simulation trials, of estimated holdings based performance measures. The units are percent excess return per quarter. True denotes the actual values of the measures used to calibrate the simulations, bootstrapping from versions of Equations (8) and (11), the predictive system for returns and weights in the main paper. These are found at various fractiles of the DiffIV estimates in the cross-section of actual fund data. The "No alpha" OLS estimates the slope coefficient in the baseline panel regression of (4), Diff IV is the differenced IV estimator, Diff no IV is the classical difference estimator of the regression (8) with stock dummies and Within is the classical within-group (least squares with dummy variables) estimator. OLS with alpha is based on the model with a common intercept. Haj2010 is the bias adjusted estimator of Hjalmarsson (2010) and Haj2008 is the bias adjusted estimator of Hjalmarsson (2008). GT is the weight change measure of Grinblatt and Titman (1993), DGTW is the measure of Grinblatt, Titman and Wermers (1997). CWM is the conditional weight measure of Ferson and Khang (2002). FM is the stochastic discount factor measure of Ferson and Mo (2016).

Classical Measures when there are no Fixed Effects

True (GT)	GT	True (DGTW)	DGTW	True (CWM)	Haj10(CWM)	True (FM)	FM
-0.29	-0.29	-0.26	-0.29	-0.15	-0.15	-0.54	-0.54
-0.19	-0.17	-0.18	-0.18	-0.08	-0.08	-0.37	-0.37
0.06	0.06	0.00	0.03	0.07	0.06	0.00	0.01
0.40	0.41	0.22	0.23	0.20	0.20	0.23	0.24
0.58	0.59	0.35	0.32	0.28	0.26	0.38	0.38

Table A.9: Simulations of Hypothetical Strategies

Two strategies are simulated: buy-and-hold and momentum. The average values (annualized percentage) are shown in the first row of each panel. The distributions of the T-statistics are summarized by reporting the values at the 2.5%, 5%, 50%, 95%, and 97.5% tails of the 1000 simulations. The percentage of simulated T-statistics larger than 1.96 are presented in the bottom row of each panel. GT, DGTW, CWM and FM are the original estimates, while DiffIV uses the differenced IV method and Haj10 uses the Hjalmarsson (2010) estimator for the models with fixed effects.

Panel A: Simulated Buy-and-Hold strategy for GT and DGTW measures

	GT	DGTW	DiffIV GT	DIffIV DGTW	Haj10 GT	Haj10 DGTW
Average Measure	1.04	9.38	-0.03	0.03	0.04	-0.03
2.5%	-0.96	3.00	-2.37	-2.10	-2.24	-2.33
5.0%	-0.74	3.51	-1.97	-1.76	-1.98	-2.04
50%	1.18	7.50	-0.09	-0.01	-0.15	-0.34
95%	2.50	10.08	1.78	1.69	1.52	1.26
97.5%	2.77	10.48	2.10	1.86	1.74	1.52
>1.96	16.80%	99.80%	3.10%	1.90%	1.40%	0.50%

Panel B: Simulated Momentum strategy for GT and DGTW measures

	GT	DGTW	DiffIV GT	DiffIV DGTW	Haj10 GT	Haj10 DGTW
Average Measure	0.42	7.57	-0.06	-0.10	0.04	0.00
2.5%	-1.14	9.61	-2.31	-2.45	-2.20	-2.37
5.0%	-0.85	9.87	-2.00	-2.16	-1.83	-1.96
50%	0.84	11.39	-0.09	-0.38	0.10	-0.09
95%	2.70	13.38	1.90	1.48	1.87	1.73
97.5%	3.15	13.79	2.33	1.87	2.25	2.09
>1.96	16.70%	100.00%	4.80%	1.90%	4.20%	3.10%

Panel C: Simulated Buy-and-Hold strategy for CWM and FM measures

	CWM	DiffIV CWM	Haj10 CWM	FM	DiffIV FM	Haj10 FM
Average Measure	-1.38	-0.05	-0.04	9.37	0.00	0.31
2.5%	-1.94	-1.94	-2.01	1.76	-1.97	-1.98
5.0%	-1.82	-1.69	-1.80	2.12	-1.81	-1.68
50%	-1.01	-0.04	-0.04	4.09	-0.05	0.03
95%	0.95	1.59	1.48	6.09	1.57	1.39
97.5%	1.20	1.78	1.79	6.49	1.82	1.67
>1.96	0%	1.9%	1.7%	96%	1%	1%

Panel D: Simulated Momentum strategy for CWM and FM measures

	CWM	DiffIV CWM	Haj10 CWM	FM	DiffIV FM	Haj10 FM
Average Measure	3.50	-0.01	0.04	9.07	-0.02	0.02
2.5%	-0.43	-2.20	-1.92	5.51	-2.07	-2.10
5.0%	-0.17	-1.85	-1.64	5.76	-1.80	-1.75
50%	1.81	0.00	0.05	7.11	-0.05	-0.01
95%	3.07	1.77	1.63	9.06	1.81	1.86
97.5%	3.29	2.08	1.91	9.41	2.17	2.21
>1.96	43%	3.5%	2.3%	100%	4%	4%

Table A.10: Fund return Attribution

The benchmark return for each stock, r_B, follows DGTW (1997). The components of the holdings-based fund returns, E(w'r), are shown for the 1980-2012 sample period. The cross-sectional variances (x10^4) of the components are in the right-hand columns. T-ratios, following DGTW, compute standard errors from the time-series variances of monthly portfolios of funds in each group. US active equity funds are grouped following DGTW as Aggressive Growth (Agg.Grow), Growth (Grow) and All. The holdings-based expected return is decomposed as: $E(\mathbf{w'r}) = E(\mathbf{w})'E(r_B) + E(\mathbf{w})'\alpha + Cov(\mathbf{w'; u}) + Cov(\mathbf{w'; r_B})$. The Normal Return is $E(\mathbf{w})'E(r_B)$. The Average Abnormal return is $E(\mathbf{w})'\alpha$. The Average Abnormal return is decomposed into the buy-and-hold drift (BH Drift), starting with the funds' initial weights, $E(w_{BH})'\alpha$ and the Average Abnormal return net of buy-and-hold drift, $E(w)'\alpha - E(w_{BH})'\alpha$. The TSA $Cov(\mathbf{w'; r}) = Cov(\mathbf{w'; u}) + Cov(\mathbf{w'; r_B})$. The first term is Selection and the second is Timing. The units are annual percent.

Panel A:	Average return Components			Cross-sectional Variances	
	All	Agg.Grow	Grow		
Expected Return, $E(\mathbf{w'r})$	13.19	14.03	13.32	56.27	
	(4.99)	**(4.73)**	**(4.99)**		
Normal Return, $E(\mathbf{w})'E(r_B)$	12.22	12.15	12.35	46.77	
	(5.90)	**(6.48)**	**(6.26)**		
Average Abnormal, $E(\mathbf{w})'\alpha$	0.52	1.05	0.60	6.20	
	(1.54)	(1.59)	(1.63)		
BH Drift, $E(w_{BH})'\alpha$.	0.69	1.11	0.76		5.25
	(2.04)	(1.81)	(1.96)		
Net of BH	-0.17	-0.06	-0.16		4.25
	(-1.74)	(-0.27)	(-1.34)		
Time-series Information, $Cov(\mathbf{w'; r})$	0.39	0.72	0.31	8.07	
	(0.40)	(0.42)	(0.26)		
Selection, $Cov(\mathbf{w'; u})$	-0.22	-0.07	-0.28		3.34
	(-0.59)	(-0.11)	(-0.68)		
Timing, $Cov(\mathbf{w'; r_B})$	0.67	0.91	0.65		3.24
	(0.87)	(0.70)	(0.72)		

Panel B: GT Measure Components	Average Components			Cross-sectional Variances
	All	Agg.Grow	Grow	
GT, E(Δ**w’r**)	1.32	2.55	1.28	6.44
	(2.50)	**(2.63)**	**(2.19)**	
E(Δ**w**)’E(r_B)	0.29	0.30	0.29	1.24
	(2.47)	(1.72)	**(2.10)**	
Average Abnormal, E(Δ**w**)’α	-0.15	-0.23	-0.17	1.63
	(-1.90)	(-1.88)	**(-2.01)**	
BH Drift	-0.06	-0.01	-0.07	0.75
	(-0.87)	(-0.10)	(-0.84)	
Net of BH	-0.08	-0.22	-0.10	1.39
	(-1.68)	**(-2.65)**	(-1.69)	
Time-series Information, Cov(Δ**w’; r**)	1.17	2.51	1.14	7.92
	(2.13)	**(2.48)**	(1.86)	
Selection, Cov(Δ**w’; u**)	0.36	1.07	0.34	3.43
	(1.18)	(1.92)	(1.04)	
Timing, Cov(Δ**w’; r**$_B$)	0.81	1.41	0.81	2.70
	(2.52)	**(2.42)**	**(2.23)**	
