Current Misconceptions in Smart Beta Investing

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Introduction: The Smart Beta Debate

• Smart Beta often draws fierce criticism
  – from providers of traditional active management
  – from providers of traditional passive management

• Smart Beta providers show surprisingly little agreement with each other on the defining characteristics of Smart Beta

• The objective of this presentation is to review common claims about Smart Beta and to analyse the underlying misconceptions
  – Misconceptions on the sources of outperformance
  – Misconceptions on investability hurdles
Outline

• On the sources of outperformance
  – The Hiding Game
  – The Monkey Portfolio Claim
  – The Value and Size Myth
  – The Rebalancing Fantasy

• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
• On the sources of outperformance
  – The Hiding Game
  – The Monkey Portfolio Claim
  – The Value and Size Myth
  – The Rebalancing Fantasy

• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
1. The Hiding Game

“Smart Beta generates alpha”

• Smart Beta aims to outperform cap-weighted market indices. Some claim that Smart Beta is thus a way of generating alpha

“if one can find a more reliable alpha, and pay less for it, that would be pretty smart.”

Arnott, R., and Engin Kose. 2014. What “Smart Beta” Means to Us, Research Affiliates Publication

“...a handful of risk-premia indices can account for a substantial portion of alpha...”


“The goal of smart beta is to obtain alpha.”

Investopedia
1. The Hiding Game
Sources of Value-Added

• **Not alpha:** Systematic strategies can add value over a CW market index through
  – **Factor tilts:** Asset pricing theory suggests multiple rewarded factors
  – **Diversification (for a given factor tilt):** unrewarded risks should be diversified away
  – **Multi factor allocation:** Asness *et al.* (2013) show that allocating across rewarded factors adds value

• **Alpha:** Discretionary active managers may try to add more value through applying skill
  – **Stock selection**
  – **Factor timing**
1. The Hiding Game
Where did all the alpha go?

- Some smart beta strategies only exploit one of the three sources of value added: tilting toward a single rewarded factor
- Smart beta providers still omit information on factor exposures
  - e.g.: Arnott et al. (2005) report a positive single factor alpha for their fundamental equity indexation strategy and omit multi-factor results
- Simple factor-tilted portfolios have positive CAPM alphas which disappear with the introduction of more appropriate factor models
  - Excess returns of such strategies are not alpha, but are simply reward for exposure to the relevant factor

<table>
<thead>
<tr>
<th>Annualized Alpha</th>
<th>Portfolios based on univariate sorts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
</tr>
<tr>
<td></td>
<td>Top 30%</td>
</tr>
<tr>
<td>CAPM</td>
<td>3.32%</td>
</tr>
<tr>
<td>Fama French 3 factor model</td>
<td>-1.08%</td>
</tr>
<tr>
<td>Fama French 5 factor model</td>
<td>-0.66%</td>
</tr>
</tbody>
</table>

The table shows annualized alpha from different factor models of univariate 30% bottom (top) portfolios. Portfolios and factors come from Kenneth French’s data library. Statistics are annualised. Alphas significant at the 95% level are highlighted in bold. The analysis is based on monthly data from December 1974 to December 2014 (40 years). Newey-West robust standard errors are employed.
1. The Hiding Game
Having no alpha is not so bad...

• That smart beta performance is driven by beta rather than alpha is good news
  – Alpha relies on anomalies which are bound to disappear
  – A fair reward for taking on risk (beta) is not likely to disappear in the long term

• Issues related to crowing and capacity of such strategies should be examined based on what we know about asset pricing rather than based on anecdotes
• On the sources of outperformance
  – The Hiding Game
  – The Monkey Portfolio Claim
  – The Value and Size Myth
  – The Rebalancing Fantasy

• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
2. The Monkey Portfolio Claim

“Anything beats cap-weighted market indices”

“...the investment beliefs upon which many investment strategies are ostensibly based play little or no role in their outperformance”


“...popular strategy indexes, when inverted, produce even better outperformance”


Smart Beta “strategies add value, like Malkiel’s monkey, simply because they rebalance to non-price weights.”

2. The Monkey Portfolio Claim

The problem with testing Upside-down strategies

• Behavior of the “inverse” depends on the type of strategy
  – Strategies that are close to EW behave similarly when “inverted”
  – Monkey argument may rely on a biased selection of strategies

• Amenc et al. (2016) use a broad set of strategies tilting to different factors and using different weighting schemes
  – Both portfolio weights and direction of stock selection are inverted
    • For example, the upside-down strategy for value selects stocks with the lowest value score and then tilts the weights toward the stocks with the lowest value score
  – It is expected that the inverted strategies do not benefit from risk premia since they tilt to the opposite of rewarded factors
2. The Monkey Portfolio Claim

Testing the Upside-down strategies

- A reassuring finding from Amenc et al. (2016): Most **Upside-down strategies have lower returns** than the originals, and lower Sharpe and Inform. ratios
- Only fundamental weighting behaves monkey-like

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Stocks</td>
<td>Fundamental Wtd</td>
<td>12.51%</td>
<td>16.84%</td>
<td>0.43</td>
<td>1.56%</td>
<td>3.58%</td>
<td>0.44</td>
</tr>
<tr>
<td>All Stocks</td>
<td>Upside-down</td>
<td>12.62%</td>
<td>17.21%</td>
<td>0.42</td>
<td>1.67%</td>
<td>4.08%</td>
<td>0.41</td>
</tr>
<tr>
<td>Mid Cap</td>
<td>Mid Cap Score Wtd</td>
<td>15.40%</td>
<td>18.34%</td>
<td>0.55</td>
<td>4.45%</td>
<td>7.40%</td>
<td>0.60</td>
</tr>
<tr>
<td>Large Cap</td>
<td>Upside-down</td>
<td>9.91%</td>
<td>17.80%</td>
<td>0.26</td>
<td>-1.04%</td>
<td>2.72%</td>
<td>-0.38</td>
</tr>
<tr>
<td>High Momentum</td>
<td>Momentum Score Wtd</td>
<td>12.91%</td>
<td>18.35%</td>
<td>0.41</td>
<td>1.96%</td>
<td>5.69%</td>
<td>0.34</td>
</tr>
<tr>
<td>Low Momentum</td>
<td>Upside-down</td>
<td>8.10%</td>
<td>21.15%</td>
<td>0.13</td>
<td>-2.85%</td>
<td>9.04%</td>
<td>-0.32</td>
</tr>
<tr>
<td>Low Volatility</td>
<td>Low Volatility Score Wtd</td>
<td>11.49%</td>
<td>14.75%</td>
<td>0.42</td>
<td>0.54%</td>
<td>5.91%</td>
<td>0.09</td>
</tr>
<tr>
<td>High Volatility</td>
<td>Upside-down</td>
<td>9.06%</td>
<td>26.07%</td>
<td>0.14</td>
<td>-1.89%</td>
<td>12.42%</td>
<td>-0.15</td>
</tr>
<tr>
<td>Value</td>
<td>Value Score Wtd</td>
<td>14.89%</td>
<td>18.52%</td>
<td>0.52</td>
<td>3.94%</td>
<td>5.94%</td>
<td>0.66</td>
</tr>
<tr>
<td>Growth</td>
<td>Upside-down</td>
<td>8.88%</td>
<td>18.06%</td>
<td>0.20</td>
<td>-2.07%</td>
<td>4.10%</td>
<td>-0.51</td>
</tr>
<tr>
<td>Low Investment</td>
<td>Low Inv Score Wtd</td>
<td>13.26%</td>
<td>16.35%</td>
<td>0.49</td>
<td>2.31%</td>
<td>4.42%</td>
<td>0.52</td>
</tr>
<tr>
<td>High Investment</td>
<td>Upside-down</td>
<td>9.15%</td>
<td>19.67%</td>
<td>0.19</td>
<td>-1.80%</td>
<td>4.79%</td>
<td>-0.38</td>
</tr>
<tr>
<td>High Profitability</td>
<td>High Prof Score Wtd</td>
<td>11.52%</td>
<td>17.40%</td>
<td>0.36</td>
<td>0.57%</td>
<td>4.66%</td>
<td>0.12</td>
</tr>
<tr>
<td>Low Profitability</td>
<td>Upside-down</td>
<td>10.37%</td>
<td>20.02%</td>
<td>0.25</td>
<td>-0.58%</td>
<td>7.43%</td>
<td>-0.08</td>
</tr>
</tbody>
</table>
• On the sources of outperformance
  – The Hiding Game
  – The Monkey Portfolio Claim
  – The Value and Size Myth
  – The Rebalancing Fantasy
• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
3. The Value and Size Myth

“Performance is entirely due to value and small cap exposure”

Smart beta strategies “outperform because of the positive value and size loadings” given that “none of these strategies are different from naive equal-weighting.”


Any smart beta strategy “necessarily results in value and size tilts, regardless of the weighting method chosen.”


“... outwardly different smart betas produce nearly similar premiums for similar reasons.”

3. The Value and Size Myth

Testing the claim

• Proponents of the value and size myth seem to have missed market developments over the past five years...
  – The underlying analysis focuses on some broad-based smart beta 1.0 strategies with implicit value and size tilt. More recent products have introduced explicit tilts to various factors. Moreover, the smart beta 2.0 approach allows combining explicit tilts with diversified weighting schemes.

• Amenc et al. (2016) perform regressions using a multi-factor model including a wide range of consensual equity factors and testing a range of explicitly factor tilted strategies.

• If the Value and Size claim holds, we expect the following:
  – regression coefficients for size and value factors should be significantly positive for all strategies
  – regression coefficients for all factors other than size and value should be insignificant
3. The Value and Size Myth
Testing the exposure of Smart Beta strategies

- **No** ubiquitous Value and Size exposure
- Most strategies **differ from EW**

<table>
<thead>
<tr>
<th>Weighting Scheme</th>
<th>Stock Selection</th>
<th>Ann Alpha</th>
<th>Market Beta</th>
<th>SMB Beta</th>
<th>HML Beta</th>
<th>MOM Beta</th>
<th>BAB Beta</th>
<th>Prof Beta</th>
<th>Invest. Beta</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals-Based</td>
<td>All Stocks</td>
<td>-0.48%</td>
<td>1.00</td>
<td>0.02</td>
<td>0.26</td>
<td>-0.04</td>
<td>0.01</td>
<td>0.04</td>
<td>0.13</td>
<td>98.3%</td>
</tr>
<tr>
<td>Equal-Weighting</td>
<td>All Stocks</td>
<td>0.94%</td>
<td>1.03</td>
<td>0.27</td>
<td>0.18</td>
<td><strong>-0.10</strong></td>
<td>0.02</td>
<td>0.00</td>
<td><strong>0.09</strong></td>
<td>96.5%</td>
</tr>
<tr>
<td></td>
<td>Mid Cap</td>
<td><strong>1.84%</strong></td>
<td>1.06</td>
<td>0.45</td>
<td>0.26</td>
<td>-0.19</td>
<td>0.01</td>
<td>-0.01</td>
<td><strong>0.18</strong></td>
<td>92.0%</td>
</tr>
<tr>
<td>Score x Market Cap Weighting</td>
<td>Momentum</td>
<td>0.12%</td>
<td>1.02</td>
<td>0.03</td>
<td><strong>0.00</strong></td>
<td>0.40</td>
<td>-0.02</td>
<td>-0.10</td>
<td>-0.13</td>
<td>96.8%</td>
</tr>
<tr>
<td></td>
<td>Low Vol</td>
<td>-2.36%</td>
<td>0.87</td>
<td>-0.11</td>
<td><strong>-0.03</strong></td>
<td>0.02</td>
<td>0.09</td>
<td>0.27</td>
<td>0.37</td>
<td>94.5%</td>
</tr>
<tr>
<td></td>
<td>Value</td>
<td>2.34%</td>
<td>1.05</td>
<td>0.07</td>
<td>0.57</td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.19</td>
<td>-0.14</td>
<td>95.7%</td>
</tr>
<tr>
<td></td>
<td>Low Invest.</td>
<td>-1.09%</td>
<td>0.99</td>
<td>0.06</td>
<td><strong>0.00</strong></td>
<td>0.03</td>
<td>0.03</td>
<td>0.00</td>
<td>0.52</td>
<td>96.8%</td>
</tr>
<tr>
<td></td>
<td>High Prof.</td>
<td>1.56%</td>
<td>0.94</td>
<td>-0.02</td>
<td><strong>-0.33</strong></td>
<td>0.03</td>
<td>-0.01</td>
<td>0.19</td>
<td>0.01</td>
<td>96.0%</td>
</tr>
<tr>
<td></td>
<td>Multi Factor</td>
<td>0.46%</td>
<td>0.99</td>
<td>0.08</td>
<td>0.08</td>
<td>0.05</td>
<td>0.01</td>
<td>0.03</td>
<td>0.14</td>
<td>99.1%</td>
</tr>
</tbody>
</table>

**Seven-Factor Regression** – From Amenc et al. (2016)
The Market factor is the excess returns of the CRSP S&P 500 index over risk-free rate. The yield on Secondary US Treasury Bills (3M) is used as a proxy for the risk-free rate. The Size, Value, Momentum, High Profitability, and Low Investment factors are obtained from the Kenneth French data library. The Betting-Against-Beta (BAB) factor is obtained from the Andrea Frazzini data library. The Newey-West (1987) estimator is used to correct for autocorrelation. Daily total returns from 31 December 1973 to 31 December 2013 are used for the analysis. Regression coefficients that have p-values less than 5% are highlighted in bold. Alphas are annualized.

**EW has negative MOM exposure, unlike most of the other strategies**

**Negative or insignificant HML Beta**

**Significant positive exposure to other rewarded factors**
• On the sources of outperformance
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  – The Rebalancing Fantasy

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4. The Rebalancing Fantasy

“Smart Beta outperforms because it trades against mean reversion”

“By rebalancing periodically, you keep breaking the relationship between price and weight and you **trade against mean reversion** [...] this is the biggest reason why most smart-beta strategies outperform.”

*Steward, M: Smart beta: Smart investing or smart trading?, IPE Report, March 2014*

“...the long-term performance of many smart beta strategies ... can be attributed to this [rebalancing] phenomenon.“


“At its heart, rebalancing is a simple contrarian strategy....The main source of value-added is not the average value tilt of the RAFL portfolios, but its **dynamic contra-trading against the most extreme market bets**....”

*The great contra-trade, R. Arnott, 2009, Research Affiliates poublication*
Several academic findings are frequently cited to support the claim

- Stock returns may show “return reversal” (realized return reversal) thus favoring contrarian strategies (Lakonishok et al (1994)).

- Rebalancing allows “volatility pumping”. Theory suggests that even when asset returns are independent (Luenberger (1997)) a fixed weight strategy grows more rapidly in portfolio value than a buy and hold strategy. The higher the volatility of the assets the higher the effect.

- It is well known that stock returns show mean reversion (expected return reversal) (see Poterba and Summers (1988)).

Fundamental indexers refer to mean reversion to the so-called “fundamental value” of a stock. This idea is unrelated to all of the academic findings above.

- ‘return reversal’ relies on price information, which is effectively ignored by fundamental indexation strategies.

- The effects of ‘volatility pumping’ pertain to fixed weight strategies, not to strategies that employ measures of fundamental value. Implementation of such strategies targets at a high frequency as rebalancing effects are best harvested when rebalancing often.

- ‘mean reversion’ in stock returns refers to a time series effect at the asset class level, rather than a cross sectional effect at the individual stock level. Strategies based on such ‘mean reversion consider the price level (e.g. through dividend yield). A strategy like fundamental weighting that ignores price is not likely to capture such an effect.
4. The Rebalancing Fantasy
Further Insights from Academic Research

• No consensus on **cross-sectional** rebalancing premium
  – “Rebalancing“ relates to disparate concepts (Hallerbach (2014))
  – Qian (2014): rebalancing premium may be **positive or negative**
    • He breaks down the rebalancing effect into “volatility effect” and “return effect” and shows that the sign depends on the relative magnitude of both effects
  – Asset pricing models do not use a “rebalancing factor”
    • Such a factor is absent from the Fama French-Carhart models
  – Time horizon plays a crucial role for effects related to rebalancing
    • Evidence of medium-term return continuation (Jegadeesh and Titman (1993)) and long term-return reversal (Lakonishok, Shleifer and Vishny (1994))
    • Rebalancing effect occurs at frequencies higher than typical index rebalancing (Plyakha, Uppal and Vilkov (2012))
4. The Rebalancing Fantasy

Performance of Rebalanced and Buy & Hold portfolios

- We allocate across different stock portfolios (9 datasets): initially EW allocation, different rebalancing frequencies:
  
  - There is no uniform relationship between the rebalancing interval and performance (Sharpe ratio)

<table>
<thead>
<tr>
<th>Rebalancing Frequency</th>
<th>32 portfolios (2x4x4 sorts on ME, B/M and OP)</th>
<th>100 portfolios sorted by ME and B/M</th>
<th>48 industry portfolios</th>
<th>25 portfolios sorted by B/M and OP</th>
<th>25 portfolios sorted by ME and INV</th>
<th>25 portfolios sorted by OP and INV</th>
<th>10 port. sorted by E/P</th>
<th>10 port. sorted by CF/P</th>
<th>10 port. sorted by DY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly</td>
<td>0.61</td>
<td>0.61</td>
<td>0.54</td>
<td>0.57</td>
<td>0.60</td>
<td>0.55</td>
<td>0.60</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>Quarterly</td>
<td>0.62</td>
<td>0.61</td>
<td>0.55</td>
<td>0.57</td>
<td>0.60</td>
<td>0.55</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>Semi-annual</td>
<td>0.62</td>
<td>0.61</td>
<td>0.55</td>
<td>0.58</td>
<td>0.60</td>
<td>0.56</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>Annual</td>
<td>0.62</td>
<td>0.61</td>
<td>0.55</td>
<td>0.58</td>
<td>0.61</td>
<td>0.56</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>18 months</td>
<td>0.63</td>
<td>0.61</td>
<td>0.56</td>
<td>0.59</td>
<td>0.61</td>
<td>0.56</td>
<td>0.61</td>
<td>0.60</td>
<td>0.58</td>
</tr>
<tr>
<td>2 years</td>
<td>0.63</td>
<td>0.61</td>
<td>0.56</td>
<td>0.58</td>
<td>0.61</td>
<td>0.56</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
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<tr>
<td>3 years</td>
<td>0.63</td>
<td>0.61</td>
<td>0.55</td>
<td>0.58</td>
<td>0.61</td>
<td>0.56</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>4 years</td>
<td>0.64</td>
<td>0.62</td>
<td>0.55</td>
<td>0.58</td>
<td>0.62</td>
<td>0.57</td>
<td>0.61</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>5 years</td>
<td>0.65</td>
<td>0.62</td>
<td>0.57</td>
<td>0.60</td>
<td>0.62</td>
<td>0.57</td>
<td>0.61</td>
<td>0.61</td>
<td>0.57</td>
</tr>
<tr>
<td>Buy &amp; Hold</td>
<td>0.73</td>
<td>0.65</td>
<td>0.65</td>
<td>0.65</td>
<td>0.66</td>
<td>0.64</td>
<td>0.64</td>
<td>0.62</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Comparison of Sharpe ratios between various rebalanced and buy and hold portfolios. 40 Years of data (1974 to 2014)

The table shows the Sharpe ratios of portfolios formed by periodically rebalancing the underlying constituents. The underlying constituents are portfolios themselves, officially published in Kenneth French’s data library. ME stands for market equity, B/M is the book-to-market ratio, OP stands for operating profitability, INV for investments. E/P refers to the earnings-to-price ratio, CF/P is the cash flow-to-price ratio while DY stands for dividend yield. For details of calculations of the individual portfolios and the variable definitions, consult Kenneth French’s website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
4. The Rebalancing Fantasy
In search of the “rebalancing factor”

- A rebalancing effect should be revealed in exposure of Smart Beta strategies to reversal factors. We thus compare models including reversal factors with respect to established factor models which omit such factors.

- The table below shows the effect of adding two reversal factors to the four standard Carhart factors:
  - Exposure to reversal factors is insignificant, negative or economically unimportant.
  - Adding the reversal factors does not increase explanatory power.

<table>
<thead>
<tr>
<th>Smart Beta Equity Indices (USA)</th>
<th>Maximum Deconcentration</th>
<th>High-Momentum Maximum Deconcentration</th>
<th>Value Maximum Deconcentration</th>
<th>Mid-Cap Maximum Deconcentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to Short Term Reversal</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.00</td>
<td>-0.02</td>
</tr>
<tr>
<td>Exposure to Long Term Reversal</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Change in R-squared w.r.t. 4 Factor model</td>
<td>0.01%</td>
<td>0.03%</td>
<td>0.00%</td>
<td>0.08%</td>
</tr>
</tbody>
</table>

*Note: The table above shows the reversal factor exposure of SciBeta smart beta strategies based on historical track record. The two reversal related factors are included in addition to the standard four Carhart factors. The Market factor is the excess returns of the CRSP S&P-500 index over risk-free rate. The yield on Secondary US Treasury Bills (3M) is used as a proxy for the risk-free rate. The SMB, HML, MOM and reversal factors are obtained from Kenneth French’s data library. Statistics are annualized. Regression coefficients significant at the 95% level are highlighted in bold.*
4. The Rebalancing Fantasy

Additional considerations

• There is a broad consensus that there is momentum at intermediate time horizons. Any rebalancing back to recent loser stocks will generate negative momentum exposure and will thus a negative impact on returns.

• If the idea is to ignore price to benefit from supposed reversion of prices to “fundamental values” proxied for by accounting data, this is indeed a very backward looking approach. Should we really believe that markets are so inefficient that one should trust accounting data more than market prices?

• If one believes in the possibility of beating the market through a capacity to predict future prices, then rather than considering backward-looking data (like the averaged accounting numbers over the past four years) one could perhaps turn to truly active management which uses prediction of future accounting variables.
• On the sources of outperformance
  – The Hiding Game
  – The Monkey Portfolio Claim
  – The Value and Size Myth
  – The Rebalancing Fantasy

• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
5. The Liquidity Concern

“Smart Beta requires positions in highly illiquid stocks”

"Disadvantages of [EW] strategy indices include illiquidity issues...”


"...allocating a large weight to stocks with low liquidity...should result in higher trading costs. In that respect, the equal-weight suffers greatly...”


• Simple empirical tests suggest that the liquidity of Smart Beta strategies can be controlled for while maintaining outperformance
  – We look at simple, quarterly rebalanced EW portfolio and introduce liquidity adjustments in the portfolio construction process to study their impact on the outperformance
  – We also investigate the impact of the High-Liquidity filter in the case of Scientific Beta indices
5. The Liquidity Concern
Introducing liquidity adjustments to a simple EW strategy

- An EW quarterly rebalanced strategy generates outperformance but may come with liquidity issues
  - EW may involve trading in smaller stocks. Trading costs are positively related to trade size relative to market cap and negatively related to market cap (Keim and Madhavan (1997))
  - We introduce liquidity capping rules to ease implementation:
    - Holding multiple: stock weight capped to 10 times its weight in CW index
    - Trading multiple: stock’s weight change capped to its weight in CW index
- The constrained version retains the outperformance while significantly easing implementation

<table>
<thead>
<tr>
<th>Quarterly Rebalanced EW Portfolio of 500 US Stocks</th>
<th>Annualized Excess Returns</th>
<th>Avg. 95&lt;sup&gt;th&lt;/sup&gt; percentile of Trading multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconstrained</td>
<td>2.78%</td>
<td>Unconstrained</td>
</tr>
<tr>
<td>Constrained</td>
<td>2.58%</td>
<td>Constrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.99</td>
</tr>
</tbody>
</table>

Comparison between unconstrained and constrained versions of quarterly rebalanced EW portfolio
The table shows the comparison of annualized excess returns and the average of the 95<sup>th</sup> percentile of the Trading multiple between the Unconstrained and Constrained versions of the test portfolio from 500 US stocks from the CRSP database. The test portfolio in the Unconstrained version is a simple EW quarterly rebalanced portfolio. In the Constrained version, security weight is first capped to 10 times its CW benchmark weight (Holding multiple cap). After this, the change in security weights at rebalancing is limited to the benchmark weight (Trading multiple cap). The Trading multiple metric is calculated as the time series average (across quarters) of 95th percentile of the ratio of portfolio stock weight change between two consecutive quarters to its weight in the cap-weighted benchmark. S&P 500 (SPX) is used as the benchmark. Yield on Secondary US Treasury bills (3M) is used as the proxy for risk-free rate. The analysis is done for the period 31/12/1974 – 31/12/2014.
5. The Liquidity Concern
Introducing a High-Liquidity filter for Smart Factor Indices

- A High-Liquidity filter is yet another solution to liquidity concerns
  - After selecting stocks based on the desired factor tilt, the High-Liquidity filter applies a liquidity screen and keeps 60% of the stocks with the highest liquidity score*
  - Positive excess returns are still retained: This is a viable option for liquidity-focused investors

| Scientific Beta Long Term Track Record USA Indices – Maximum Deconcentration Weighting Scheme |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
|                                               | Value | Mid Cap | Hi Momentum | Low Volatility | Multi Beta EW |
| Ann. Excess Returns                           |       |         |             |                |                |
| Normal | HiLiq | Normal | HiLiq       | Normal         | HiLiq         | Normal         | HiLiq         |
| 4.52%  | 3.75% | 4.33%  | 4.09%       | 3.46%          | 2.41%         | 2.83%          | 1.87%         | 3.88%          | 3.17%          |
| Tracking Error                                |       |         |             |                |                |
| 6.23%  | 6.10% | 7.30%  | 7.90%       | 4.59%          | 4.59%         | 5.67%          | 5.41%         | 4.94%          | 4.31%          |
| Information Ratio                             |       |         |             |                |                |
| 0.72   | 0.62  | 0.59   | 0.52        | 0.75           | 0.52          | 0.50           | 0.35          | 0.79           | 0.74           |

*Scientific Beta definition of liquidity - the sum of stock’s trading ratio z-score and trading volume z-score. More details are available on www.scientificbeta.com.
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  – The Value and Size Myth
  – The Rebalancing Fantasy

• On investability hurdles
  – The Liquidity Concern
  – The Turnover Critique
  – The Crowding Hypothesis
6. The Turnover Critique

“Smart Beta necessarily leads to high turnover”

“...rules-based...construction has a tough time controlling turnover...”
Webster, J. 2015. The move to multi-factor investing: what every investor should know. Axioma Exchange Traded Funds Guide

“...smart-beta strategies can be inefficient from a turnover perspective...”

• Turnover of smart beta indices can be controlled by suitably designed implementation rules
  – One possibility is conditional rebalancing consistent with optimal control theory (Martellini and Priaulet (2002), Leland (1999))
  – Amenc, Goltz, and Gonzalez (2014) analyze the results obtained with indices before and after implementing turnover control*
    • Before the control, turnover reached up to about 65%
    • After controlling for turnover, the same indices exhibit a much more reasonable level of turnover which remains in the vicinity of 30%

* At each quarterly rebalancing date, the end-of-rebalancing weights of the strategy are reviewed. The portfolio is not rebalanced until the quarterly two-way turnover reaches a threshold calibrated such that the strategy’s resulting one-way annual turnover does not exceed 30%. Details of this approach are available at www.scientificbeta.com.
6. The Turnover Critique

Illustration of Turnover Control

- Reducing the turnover does not significantly alter the benefits of alternative weighting schemes

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Before Turnover Control</td>
<td>Annualised return</td>
<td>13.82%</td>
<td>13.77%</td>
<td>13.75%</td>
<td>13.61%</td>
<td>13.74%</td>
</tr>
<tr>
<td></td>
<td>Annualised volatility</td>
<td>17.46%</td>
<td>16.65%</td>
<td>16.83%</td>
<td>14.30%</td>
<td>15.96%</td>
</tr>
<tr>
<td></td>
<td>Ann. 1-Way turnover</td>
<td>23.39%</td>
<td>25.35%</td>
<td>58.84%</td>
<td>54.78%</td>
<td>64.71%</td>
</tr>
<tr>
<td>After Turnover Control</td>
<td>Annualised return</td>
<td>13.82%</td>
<td>13.77%</td>
<td>13.83%</td>
<td>13.50%</td>
<td>14.03%</td>
</tr>
<tr>
<td></td>
<td>Annualised volatility</td>
<td>17.46%</td>
<td>16.65%</td>
<td>16.74%</td>
<td>14.39%</td>
<td>15.79%</td>
</tr>
<tr>
<td></td>
<td>Ann. 1-Way turnover</td>
<td>23.39%</td>
<td>25.35%</td>
<td>36.57%</td>
<td>36.73%</td>
<td>32.35%</td>
</tr>
</tbody>
</table>

Comparison of performance and turnover before and after turnover control – taken from Amenc, Goltz, and Gonzalez (2014)

The table shows the annualised return, annualised volatility and annualised 1-way turnover of the five alternatively weighted strategy indices and the cap-weighted reference index for the US market. The first panel reports the statistics for the indices before any turnover control is applied, whereas the second panel reports the statistics for the indices after turnover control is applied. Returns and Volatility are calculated using daily total returns in the period: 31/12/1973 to 31/12/2013 (40 years). Reported Turnover is one-way annualised. Turnover is the average value across 160 quarters (40 years). All statistics are annualised.
• On the sources of outperformance
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• On investability hurdles
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  – The Turnover Critique
  – The Crowding Hypothesis
7. The Crowding Hypothesis

“If everyone knows about smart beta the benefits will disappear”

“We foresee the reasonable probability of a smart beta crash as a consequence of the soaring popularity of factor-tilt strategies”

“...we view crowding as a new emerging risk factor which may be increasingly important...“
Brochart, B., Taillardat, B., Jourovski, A., Liquidity and crowding within low volatility equity strategies, Unigestion research Publication, October 2013

“... the inability to limit investments can lead to overvaluation ... and even factor crashes...we’ve already seen an example in the collapse of momentum stocks with the tech wreck in 2000.”

• Crowding is commonly pointed to but it is rarely formalized or empirically tested for
7. The Crowding Hypothesis

Back to the basics: Risk-based explanations versus mispricing

- The **economic rationale** has implications for crowding risk:
  - **Risk-Based Explanation**: the premium is likely to **persist**, because some investors will rationally avoid a tilt despite the higher returns
  - **Systematic Errors**: if investors learn over time, factor strategies may indeed see diminishing premia, except if there are limits to arbitrage

<table>
<thead>
<tr>
<th>Factor</th>
<th>Risk-Based Explanation</th>
<th>Behavioral Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>Costly reversibility of assets in place leads to high sensitivity to economic shocks in bad times</td>
<td>Overreaction to bad news and extrapolation of the recent past leads to subsequent return reversal</td>
</tr>
<tr>
<td>Momentum</td>
<td>High expected growth firms are more sensitive to shocks to expected growth</td>
<td>Investor overconfidence and self-attribution bias leads to returns continuation in the short term</td>
</tr>
<tr>
<td>Low Risk</td>
<td>Liquidity-constrained investors hold leveraged positions in low risk assets which they may have to sell in bad times when liquidity constraints become binding</td>
<td>Disagreement of investors about high risk stocks leads to overpricing in the presence of short sales constraints</td>
</tr>
<tr>
<td>Size</td>
<td>Low profitability leads to high distress risk and downside risk. Low liquidity and high cost of investment needs to be compensated by higher returns.</td>
<td>Limited investor attention to smaller cap stocks</td>
</tr>
<tr>
<td>Profitability</td>
<td>Firms facing high cost of capital will focus on the most profitable projects for investments</td>
<td>Investors do not distinguish sufficiently between growth with high expected profitability and growth with low profitability, leading to under-pricing of profitable growth firms</td>
</tr>
<tr>
<td>Investment</td>
<td>Low investment reflects firms limited scope for projects given high cost of capital</td>
<td>Investors under-price low investment firms due to expectation errors</td>
</tr>
</tbody>
</table>
7. The Crowding Hypothesis
Disappearing premium or risk premium?

• Claiming that there must be crowding in a factor because it suffers from losses completely ignores the nature of risk premia
  – A risk premium corresponds to a higher average return that is due to taking on additional risk
  – All risk factors will have returns which vary substantially over time
  – Only an analysis of long-term data can lead to any meaningful conclusions on the average premium
  – Factors are rewarded precisely because they produce losses in bad times (see below).
7. The Crowding Hypothesis
“Factor crashes”: The case of momentum

- “factor crashes...we’ve already seen an example in the collapse of momentum stocks with the tech wreck in 2000.” (Jacobs (2015))

- Is this evidence of crowding? If so, was there crowding in momentum factor indices in the early 1930s as well?

Cumulative return of Momentum factor, US data, 1927-1960

The charts display cumulative return of the Momentum factor for the USA from Kenneth French’s data library. The data displayed is between January 1927 and December 2015, split in two charts and is based on monthly observations.
• McLean and Pontiff (2015) analyze the returns to almost 100 different “factors”
  – NB: These include *ad-hoc* factors with no clear economic rationale
  – For every strategy, the authors analyze three different time periods
    • In-sample result over the period used in the original study
    • Out-of-sample but before publication
    • The post-publication results up to today

• The authors reject the hypothesis that *post-publication* returns decay entirely
  – A significant reduction in returns post publication is found and attributed to the publication effect

• The key conclusion is thus that while the publication of academic research tends to lower returns going forward, these premia do not disappear
7. The Crowding Hypothesis
Where is the evidence? (Carhart factors)

- Many standard factors had been widely documented by the early 1990s.
- For such factors, we have a 25-year-long post publication test.

### Average Gross Return Spreads Over Different Periods

<table>
<thead>
<tr>
<th>Period</th>
<th>SMB</th>
<th>HML</th>
<th>UMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1927-1991</td>
<td>2.8%</td>
<td>5.1%</td>
<td>8.9%</td>
</tr>
<tr>
<td>1963-1991</td>
<td>3.2%</td>
<td>4.7%</td>
<td>10.1%</td>
</tr>
<tr>
<td>1992-2015</td>
<td>2.6%</td>
<td>3.6%</td>
<td>6.1%</td>
</tr>
</tbody>
</table>

**T-stat on Difference**
-0.08  -0.48  -0.71

• Cochrane (1999) provides an excellent discussion of the macro-consistency of factor tilted strategies
  – The reward for tilting to factors is compensation for additional types of risk
    • Strategies that suffer losses in bad times (when marginal utility of consumption is high) are shunned by investors unless they provide a higher expected long term return
    • Investors are willing to accept lower expected returns for strategies that pay off relatively well in bad times.
  – Investors who are well-positioned to shoulder such factor risk can harvest the associated risk premia
    • Investors with a longer time horizon than the average market participant may be well-positioned to take on such risks,
The smart beta debate has produced misconceptions

- Common wisdom often does not align well with the facts
- Superficially convincing claims often stand on shaky foundations

Our analysis calls for a thorough assessment of smart beta

- Beware of oversimplification: a detailed analysis of smart beta strategies and their risks is necessary
- Beware of overgeneralization: some misconceptions arise because differences between strategies are not considered
References


Arnott, R., and Engin Kose. 2014. What “Smart Beta” Means to Us, Research Affiliates Publication


Brochart, B., Taillardat, Bruno, Jourovska, Alexei. Liquidity and crowding within low volatility equity strategies, Unigestion research publication, October 2013


Steward, M. 2014: Smart beta: Smart investing or smart trading?, IPE Report, March 2014


Webster, J. 2015. The move to multi-factor investing: what every investor should know. Axioma Exchange Traded Funds Guide