PMC ETF and Index Mutual Fund/SMA Quantitative Ranking Methodology
The Quantitative Research Group (QRG) is a division within PMC that provides regular and systematic evaluation, monitoring, and ranking of funds/managers, resulting in an “approved” list published on the Envestnet platform. This research allows advisors to choose from a comprehensive universe of "Approved-Quantitative" ETFs, Index Mutual Funds, and SMAs.

1. Funds included in analysis
QRG’s universe includes all the available “alive” (i.e., those still in existence) U.S.-based ETFs in the Morningstar Direct database. For index mutual funds, we start with the entire Morningstar’s US Mutual Funds database and screen out those funds where the “Index Fund” indicator is set to “No”.

In case of multiple share classes in the mutual fund (“MF”), we use only one share class to represent the fund performance in the ranking step. We take the following steps to select the representative share class:
1. Exclude load share classes and ineligible share classes (Retirement and R);
2. Among the remaining share classes with 24 months of data (see Section 2.1 on additional data requirements), we pick the share class with the lowest expense ratio;
3. In case of ties in step 2, pick the share class with the highest priority, where the priority across the share classes is defined as follows: Inst > No Load > Adv > Inv > D > A > B > C > N > S > T > Other.

To calculate Tracking Error, we use either Envestnet platform benchmarks or, if the specific category is not listed in Envestnet’s investment styles, the Morningstar category benchmarks.

2. Methodology
The fund ranking methodology is performed annually, and is carried out after the first quarter of the year. The process consists of two main steps. First, QRG screens all available funds based on five criteria. Second, QRG calculates a weighted average score of three performance areas for post-screen funds, and ranks them within their respective peer groups. ETFs and Index Mutual Funds/SMAs are ranked separately, because some of the evaluation components are not available for index funds.

2.1. Screening Process
In order to exclude sub-standard firms and products, QRG imposes simple filters on the fund universe. The screening criteria consist of the following seven components: legal structure, active vs. passive management, available data history, Envestnet platform style, total sponsor assets under management (AUM), minimum fund AUM, and Strategic Beta universe screen. Funds are eligible for the ranking process only if they pass all seven tests.

• Legal structure. Funds in the Morningstar Direct database are classified into five legal structures: Grantor Trust, Open Ended Investment Company; Partnership (3C1), Uncollateralized Debt Instrument; and Unit Investment Trust. We exclude Uncollateralized Debt Instruments (ETNs) from further ranking, as these are considered to be debt securities rather than index funds.
• Active vs. passive management. We exclude actively managed funds.

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1 All index funds are classified as Open Ended Investment Company, which ensures all index funds pass this screen.
Available data history. We exclude funds if there are any monthly returns missing in the last 24-month period, since we use the last 24-month Tracking Error in the ranking process. Note, we use Morningstar’s extended performance data for product evaluation (see "Morningstar Extended Performance Methodology" white-paper for details).

Envestnet platform style. We adopt the mutual fund/separately managed account (MF/SMA) Q-Score ranking process style map as the basis for which Morningstar categories are included in the ranking process. In addition, we include sectors and currency categories.2

Total sponsor AUM. We assign a score of one through five based on the total AUM of the firm (per Branding Name). This score is assigned jointly across ETF and Index Fund universes by adding up both ETFs and Index Fund AUM (Vanguard is an exception, because Vanguard classifies its ETF as one share class in Index Fund.) We include only those sponsors that have an assigned score of 4 or 5. The purpose of this screen is to obtain a list of firms with high AUM in their ETF and Index Fund programs, which would allow us to have high confidence that in times of market stress the firm would have abundance of resources not to close any of their products. We deem the necessary level of AUM to be in the $10 billion range. The actual cutoff is selected in such a way that short-term market fluctuations are very unlikely to change the composition of the approved list.

Minimum fund AUM. We require a minimum $100M AUM for both ETFs and Index Funds. The purpose of this screen is to ensure that the Fund company is unlikely to close the product under financial distress.

Strategic Beta ETFs. We exclude certain Strategic Beta ETFs, because these products are evaluated separately under Strategic Beta ranking methodology. The valid ETFs must be classified in the following MorningStar categories: EM, EAFE (6 categories), World Stock, and Domestic Equity (9 categories), and must contain at least one of the following Strategic Beta attributes: Dividend Screened/Weighted, Fundamental Weighted, Low Beta, Low/Minimum Volatility/Variance, Quality, Momentum.

* Table 1: Example of ETF sponsors with scores of 4 or 5 *

<table>
<thead>
<tr>
<th>Sponsor/Branding Name</th>
<th>Total AUM* (in $ billions)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanguard</td>
<td>3,837.78</td>
<td>5</td>
</tr>
<tr>
<td>iShares</td>
<td>1,725.83</td>
<td>5</td>
</tr>
<tr>
<td>State Street</td>
<td>734.89</td>
<td>5</td>
</tr>
<tr>
<td>Fidelity</td>
<td>617.35</td>
<td>5</td>
</tr>
<tr>
<td>Charles Schwab</td>
<td>255.82</td>
<td>5</td>
</tr>
<tr>
<td>Invesco</td>
<td>235.99</td>
<td>5</td>
</tr>
<tr>
<td>First Trust</td>
<td>86.73</td>
<td>4</td>
</tr>
<tr>
<td>TIAA</td>
<td>84.25</td>
<td>4</td>
</tr>
<tr>
<td>VanEck</td>
<td>43.78</td>
<td>4</td>
</tr>
<tr>
<td>BlackRock</td>
<td>41.77</td>
<td>4</td>
</tr>
<tr>
<td>WisdomTree</td>
<td>40.65</td>
<td>4</td>
</tr>
<tr>
<td>Jackson National</td>
<td>40.57</td>
<td>4</td>
</tr>
<tr>
<td>JPMorgan</td>
<td>38.16</td>
<td>4</td>
</tr>
<tr>
<td>T. Rowe Price</td>
<td>34.99</td>
<td>4</td>
</tr>
</tbody>
</table>

* As of December 2019
2.2. Exceptions
There may be some categories (e.g., Bank Loan, Commodities Broad Basket) in which only a small number of funds meet the five criteria. We do not recommend ranking these funds within these peer groups on a quantitative basis, so as to avoid approving a fund with poor Tracking Error against its relevant index. These categories must be ranked manually, and, therefore, are eligible for “approved-by-exception” status. We also segregate the entire fund universe into Quantitatively Rankable Categories, Manually Rankable Categories, and Non-Rankable Categories (Table 2). The difference between Quantitatively and Manually Rankable Categories is that the categories in the latter group do not have enough products in them for us to rank them algorithmically. Non-Rankable Categories are generally those Morningstar categories that are not ranked in our Q-Score manager ranking approach (please see “PMC Mutual Fund and SMA Quantitative Ranking Methodology” write-up document as well as section “Envestnet platform style” under section 2.1).

Table 2: Example summary of Quantitatively, Manually and Non-Rankable Categories*  
<table>
<thead>
<tr>
<th>Type</th>
<th># of Morningstar Categories</th>
<th>Total # of ETFs</th>
<th>Rankable ETFs</th>
<th>Approved ETFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitatively rankable</td>
<td>46</td>
<td>1417</td>
<td>504</td>
<td>236</td>
</tr>
<tr>
<td>Manually rankable</td>
<td>7</td>
<td>137</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Non-rankable</td>
<td>48</td>
<td>854</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

* As of December 2019

Certain categories are merged into one peer group, as they share the same benchmark on the UMP platform, for example Short Government bond, Short-Term bond and Ultrashort bond. This is identical to the approach used for the MF/SMA Q-Score ranking process.
QRG will continue to monitor the manually rankable categories on a quarterly basis to determine whether the number of fund products has reached the point where manual supervision and ranking are no longer required.

Finally, if there are any missing values in the statistical components that we use to evaluate the funds, we impute these values by substituting the median value in that category.

2.3. Ranking Process

We use three broad metrics to evaluate fund performance: Tracking, Liquidity, and Cost. Liquidity and Cost have multiple areas of additional measurement.

2.3.1. Construction of the Overall Score

- **Tracking Measure.** Tracking Measure involves computing the Tracking Error, which is calculated against the prospectus benchmark using the monthly returns over the last 24-month period. If the prospectus benchmark is not available (e.g., missing recent performance data, etc), we use Morningstar’s category benchmark for the calculation. Tracking Error measures how closely a portfolio follows its benchmark. A fund that performs well often maintains annual tracking error of less than 20 bps.\(^4\)

- **Liquidity Measure.** Liquidity Measure involves four statistical components for ETFs: Average Spread/Price Ratio, Average Daily Volume/Shares Outstanding Ratio, Fund Size Base Currency, and Market Impact Cost.\(^3\) The first three metrics are self-explanatory. Market Impact Cost is calculated as a fraction of the daily volatility in an ETF’s market price relative to its underlying value. All four of these statistics show the degree to which a fund can be traded without affecting its price.

- **Cost Measure.** Cost Measure involves two statistical calculations: Annual Report Net Expense Ratio and Tax Cost Ratio.\(^4\) Expense Ratio is the percentage of fund assets used to pay for operating expenses and management fees. Tax Cost Ratio indicates how much a fund’s annualized return is reduced by the taxes investors pay on distributions. Lower Expense Ratio and Tax Cost Ratio values mean that investors spend less to own the fund.

To confirm that none of the seven above-mentioned statistical components contains overlapping information, we apply linear- and rank-correlation analyses for each of the ranked peer groups and for the overall universe. We conclude that the highest-correlated metrics (rank correlation of approximately negative 0.5) are Fund Size and Market Impact Cost. This lends support to incorporating all of these metrics as unique sources of information to construct the overall fund ranking score.

2.3.2. Unitization of the Sub-metrics

Since the components of the overall score have various scales, and differ from peer group to peer group, they are not directly comparable. Instead, we first sort them within a peer group, and then assign sub-scores using a piecewise linear function.

2.3.3. Weighting of sub-measures

Because Tracking Error is the only metric we use for the Tracking Measure, the Tracking Score is equivalent to the Tracking Error sub-score. The Liquidity Score is defined as the equally weighted average of the four scores for the liquidity measures noted above. Cost Score is defined as an equally weighted average of the two scores for the Cost metrics noted above. The Overall Score is the equally weighted average of the Tracking, Liquidity, and Cost Scores.

\(^3\) For index funds (MFs and SMAs), the Liquidity Measure involves Fund Size Base Currency and Data History Length – an added metric that is not present for ETF evaluation. Although the purpose of the Liquidity measure for ETFs is to calculate the degree of potential market impact resulting from buying/selling the ETF, market impact is not a relevant consideration for index MFs/SMAs. Rather, the size of the fund/strategy and the length of data history proxies for experience of the team running the product.

\(^4\) ETF/index fund managers tend to minimize tracking error as much as possible, and tracking performance becomes less important to investors among top performing funds. Think about an investor who is comparing two ETFs that track similar indexes. One ETF has annualized TE of 5bps and the other has 10bps. Most likely the investor would ignore the 5 bps difference and focus on comparing Liquidity and Cost measures. When generating tracking scores we don’t want to put too much emphasis on TE ranking especially if the tracking performance is already good enough. We give the highest tracking score to funds whose TEs are less than min(TE)+20bps within peer group.
2.3.4. Selection of the Approved funds
We applied this methodology to the ranking process on a quarterly basis. We approve those funds that fall in the top thirty percent within their peer group according to their overall score. In addition, we also approved those funds with AUM greater than the maximum of the AUMs for those quant-approved funds within the same peer group ("AUM-approved"). The latter rule allowed us to consider those funds that were very popular in the marketplace (i.e., high-AUM funds), but that might not track a benchmark identical to that of a particular investment style (e.g., funds tracking Barclays Aggregate Index that were classified as Intermediate Bond in Morningstar and had the Barclays Intermediate Gov't/Credit benchmark on the Envestnet platform).

Finally, “approval-by-exception” allowed us to approve certain funds on a case-by-case basis.

All three approval types (“quant-approved”, “AUM-approved”, and “approval-by-exception”) will result in the Envestnet platform “IM&R status” of “Approved-Quantitative” for that particular fund.

To reduce the turnover rate in the approved list of funds, we will maintain the approval rating of quant-approved funds, unless their overall ranking falls below the 50th percentile.

2.3.5. Process Details Pertaining Only to Index SMA Ranking Process
The methodology for Index SMAs is largely the same as that for ETF/index MFs, with the following exceptions:

A. In Section 1 the starting universe of index SMAs is the Morningstar US Separate Accounts (Composite) database. From this universe, we select those SMAs for which the field “Management Approach-Passive” is set to “Yes”. Next, from this subset we screen out those SMAs with names that contain the word “ETF”. We then screen out those products that are determined by PMC Research to be “Fund Strategist Portfolios”. Finally, we screen out SMAs with the word “Allocation” in any of the following dimensions: “Global Broad Category Group”, “Global Category”, “Morningstar Category”, and “Morningstar Institutional Category”. The purpose of these screens is to arrive at a universe of managers who follow truly passive index-replicating strategies.

B. In the “Screening Process” (section 2.1), we do not include the “Legal Structure” and “Total Sponsor AUM” steps. The reasoning behind why we eliminate the “Total Sponsor AUM” step is that in the case of SMAs, the client account holds the stocks, so measuring the financial soundness of an organization is less important. We add another screen for the index SMA universe: any SMA where either “Product Focus” is labeled “Institutional” or where the “Min Investment (Base Currency)” is above/equal to $1M is either not available or is eliminated. Also, under the “Envestnet platform style” screen we add a “laddered portfolio” peer group. These SMAs are identified by searching for the word “laddered” in the SMA’s name.

C. In the “Ranking Process” (section 2.3), we only use the Tracking and Liquidity measures, because there is no Cost measure data for index SMAs. Our current weights for ETFs/index MFs on these three measures are 0.5, 0.25, and 0.25. Setting Cost measure to zero leaves us with 2/3 and 1/3 weights for Tracking and Liquidity measures, respectively.

D. Under “Selection of the Approved funds” (section 2.3.4), we do not use “AUM-approved” for the index SMA strategies.
3. Appendix-Methodology Changes

3.1. Q-score benchmark that is used to calculate tracking error was changed from platform investment style benchmark to prospectus benchmark of each fund. We assume investors have sufficient knowledge on the products and underlining benchmarks they select. This methodology change improves the efficiency of tracking measure, especially in asset classes with Heterogeneous products such as international equity/fixed income, commodity and sectors.

3.2. Adding indifference range to tracking score. The tracking error to score mapping function was a piecewise linear function that standardize tracking error. We added a 20 bps indifference range to top ranked (tracking measure) products so that all funds within this range get highest score to tracking measure. This is consistent with the behavior that investors tend to ignore small tracking error difference and put more emphasis on liquidity and cost measure if ETFs/index funds already have low tracking errors.

3.3. Overall score weights on tracking measure, liquidity measure and cost measure was changed from [1/2, 1/4, 1/4] to [1/3, 1/3, 1/3]

Disclosure

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PMC_BR_ETFRMS-QRM_0120