A wise investor once said “One cannot beat the benchmark by being the benchmark!” While it may be a rather simple and straightforward statement, we believe it helps define what it really means to be an ‘active’ investor. Furthermore, we believe the concept of a portfolio looking fundamentally different from its respective benchmark can now be quite easily explained by a recently popularized statistic known as Active Share.

The pioneers of the Active Share concept include leading researchers Dr. Martijn Cremers from the Yale School of Management and New York University Professor Antti Petajisto who originally published research on the topic in 1997. This paper provides a summary of their key findings and reviews the concept of Active Share, including its strengths and limitations. Additionally, we will highlight what we believe to be some key considerations for investors who may utilize the Active Share statistic as part of their evaluation process to identify an investment manager’s skill.

Our analysis, incorporated with Cremers and Petajisto’s research, highlights the following topics:

- Active Share is a straightforward and effective tool for identifying actively managed portfolios and evaluating the potential for alpha generation
- Research findings and trends in Active Share, as identified by Drs. Marjitn Cremers and Antti Petajisto
- Active Share is different from tracking risk. The two statistics evaluated together may provide additional insight into a manager’s investment strategy
- Further insight can be gained from combining Active Share with a variety of statistics and evaluating these relationships over time
- High Active Share managers typically exhibit above-average volatility; the efficiency ratios measure the potential benefits of this additional volatility and we review a basic framework for investing with high Active Share managers

Active Share Calculation

Cremers and Petajisto define the Active Share measure as the sum of the absolute difference of all of the overweight and underweight positions in a portfolio versus its “best fit” benchmark, divided by two (Figure 1).

We must first calculate the active weight in a portfolio before we calculate its Active Share. It is important to note that active managers must get credit for all ‘active’ decisions which include owning a stock that isn’t in the benchmark and also not owning a stock that is in the benchmark. For example, if Starbucks Inc. represents 2% of a benchmark and the manager owns 4% in the portfolio, this would be considered a 2% active position. Alternatively, the benchmark may own 2% in Microsoft Corp. but the manager may not own this stock in the portfolio. By taking the absolute value of the difference in weights of that stock, this would also be considered a 2% active position. This calculation is then completed for all of the stocks in the portfolio and all of the stocks in the benchmark and then the differences are summed up to arrive at a total active weight (Figure 2).

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Benchmark Difference</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starbucks Inc.</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Microsoft Inc.</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>.....</td>
<td>.....</td>
<td>.....</td>
</tr>
<tr>
<td>Total</td>
<td>4%</td>
<td>4%</td>
</tr>
</tbody>
</table>

This total active weight is then divided by 2 to arrive at the final Active Share.

The active weight can range from 0% (no differences – pure index) to 200% (entirely active – portfolio and benchmark are completely different). The total active weight is then divided by two to arrive at the final Active Share. The resulting statistic will range from 0% indicating a pure index strategy to 100% for an entirely active portfolio.
Cremers and Petajisto examined mutual fund data over a 23 year period and found that managers who took significant active positions performed better than those who took small positions. They learned that funds with the highest aggregate Active Share outperformed those with the lowest Active Share by roughly 2.5% per year. They attributed this result to greater "conviction" on the part of the manager and concluded that "most active diversified stock pickers and concentrated stock pickers have enough skill to generate alphas that remain positive even after fees and transaction costs." ("How Active is Your Fund Manager? A New Measure That Predicts Performance", in the Review of Financial Studies, 2006)

The Research

Cremers and Petajisto first published their research paper, "How Active is Your Fund Manager? A New Measure That Predicts Performance," in the Review of Financial Studies in 2006. The research study was updated in 2009 and again in 2011. The scope of their original research included domestic equity funds between the years of 1980 and 2003. Portfolio holdings were compiled on a quarterly basis and compared to nineteen different domestic equity benchmarks to ensure that the most appropriate benchmark was selected for each fund. The researchers summarized their key findings as follows:

- High Active Share predicted performance
- High Active Share funds outperformed both gross and net of fees
- High Active Share funds exhibited performance persistence
- Low Active Share funds were associated with underperformance

The table below (Figure 3) compares relative performance (annualized) of the top Active Share funds versus the bottom Active Share funds:

<table>
<thead>
<tr>
<th>Year</th>
<th>80-100%</th>
<th>60-80%</th>
<th>40-60%</th>
<th>20-40%</th>
<th>0-20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>+150 to</td>
<td>+113 to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>+240 bps</td>
<td>+115 bps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>+11 to</td>
<td>-142 to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>-63 bps</td>
<td>-183 bps</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One of the conclusions from Cremer and Petajisto’s research was the ‘size effect’ and its relationship to Active Share. Fund size (AUM) was found to be somewhat negatively correlated with Active Share, but not in all cases. Small funds were found to be generally more active than large funds. Additionally, the size effect strengthened with funds greater than $1B in assets, as those funds demonstrated lower Active Share.

The researchers further tested the historical relationship between Active Share and performance. They specifically sought to confirm that fund size was not the primary determinant of fund performance. To do so, they controlled their study by grouping funds into different size buckets. Higher Active Share again predicted fund performance within each size segment.

Other trends in Active Share statistics within domestic equity funds were also apparent. The percentage of funds with high Active Share in 1980 decreased significantly from 1980 to 2003. Conversely, funds with low Active Share dramatically increased from 1980 -2003 (Figure 4). We believe multiple factors contributed to these changes, including:

- The proliferation of index funds in the 1980’s and emergence of ETF’s in the 1990’s
- Increase in market volatility and tactical investing
- Fund manager fear of underperformance (low conviction)

Active Share vs. Tracking Risk

Prior to the introduction of Active Share, tracking risk (or tracking error) was the most commonly used statistic in identifying and describing the difference between a portfolio’s returns and the returns of its benchmark. The concept of tracking risk was first popularized by index fund managers as tracking ‘error’. Pure index fund managers were expected to replicate, before trading and other costs, the returns of an index exactly and any deviation from the index returns was deemed as ‘error’. We believe it is an important distinction to note that what is deemed as tracking ‘error’ for an index manager would not be considered an ‘error’ for an active fund manager. An active fund manager is expected to take risk outside of its benchmark in order to outperform the index. Therefore, the term “error” is a misnomer. Instead, the term “tracking risk” is more appropriate in the context of active management.
Figure 5 below depicts the differences between Active Share and tracking risk. There are a number of fundamental differences in the statistics. Most importantly, is the difference in how the statistics are calculated. Active Share is derived from portfolio/benchmark holdings, whereas tracking risk is derived from portfolio/benchmark returns. For example, on the first day that a portfolio manager decides to invest, we can quickly calculate the Active Share for that portfolio versus its benchmark before a single day of trading. Alternatively, the tracking risk calculation requires some minimal portfolio and benchmark trading history so that the returns can be incorporated into the calculation.

This two dimensional framework is explicitly laid out in Cremers and Petajisto’s research paper in Figure 6 below.

### Figure 5. Active Share v. Tracking Error

<table>
<thead>
<tr>
<th>Active Share</th>
<th>Tracking Error</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs (holdings)</strong></td>
<td><strong>Outputs (returns)</strong></td>
</tr>
<tr>
<td>Easier to Calculate (Excel)</td>
<td>Harder to Calculate (portfolio software)</td>
</tr>
<tr>
<td>All active bets are same (does not account for diversification)</td>
<td>Account for Covariance</td>
</tr>
<tr>
<td>High Score = &gt;80%</td>
<td>High Score = 8-15%</td>
</tr>
<tr>
<td>Low Score = &gt;60%</td>
<td>Low Score = 2-6%</td>
</tr>
</tbody>
</table>

*Both stats are closely related, but have differences.*

Another point of distinction is that tracking risk accounts for diversification benefits. Because Active Share is simply a sum total of the active bets in a portfolio, it treats all active bets equally. If a portfolio owns an information technology stock and a utility stock, neither of which can be found in the benchmark, then each stock will contribute equally to the ‘holdings-based’ Active Share statistic. Conversely, tracking risk is calculated using the total returns of the Fund and the benchmark, which will account for the diversification benefits realized by holding two stocks that are not perfectly correlated.

### Complementary Statistics: Active Share and Tracking Risk

After reviewing the primary differences between Active Share and tracking risk, there is additional context to be gained from combining the statistics together. This complementary relationship can be a vital component in the asset allocation and due diligence process for those who are charged with the responsibility of selecting/monitoring active managers. We found this concept to be one of the most compelling takeaways from the research performed by Cremers and Petajisto.

The two dimensional framework of Cremers and Petajisto, using Active Share and tracking risk, showed a clear positive correlation between both active management measures. However, their analysis showed considerable variation within almost all fund categories as funds with Active Share ranging from 30% to 100% had tracking risk scores between 4% and 16%.

At the origin of the graph above, pure index fund managers are expected to generate a zero Active Share with no tracking error, thereby fully replicating the index and its return pattern. Alternatively, an active manager may employ various styles when seeking to outperform their benchmark. Cremers and Petajisto categorized active managers into four basic groups: Closet Indexer, Diversified Stock Pickers, Concentrated Stock Pickers, and Factor Bets.

**Closet Indexing:** While still claiming to be active, a “closet indexer” scores low on both dimensions of active management. Cremers and Petajisto illustrated that closet indexers generally exhibited no ability to outperform and tended to lose money after relevant management fees and transaction costs.

**Factor Bets:** A fund manager that invests according to systematic factors (e.g., earnings surprise, economic indicators, etc.) by making sector bets can generate large tracking risk even without large deviations from index holdings. After fees and expenses, Cremers and Petajisto found that factor bets, on average, detracted from investor returns.

**Diversified Stock Picks:** A diversified stock picker can be very active despite having low tracking risk. The element of diversification will have a similar impact on the portfolio and benchmark returns, resulting in low tracking risk. However, the portfolio’s holdings may be significantly different from the benchmark’s holdings, resulting in high Active Share.

**Concentrated Stock Picks:** A concentrated stock picker tends to reflect higher conviction in the portfolio, which results in less diversification. The manager will exhibit both higher levels of tracking risk and Active Share.
According to a sample study performed by the researchers:

“The best performers are concentrated stock pickers (high Active Share, high tracking error), followed by diversified stock pickers (high Active Share, low tracking error). Both groups appear to have stock-picking ability, even after fees and transaction costs the most active of them beat their benchmark.”

- How Active Is Your Fund Manager? A New Measure That Predicts Performance p. 21, March 31, 2009, K.J. Martijn Cremers, Antti Petajisto

While the sample study from Cremers and Petajisto suggests that stock-pickers, in general, were able to add value relative to their respective benchmarks, one should not conclude that all high Active Share managers will outperform. There were cases throughout the observed sample period where high Active Share managers underperformed their benchmarks. As was stated earlier, the willingness to invest in areas outside of the benchmark carries with it the risk of underperformance, which is a reality that will always face active investors. The evolution of the four basic types of active management styles is illustrated in Figure 7 below.

**Figure 7. The Evolution of the Mutual Fund Industry**

(% of all equity assets)

Source: Cremers and Petajisto and Dresdner Kleinwort Macro research

**Incorporating Active Share in Manager Due Diligence**

Conceptually, stand-alone statistics are important because they provide an absolute and relative point of reference when making comparisons between managers. But a comparative analysis can be greatly strengthened by using multiple statistics as illustrated in Cremers & Petajisto’s two-dimensional view (see Figure 6) of active management incorporating Active Share and Tracking Risk. The synergies created by adding new statistical reference points can be multiplicative, not simply additive, because of the additional context provided (e.g., diversified and concentrated stock pickers, factor bets, closet indexers). Furthermore, evaluating these statistical relationships over time can provide an even more comprehensive perspective for making an educated investment decision when selecting a manager.

We can see from Figures 8 and 9 that a review of multiple statistics over time may provide quantitative evidence of a manager in transition. Figure 8 illustrates Active Share, Tracking Risk, Risk-adjusted Alpha, and Size (AUM) of the largest fund in the ‘Large Cap Growth’ category, as defined by Morningstar, over the past ten years.

**Figure 8. Active Share and assets of the Growth Fund of America**

Source: Cremers and Petajisto and Dresdner Kleinwort Macro research

**Figure 9. The Largest Fund, October 1997 - September 2012 Tracking Error - Rolling 5 Years (Annualized)**

Source: FactSet. Fund is largest based on total assets as of 9/31/12 as listed in the Morningstar Large Growth Catergory.

The inverse relationship between fund size (AUM) and Active Share of the subject manager is clear over time. Additionally, the decreasing levels of Tracking Risk and Risk-adjusted Alpha appear to be highly correlated with the lower Active Share over time (Figure 9).
These observable trends are very much in-line with the research findings and analysis performed by Cremers & Petajisto. We believe this type of analysis is another example of how Active Share can be used as a meaningful statistic in the manager due diligence and oversight process. When evaluating the historical profile and characteristics of a fund, it is reasonable to expect a consistent profile and set of characteristics to exist if the fund manager adheres to their stated investment process. As was illustrated in Figures 8 and 9, an analysis of a time series of certain portfolio statistics such as Active Share, fund assets, tracking risk and risk-adjusted alpha may provide early signals that a fundamental change to a fund manager’s process or style has occurred.

**Active Share and Diversification**

Diversification is often viewed as a critical objective when building an investment portfolio. Active Share can be a useful tool applied in the evaluation of not only a manager’s skill, but of how well-diversified a portfolio is. Inherently, to have high Active Share, a Fund manager will own stocks that are not held in the benchmark. The Active Share statistic is important because it illustrates the diversification that can be achieved when we add a high Active Share manager to either a passive allocation or when combining active managers in a multi-managed portfolio. In both scenarios, a high Active Share approach may provide real diversification benefits but its use must be carefully considered in the portfolio construction process.

When working through the due diligence process to add or replace an investment manager, calculating Active Share among funds under consideration can help better ensure that investment specific exposures are not unknowingly increased, potentially neutralizing diversification benefits.

We can see in Figure 10 that combining three high Active Share managers (equally weighted) does not necessarily result in a portfolio that maintains the same high Active Share. In a multi-managed format, it is imperative that Active Share is evaluated among the subject funds to properly assess the diversification benefits of blending them in a single portfolio.

**Risk Efficiency**

Active managers, by definition, assume the risk of underperformance when seeking to outperform their benchmark. In fact, there are an infinite number of ways in which an active manager’s performance can vary, especially from a benchmark or an appropriate peer group. Understanding this variance and its relationship to other peer strategies will allow investors to make a more informed decision when it comes to selecting a particular strategy and sizing the allocation percentage within a more diversified portfolio. Therefore, the concept of risk efficiency becomes increasingly important when evaluating the performance of a high Active Share manager. After accounting for diversification at the portfolio level and the associated return which stems from the additional risk taken, we believe that the additional volatility inherent in high Active Share managers is often justified. Risk efficiency ratios may help assess the risk-return profile of a particular strategy on both a standalone and relative basis. The most commonly used risk-efficiency ratios are the Sharpe Ratio and the Information Ratio.

**Sharpe Ratio:** The Sharpe Ratio is a measure of an investment manager’s excess return per unit of risk. The Sharpe Ratio is used to characterize how well the return of an investment compensates the investor for the risk taken. The higher the Sharpe Ratio, the more efficient a manager was at using risk (standard deviation) to generate excess return.

\[
\text{Sharpe Ratio} = \frac{(R_p - R_f)}{S_p}
\]

*Rp = Return of portfolio*  
*Rf = Risk-free return*  
*Sp = Standard deviation of portfolio*

**Information Ratio:** The Information Ratio is a measure of an investment manager’s risk-adjusted relative return. The Information Ratio compares a manager’s outperformance to their tracking risk. The higher the Information Ratio, the more efficient a manager was at using relative risk (tracking risk) to generate outperformance.

\[
\text{Information Ratio} = \frac{(R_p - R_i)}{S_{p-i}}
\]

*Rp = Return of portfolio*  
*Ri = Return of index*  
*S_{p-i} = Tracking Risk

---

**Figure 10. Holdings Overlap**

<table>
<thead>
<tr>
<th>Fund</th>
<th>Fund #1</th>
<th>66.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund #2</td>
<td>64.0%</td>
<td></td>
</tr>
<tr>
<td>Fund #3</td>
<td>67.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Portfolio (Equally Wtd.)</strong></td>
<td>53.5%</td>
<td></td>
</tr>
</tbody>
</table>

**Stock Example: MFST**

<table>
<thead>
<tr>
<th></th>
<th>Fund</th>
<th>Benchmark</th>
<th>Active Weight</th>
<th>Active Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund #1</td>
<td>6%</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Fund #2</td>
<td>0%</td>
<td>2%</td>
<td>-2%</td>
<td>1%</td>
</tr>
<tr>
<td>Fund #3</td>
<td>0%</td>
<td>2%</td>
<td>-2%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Portfolio (Equally Wtd.)</strong></td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Combining funds with high Active Share may not result in a more active portfolio.*
When comparing multiple investment managers, both the Sharpe Ratio and Information Ratio will allow the investor to make an ‘apples-to-apples’ comparison of the historical return-risk relationship that each manager achieved over the time period assessed. The Sharpe Ratio will provide a framework for evaluating absolute performance and the Information Ratio will provide a framework for evaluating relative performance.

### Sharpe Ratio and Information Ratio

\[
\frac{\text{Portfolio Return} - \text{Cash Return}}{\text{Portfolio Risk}} \quad \frac{\text{Portfolio Return} - \text{Benchmark Return}}{\text{Tracking Risk}}
\]

For both the Sharpe Ratio and the Information Ratio, positive and high scores are ideal. The ideal comparisons using these ratios are made across managers of a particular style (peer group). A simple ranking of the ratios will provide insight into the most and least efficient users of risk within the peer group. The higher the Sharpe or Information Ratio, the more efficient the Fund manager is at using risk to generate excess return. We believe it is important to reinforce that a careful analysis of these statistics over time and throughout varying market/economic cycles will provide the most comprehensive view of a manager’s ability to add value.

### Funding Strategy with High Active Share Fund Managers

Once the Fund manager initial due diligence and research process is complete and a buy recommendation has been made, the next step is typically the asset allocation and implementation process.

- **Asset Allocation**: A high Active Share fund manager will tend to display above-average levels of volatility on an absolute (standard deviation) and relative (tracking risk) basis. A strategy that uses a mix of active and passive funds or a strategy that implements the core-satellite approach may be effective strategy to help manage this inherent risk.

- **Timing of implementation**: Point-of-entry risk must also be considered when making an initial or subsequent investment with an active manager. Point-of-entry risk is the risk that an investor allocates funds to an investment or investment strategy at an unfavorable time. Unfavorable timing may be prior to a performance drawdown or at the top of a manager’s relative performance cycle (e.g., after a period of strong outperformance).

To assist investors with the asset allocation and implementation process, we believe the following guidelines provide a disciplined framework for allocating new or additional funds to a high Active Share manager:

- **Maintain a long-term time horizon**: By increasing the expected holding period and investing with a manager for the long term, investors lengthen the time available from which they may benefit from active management decisions throughout different phases of an economic cycle.

- **Dollar-cost average**: Allocating capital periodically over time may protect against the risk of funding prior to market downturns, allowing investors to “average in” to a particular investment.

- **Beware of peak-performance**: Be mindful of a manager’s performance cycle and try to avoid funding after periods of strong relative performance.

- **Asset allocate accordingly**: Understand an investment’s risk-return impact at the portfolio level and allocate accordingly. For example, if the objective is to gain exposure to a high Active Share manager as a complement to a core portfolio, the investor should allocate accordingly with a lesser percentage.

While these guidelines may apply generally when investing, we believe they are especially relevant to investing with high Active Share fund managers because of their inherently higher levels of relative risk. In today’s market environment where investors experience the seemingly endless exchange of the “risk on, risk off” trade, a measured approach to asset allocation and implementation may serve as an effective risk management tool.

### Summary Conclusion

A review of Active Share and the research findings of Cremers and Petajisto sheds new light on the evolution of active portfolio management. The proliferation of “passive” investment vehicles, such as index funds and exchange traded funds (ETFs), has dramatically changed the investment landscape over the past two decades, especially for active investment managers. Above-average market volatility, cost pressures, and the fear of underperformance have driven active managers closer to the benchmark. These trends are evident in the research published by Cremers and Petajisto where they introduce the concept of Active Share as the most effective measure of active management. Their research concludes that there is a strong relationship between managers that have high Active Share and their ability to generate consistent outperformance.

Active Share can be readily calculated and implemented in the fund manager due diligence and oversight process to increase the rigor of an analysis. Evaluating Active Share over time and in conjunction with other statistics (e.g., tracking risk, fund size, alpha) can help paint a more comprehensive picture of a manager’s performance over time. And because the typical high Active Share fund tends to exhibit above-average levels of volatility, investors should look to the diversification benefits and efficiency ratios (Sharpe and Information ratios) to better evaluate a manager’s fit in a broader portfolio and their ability to generate returns per each unit of risk that is taken.
The conclusion that high Active Share is closely tied to outperformance may seem contradictory to the most observable and current trends in the marketplace that embrace the use of "passive" investment vehicles. Furthermore, there have been many research publications devoted to the "failures of active management" citing that the average active manager underperforms its benchmark after deducting fees and expenses. But we believe that statistical "averages" can be misleading. The Active Share research from Cremers and Petajisto offers a new perspective on this debate by parsing the active management universe into those managers that are truly active and those that are not (closet indexers). We believe the most compelling takeaway from the research publication is the two-dimensional framework (Active Share vs. tracking risk) presented by Cremers and Petajisto, which further refines the universe of active managers to those that were "truly" active and more appropriately uncovers the linkage of high Active Share fund managers to persistent outperformance.

About the Authors

Wayne G. LeSage, Jr., CFA, is a Director, Investment Strategy Group with DundeeWealth US. He earned his BBA in Finance from the University of Notre Dame and an MBA in Finance from The Wharton School.

Oz Karakus, is a Senior Investment Analyst with DundeeWealth US. He earned his Bachelors Degree in Civil Engineering from Dokuz Eylul University in Izmir, Turkey and an MBA in Finance from LaSalle University.

Sameer Somal, CFA, CAIA, CFP®, is a Senior Investment Analyst with DundeeWealth US. He earned his BS in Finance and Accounting from Georgetown University.

Works Cited


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This white paper was co-authored in 2012 by our Chief Financial Officer, Sameer Somal, prior to the formation of Blue Ocean Global Wealth. We share Sameer’s research as a Senior Investment Analyst within Scotiabank’s Investment Strategy Group for reference and informational purposes only.