Properly Defining Active Risk
Isolates Persistent Skill and Reveals Hidden Closet-indexers

Passive beta differences with a benchmark are a byproduct, typically unintentional, of any stock-selection process. Since consistent passive differences, once properly identified, can be freely obtained or offset, they are not part of active contribution.

Premise

Active contribution is not simply performance relative to a particular benchmark, it is instead only that portion of incremental return which could not have been obtained passively.

The true passive alternative to an active portfolio is rarely a single index, but rather a combination of index funds with varying market, sector, and style exposures.

In fact, defining active contribution as performance relative to a single index, when that performance can be achieved with a combination of passive index funds and ETFs at a fraction of the cost of active management, is economically unsound and increasingly risky from a legal and regulatory perspective.

Current limitation

Simplistic approaches to distinguishing active from passive contribution are flawed, brittle, and ineffective, and are unable to distinguish between portfolios taking genuine security selection risk and those merely taking high systematic market, sector, or macro risk.

This is a serious limitation as passive differences obscure active skill and inflate active risk.

Solution

Statistical factor risk models, using only passively-investable factors, precisely measure all current risk exposures (region, market, sector, and style betas, and all idiosyncratic security risk exposures) that together fully predict future performance.

Accuracy of predictions is absolute proof of validity; similarly, analytics that are not predictive are demonstrably not valid.

Implications

Closet indexing

One-third of active mutual funds take too little active risk to ever overcome fees, even if highly skilled.

Popular methods of measuring active risk (Active Share, tracking error, downside deviation, Sharpe, Sortino, and information ratios, etc.) fail to identify most closet indexers because they confuse a single index with the portfolio's true passive alternative, which is almost always a combination of index funds, leaving asset owners exposed to the risk of paying active fees for passive contributions.

Persistent skill

Properly isolated from passive market noise, security selection skill shows strong statistical evidence of persistence.

Managers with top decile security selection information ratios are twice as likely to outperform as not over the subsequent three years. Managers in the bottom decile are more than twice as likely to underperform as not.

Portfolio structure and Qualitative manager assessment

Managers with complementary exposures can be combined, or passive ETFs can be incorporated, to offset unintended passive differences with the aggregate benchmark, reducing relative risk while retaining the active risk worth paying for.

Manager discussions can focus on those exposures that will drive future performance as well as any significant changes in risk exposures or potential conflicts with mandate.

This paper discusses the limitations of current methodologies and introduces an alternative: highly predictive statistical risk models built to isolate active contributions from passively-investable exposures -- revealing security-selection skill that persists, true active risk, opportunities to reduce relative risk without sacrificing active risk, as well as to offset any unintentional bets that may endanger performance.*

* Over 0.96 median correlation between predicted and subsequent realized returns

Market Noise Overwhelms Skill

The problem with assessing skill using nominal performance is that the effects of random, typically mean-reverting, market fluctuations overwhelm any effects of manager skill. For example, a typical mutual fund's volatility attributable to security-selection accounts for less than 10% of the total. Market noise accounts for more than 90%

With such a high level of market noise, traditional techniques relying on nominal returns require decades of data to detect statistically significant evidence of skill. Over individual market cycles, the relative ranking of a fund's returns in one sample of history is negatively correlated with its relative ranking in the other. When "skill" is evaluated naively, "the best" funds in one period tend to become "the worst" in another, and vice versa.

Existing Approaches to Isolating Active Risk and Return

In order to select managers likely to outperform, and to know if managers should be replaced, the challenge is to look beneath the surface to determine whether the true source of return is investment skill (stock picking, market timing, etc.) or some combination of luck, high beta, and out-sized risk. Two attribution approaches attempt to separate active and passive contributions: holdings-based and returns-based analyses.

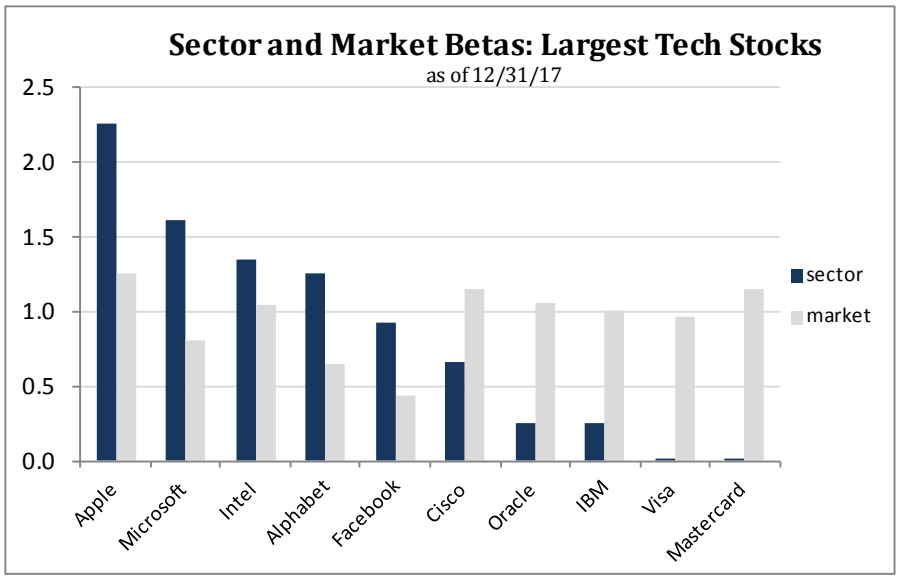
Holdings-Based Approaches: Brinson Attributions

Holdings-based approaches to performance attribution typically rely on the principles first discussed in Brinson and Fachler, Journal of Portfolio Management, 1985. The approach attributes relative returns to sector allocation relative to the benchmark and to stock selection, defined as outperformance of a stock's sector.

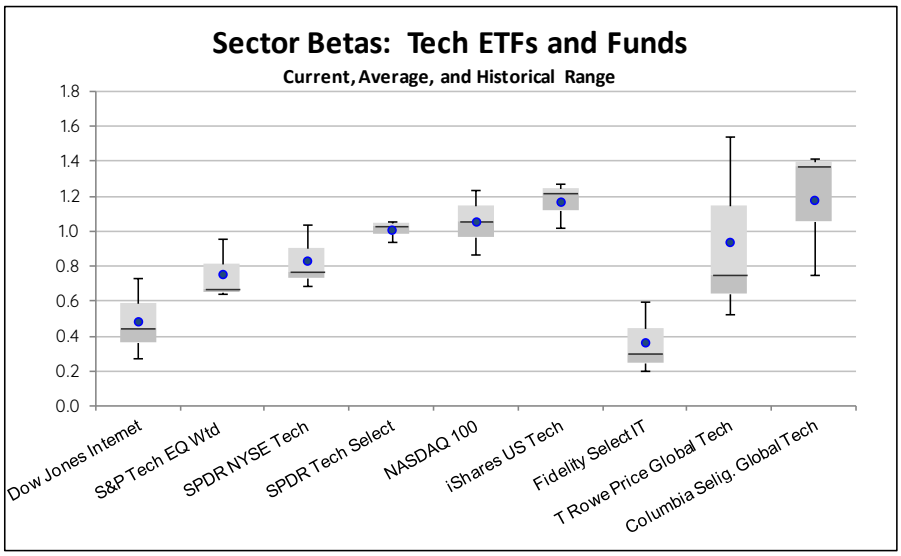
Providers, including FactSet, Morningstar, Caissa, Novus, and others, offer attribution and risk analysis using the Brinson approach and Active Share.

The Brinson method assumes that all stocks have the same market risk and all stocks within a sector have the same sector risk (e.g, a dollar in Apple and a dollar in Facebook have the same market, sector, and other systematic exposures).

Unfortunately, sector and market risks vary widely across securities,* as do sector betas -- even among the largest sector indexes and funds:



* distributions of individual security market and sector betas are shown on page 12



Fortunately, any performance attribution system that claims to identify active return is easily tested.

Since security-selection return is a residual, free from systematic risk, it is by definition uncorrelated with passive benchmarks. To the extent security-selection return and passive return calculated by a given system are correlated, the system has failed (see: three additional tests).

Active Share

Active Share estimates active risk based on individual security market-value differences with a benchmark. Astonishingly, its validity appears never to have been tested.

The approach fails for two reasons 1)its implicit premise is flawed: individual securities have widely different betas and very different impacts on portfolio risk, and more importantly 2) active risk is not risk relative to a particular benchmark, it is instead the amount of relative risk that could not be obtained passively.

For example, a fund with benchmark S&P 500 holds 100% SPY, Active Share and active risk are both zero. But a fund with the same benchmark, holding 70% SPY and 30% IWM (a Russell 2000 ETF), Active Share is 30% while active risk is zero.

Similarly, tracking error, standard deviation, and derivative measures, also fail to properly define active risk because they do not consider whether some or all of the measured deviation from a benchmark could have as easily been obtained passively.

It's not necessary that closet-indexers hold index funds, only that a sufficient portion of their portfolio's incremental performance was also available passively. Nor does it matter whether the manager is intentionally manipulating Active Share, or mitigating active risk, since consistent passive differences from a benchmark, whether or not intentional, can be freely obtained, they are not part of active contribution.

The true passive alternative to any active fund is almost always some combination of index funds rather than a single index. Most closet indexers cannot be exposed without using passive-factor risk models to identify the true benchmark. Less robust measures leave asset owners exposed to the risk of paying active fees for passive contributions.

Returns-Based Style Analysis

Returns-based style analysis and returns-based performance attribution techniques perform regressions to compute portfolio betas (exposures to systematic risk factors) and alphas (residual returns unexplained by systematic risk factors).

The simplicity of the returns-based approach has made it popular. It is often the only practical method for evaluating multi-asset-class portfolios that span commodities, public securities, derivatives, and private investments. However, this simplicity comes at a heavy cost.

The limiting assumption of returns-based analyses is the constancy of factor exposures. This assumption breaks down for active managers. In Flaws of Returns-based Style Analysis we show:

- When an active manager varies bets, a returns-based analysis yields flawed estimates of portfolio risk and may not even accurately estimate average portfolio risk.
- Errors will be most pronounced for the most active funds:
  - Estimates of a manager's historical and current systematic risks will be flawed.
  - Skilled funds may be deemed unskilled and unskilled funds may be deemed skilled.

Equity Risk Models

Multi-factor equity risk models measure portfolio risk by calculating individual security factor exposures and can distinguish between systematic risk (due to endogenous factors that affect multiple securities) and idiosyncratic risk (specific to an individual security).

Equity risk models are classified as fundamental models, macroeconomic models, and statistical models.

As these models are designed to estimate risk as precisely as possible for even the most narrow portfolios, popular models today often use well over 100 risk factors, most of which are not directly investable.

Bloomberg's Port function uses a fundamental risk model similar to but more rudimentary than Barra's and Blackrock's. Our tests found that Bloomberg's portfolio risk model typically captured less than half of the relative systematic (factor) risk explained by the more robust models.

Bloomberg and other fundamental models have two key limitations when used for oversight:

1) Fundamental models use 100+ individual risk factors, most of which are not directly investable. Attributing performance to exposure differences in momentum, leverage or the dozens of other non-investable factors, while useful for portfolio construction and optimization, is neither meaningful nor actionable for oversight since exposures cannot be passively obtained or offset.

2) Fundamental models assume that exposures to country, currency, and sector factors are either zero or one for all securities. There is no distinction in sector risk between the least risky stock in a sector and the most risky one. Since individual security sector risks vary widely (Apple, for example, recently had a Technology sector beta of 2.2 while IBM's sector beta is 0.2). Bloomberg and other providers provide a very misleading picture of sector, country, currency, and at times even market risk.

The fact that these models do not provide meaningful attributions for manager and portfolio oversight is due to an explicit design decision to target portfolio optimization and risk forecasting, rather than performance attribution.

A Statistical Risk Model Built for Oversight

Statistical factor models use various maximum likelihood and principal-components analysis procedures on time-series security return samples to identify the significant underlying drivers of returns, or factors. Statistical factor models rely on fewer assumptions and use robust statistical processes to estimate factor betas.

A statistical equity risk model built specifically for oversight, using a limited number of factors that map to common passive portfolios such as index funds and ETFs, explains risk as well as the most robust fundamental models in most cases, but can also distinguish skill from random market fluctuations.

For most portfolios, differences from the benchmark in exposures to Market, Sector, Regional, and Style factors, all available via passive investments, explain over 96% of absolute return and over 65% of relative return.

Findings

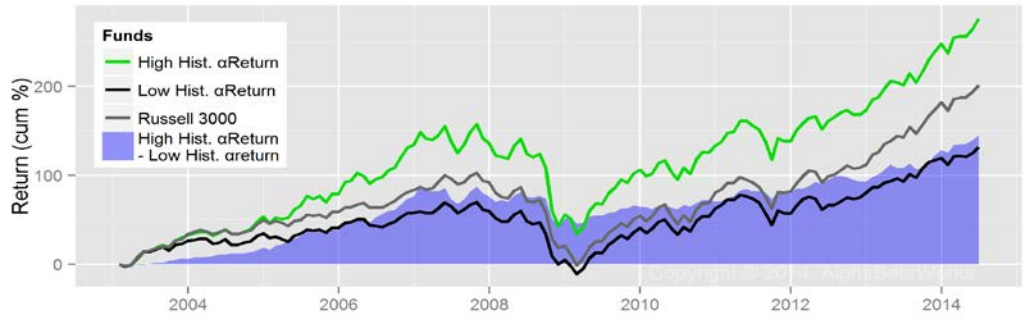
Security selection skill persists

By isolating returns due to security selection and market timing from those due to passive differences in factor (systematic) risk from the benchmark, ABW Peer Analytics risk models mitigate the impact of noise and reveal skill.

Top-decile stock-pickers are twice as likely to generate positive stock-picking returns as negative in the subsequent few years.

Bottom decile managers are more than twice as likely to generate negative stock-picking returns as positive ones in subsequent years (see: performance persistence within style boxes and performance persistence within international style boxes).

In a recent study spanning 12 years, high αReturn funds outperformed the market by 75%; low αReturn funds underperformed by 70%



Returns of mutual funds with highest and lowest trailing 36-month αReturns – equal risk

Closet indexing is prevalent

Closet indexing is the practice of charging active fees for passive management. Over a third of active mutual funds and half of active mutual fund capital appear to be investing passively: Funds tend to become less active as they accumulate assets. Skilled managers who were active in the past may be closet indexing today. These active managers take too little active risk to compensate for an average fee, even assuming top-decile skill.

Quantitative insights inform qualitative assessments

Statistical risk models quantify all current exposures that fully explain future return relative to a benchmark –- both passively-available market exposures and individual idiosyncratic security exposures –- and rank them in order of contribution to variance. Users can ensure managers' relative risk exposures are consistent with expressed strategies and mandates, and manager discussions can focus on those decisions that most impact portfolio risk and return.

Risk can be reduced while retaining active contribution

Asset owners can reduce risk relative to the benchmark without sacrificing the active risk worth paying for (by offsetting consistent passive differences with ETFs or better manager allocations),

avoid unintentionally reinforcing passive bets or offsetting active bets among individual managers,

avoid closet indexing the aggregate portfolio,

and better assess how individual managers contribute to aggregate portfolio risk.

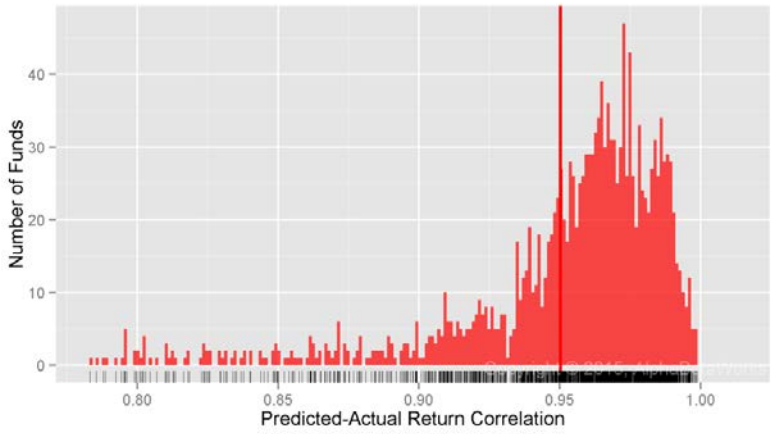
Model Validation

Though mathematically complex and hard to compare, equity risk models are easily tested.

To evaluate the accuracy of an equity risk model, we compare returns predicted by past factor exposures to subsequent portfolio performance: We measure factor exposures using end-of-month holdings and predict the following month's return as a function of index returns.

The correlation between predicted and actual return measures a model's accuracy. The higher the correlation, the more effective a model is at hedging, stress testing, and scenario analysis, as well as evaluating investment *risk* and *skill*.

Our risk models are highly predictive and deliver over 0.96 median correlation between predicted ex-ante and reported ex-post portfolio returns for both U.S. and Global Equity mutual funds (see: testing predictions of equity risk models and testing global equity risk models).



Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.666	0.942	0.962	0.950	0.977	0.999

Prospective clients need not rely on our out-of-sample tests, we're happy to provide passive ETF replicating portfolios for any of your managers and you can validate the models' accuracy independently. A few weeks of observations can provide dozens of observations and establish a high statistical confidence in the models' predictive accuracy.

Due Diligence Questions Accurately Answered with Predictive Analytics

- **Does performance exhibit statistical evidence of positive or negative skill?**
  Managers with top-decile security selection skill (information ratios of isolated security-selection performance) are twice as likely to outperform over the following three years. Bottom decile managers are more than twice as likely to underperform.

- **How much risk- and what types - is the manager taking relative to the benchmark?**
  All individual exposures that fully explain future relative performance

- **How much does risk vary over time -- and why?**

- **What part of relative risk is due to active decisions, and what part is due to passive exposures which are an unintended consequence?**
  Relative risk can be reduced, by offsetting unintended passive risk exposures, without sacrificing the active risk worth paying for.

- **Are individual managers taking sufficient active risk to justify active fees?**
  One-third of managers take too little active risk to ever compensate for fees - even with skill.

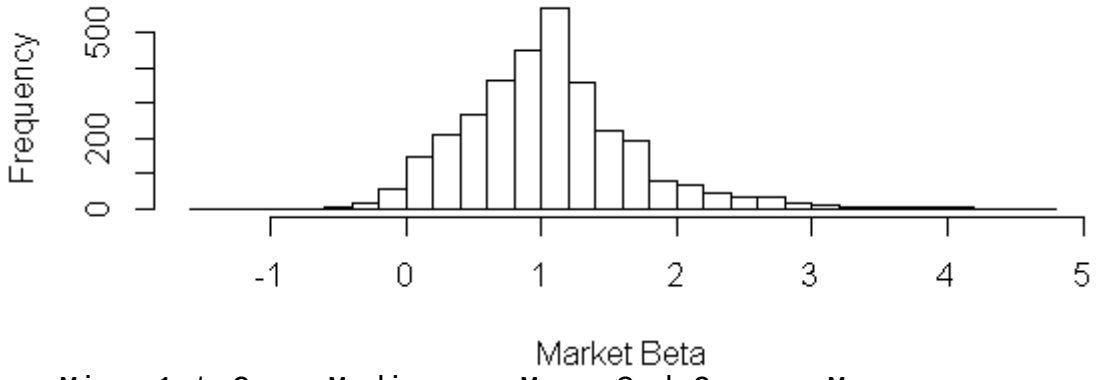
- **What are the most significant current exposures that explain future performance?**
  All statistical exposures – both passive market exposures and individual security exposures – that completely explain future return. Ranked in order of contribution to future variance.

- **Are these exposures consistent with the manager's mandate and expressed philosophy?**
  Quantitative insights that contribute to qualitative assessments

- **How do individual managers contribute to aggregate equity portfolio risk?**
  Combining managers with offsetting passive exposures reduces risk relative to the aggregate benchmark without sacrificing desirable active risk.

U.S. Market and Sector Security Beta Distributions as of 12/31/2018

The distribution of Market betas for individual securities:

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   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-1.4236  0.6462  1.0216  1.0491  1.3408  4.6518
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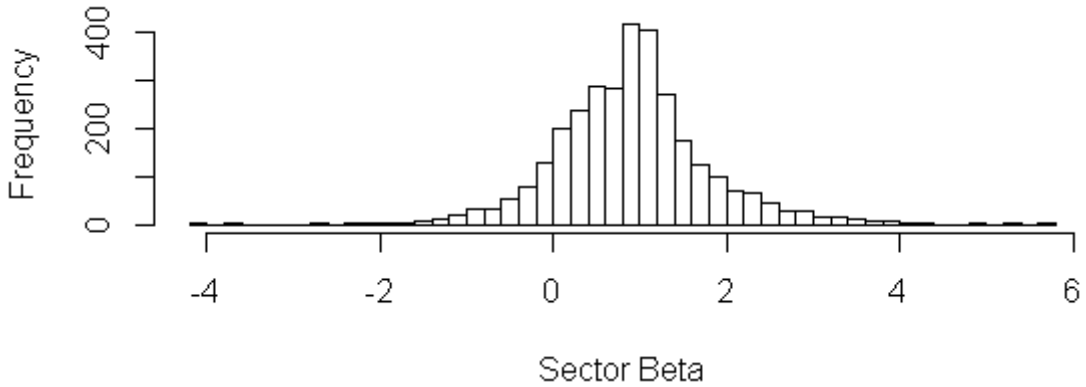
The distribution of Sector betas for individual securities:

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   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-4.1230  0.3842  0.9247  0.9076  1.3222  5.6598
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The wide variation of individual security market and sector betas is the primary reason market-value weightings are not valid proxies for risk exposures, as well as a fatal flaw with Brinson and Active Share methodologies.