

Indexed ETFs vs. Indexed Separately Managed Accounts: A User's Guide

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Exchange traded funds (ETFs) offer retail and non-taxable investors a convenient and low-cost way to take advantage of the many benefits of indexing. However, for most taxable investors who have sufficient assets to qualify for separately managed accounts (SMAs), SMAs can go well beyond the basic tax efficiency of ETFs by creating a unique additional tax benefit while still indexing at low cost. Tax-loss harvesting SMAs have the potential to increase after-tax returns for index portfolios from 0.81% to 1.93% per year as compared to ETFs. This paper examines the alternative indexing approach of SMAs and compares the costs and benefits of ETFs and SMAs.

(Note: this version updates an earlier paper from 2011.)

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Executive Summary

- SMAs and ETFs both offer low-cost indexing.
- Their legal structure allows SMAs to benefit from “tax-loss harvesting” to add value.
- SMAs have the potential to increase returns after tax from 0.81% to 1.93% per year compared to ETFs.
- Cost and portfolio risk remain minimal compared to value added.
- ETFs are better for small portfolios or for some non-taxable investors.
- SMAs are better for most taxable investors with enough assets to qualify.
- SMAs offer additional flexibility compared to ETFs by allowing investors to customize their portfolios by incorporating constraints such as factor tilts and socially responsible overlays.

Introduction

The past decade has witnessed an enormous explosion in the popularity of ETFs, reflecting their low costs, general tax efficiency, and easy access for retail investors. ETFs indexed to a broad market reflect most of the benefits of indexing, while also avoiding the significant tax drag of active stock selection that can further diminish total wealth when measured after taxes.

However, for taxable investors ETFs may not provide the highest possible return available from indexing once taxes are incorporated into the measurement of investment success. This paper will examine the alternative indexing approach of SMAs of individual stocks and compare the benefits and costs of ETFs and SMAs. Both provide exposure to broad-market benchmarks through a transparent indexing strategy, but ETFs do so through a single security that in turn owns the underlying stocks in the benchmark, while an SMA holds the actual individual stocks. Both can earn a higher return by saving on expenses paid to money managers, but only SMAs can save a lot more on expenses paid to the government in the form of taxes.

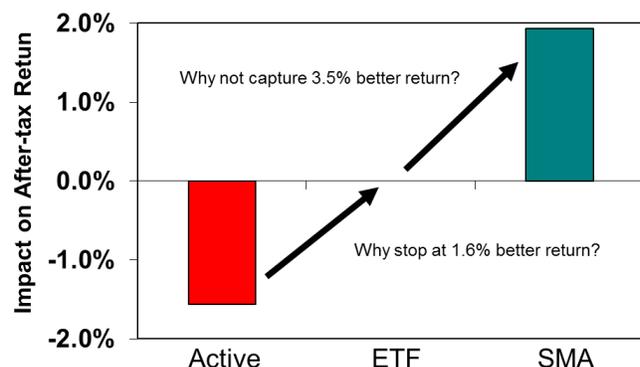
Mechanics of Tax-Managed SMAs

How do indexed SMA portfolios actually create higher returns once taxes are included? The basic concept, called tax-loss harvesting, incorporates holding a portfolio's winners and selling its losers while rebalancing with an index methodology to maintain constant exposure to a benchmark, such as the S&P 500. As a simplified example, if Coca Cola is at a loss within a portfolio, the stock can be sold and replaced with Pepsi, which still keeps the portfolio in balance with the benchmark's exposure to soft drink companies. Thus a taxable investor can recognize the tax loss, which can shrink the size of the check the investor will send to the IRS, while still earning about the same pre-tax return as the benchmark. While it may seem counterintuitive to value losses as beneficial, accountants and financial analysts have long understood that reducing expenses can be as effective a way to improve the bottom line as increasing return.

The first step to understanding the value added requires shifting from measuring investment performance that ignores taxes, called pre-tax return, and focusing instead on after-tax return. For taxable investors, that's the only number that really counts anyway. In terms of improving after-tax performance, savvy taxable investors who choose ETFs already benefit enormously from the improved tax efficiency of indexing and passive investing over active management. Such ETF investors avoid the significant tax penalty from active managers' high-turnover strategies that trigger high tax bills not for the managers but rather for their investors. The average tax drag from gains booked by active managers has been a whopping 1.57% per year of lost returns over the past 20 years.¹

However, investors with sufficient assets to qualify for SMAs can go even further than simply eliminating this tax penalty by actually creating a tax benefit while still indexing at very low cost. Because of the legal structure of ETFs, losses cannot be passed through to their shareholders, whereas SMA investors can benefit from earning pre-tax returns similar to a benchmark, like conventional indexing, while at the same time earning extra after-tax return in the form of a lower tax bill to the government. The chart on the right illustrates how moving from the average active manager to traditional indexing through an ETF improves after-tax return by 1.57% per year, as shown by eliminating the tax drag in red. With SMAs, though, a

Impact of Gains on Returns



For illustrative purposes only. The above is hypothetical and not based on any actual client. The performance does not reflect the deduction of fees a client would pay with an SMA account, which would reduce performance. Client returns will vary.

¹ Based on data from Morningstar as of 12/31/2014 comparing the pre-tax and after-tax returns of all actively managed US equity mutual funds that existed throughout the trailing 20-year period, excluding tax effects of dividends and liquidation. Data reflect 2014 maximum federal and high-tax state rates, with California as a proxy for high-tax states.

taxable investor can improve beyond that already substantial gain by capturing an additional 1.93% per year by moving from ETFs to SMAs, as shown in green.²

We'll turn now to a simple example to illustrate how the extra benefit adds value in an overall portfolio while still earning pre-tax index returns during the first year of an indexed SMA. In any portfolio, the value of losses generated presumes the presence of taxable gains elsewhere in an investor's portfolio from sources like active strategies or the disposition of concentrated positions or other assets. In the table below we'll assume that an investor has a portfolio allocation of \$12 million to riskier assets, divided between 1) \$7 million in actively managed hedge funds, and 2) \$5 million in an equity index strategy, first through an ETF and then through an SMA. (A diversified investor might own safer assets like bonds as well, but since they don't generally affect gains, we'll omit them from this illustration.) We'll also assume that all assets earn a return of 7%, but that the hedge fund throws off 100% of its pre-tax return in realized short-term gain, the ETF throws off no capital gain, and the SMA throws off losses as designed.

Hypothetical Example of Value Added in First Year³

		Hedge Fund Plus ETF	Hedge Fund Plus SMA
Portfolio Allocation	Hedge Fund, Beginning Value	\$7,000,000	\$7,000,000
	Index Equity, Beginning Value	\$5,000,000	\$5,000,000
	Total Portfolio, Beginning Value	\$12,000,000	\$12,000,000
Portfolio Pre-Tax Return		7.0%	7.0%
Pre-tax Portfolio, Ending Value		\$12,840,000	\$12,840,000
Tax Impact	Capital Gain, Hedge Fund	\$490,000	\$490,000
	Capital Gain, Index Equity	\$0	-\$516,500
	Net Capital Gain	\$490,000	-\$26,500
	Tax at 52.1%	-\$255,290	\$0
Ending Wealth		\$12,584,710	\$12,840,000
Value Added by SMA, \$			\$255,290
Portfolio After-Tax Return		4.9%	7.0%
Value Added by SMA, %			2.1%

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² Source: *ibid.* for 1.6% tax drag. SMA value added reflects additional after-tax return of 1.9% for high-tax states as described in the table on page 5, excluding tax effects of liquidation. ETFs are assumed to generate no capital gains, which is why their tax drag is shown as 0.0%.

³ The SMA account is presumed to generate 10.33% of initial portfolio value in losses in first year, all of which are short-term. Losses generated in the SMA account after the first year will include both short- and long-term and will decline over time. First-year benefits may overstate value across multiple years due to the prevalence of losses earlier in a portfolio's existence. Dividends have been ignored as the tax treatment remains constant between ETF and SMA. Returns exclude any fee differential between ETF and SMA. The tax rate assumes a federal rate of 44.6% and a net state rate of 7.50% on short-term gains. Effects of liquidation are excluded.

Higher Returns

So how big is this supposed benefit from the loss harvesting over a longer time horizon? We'll start first by calculating the theoretical benefit and then turn to historical performance of actual portfolios. The table below shows the annual theoretical after-tax return improvement generated by a loss harvesting strategy over 10 years, based on different assumptions on taxes and the final disposition of the assets in question: whether they're liquidated or passed on to charities or heirs.

Hypothetical Forecast of Annual Value Added After Taxes

	No State Tax	High State Tax
Liquidated	0.81%	0.94%
Not Liquidated	1.57%	1.93%

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These benefits reflect the advantage of an SMA versus an indexed ETF, ignoring expenses for either. The numbers are calculated based on Monte Carlo simulations⁴ that forecast after-tax performance across a wide range of market outcomes. The benefits shown reflect federal and high-tax state income tax rates as of 2014, with California as a proxy for high-tax states.

Turning from the theoretical to actual data observed over the last 10 years, the historical returns for the Aperio Total US Market Composite of SMA accounts have generated a tax benefit net of fees of 2.27% per year versus the Russell 3000 benchmark's after-tax returns, reflecting only federal taxes, as shown in the table below.

10 Year Annualized After-Tax Returns as of 12/31/2014

	Index	Aperio Composite	Benefit of Harvesting
Russell 3000	7.50%	9.77%	2.27%
S&P 500	7.23%	9.01%	1.78%

For both composites, model fees of 0.35% have been subtracted from the Aperio composite, but not from the index. The performance of any individual account may deviate from the composite due to the age of that account relative to the age of the cohort of accounts that comprise the composite. Past performance is not an indication of future returns. The Aperio composite performance returns are net of advisory fees and expenses and reflect the reinvestment of dividends and other income. Please refer to important disclosures on page 15.

Such a high benefit can be misleading given that there have been periods of high volatility during that time, meaning that opportunities for loss harvesting have been unfortunately robust. Thus the Monte Carlo simulation may provide a more reliable forecast, but the historical results do at least prove that the value can be added in practice.

⁴ See Appendix I for details.

While loss harvesting in an SMA can provide significant benefits, both theoretically and empirically, some investors have taken the approach that they can just as easily harvest losses using only ETFs, which to a limited extent is true. An investor can use the same basic approach of selling an ETF when it's down, although IRS rules prevent immediate reinvestment into what is defined as substantially the same asset. While ETF investors may be prohibited from repurchasing the identical asset, some interpret IRS rules as not applying to shifts in underlying indices, such as selling out of an S&P 500 index fund and buying a Russell 1000 index fund.⁵

Nonetheless, investors can create some limited losses through this approach, but significantly less benefit than can be generated in a separate account. This disadvantage reflects the fact that a separate account holds numerous securities that are not perfectly correlated and have a higher volatility than the market index. The increased number of securities allows for more consistent tax-loss harvesting as some securities will decline in value even if the overall portfolio increases in value. For example, the Russell 3000 returned 19.4% in 1999 but approximately 55% of the stocks in the index had negative returns. If an investor held the ETF, there would be minimal (or no) loss harvesting opportunities. An SMA holder would still have plenty of eligible stocks with which to harvest losses. Further, the higher volatility of individual stocks compared to the index ETF makes it more likely that opportunities for loss harvesting will exist. The higher the volatility of an asset, the more likely there will be a large enough drop in value at some point to economically harvest losses. See Appendix II for more details about the difference in volatility that explains the increase in harvesting opportunities.

The table below compares the tax-loss harvesting benefits of SMAs versus ETFs using federal income tax rates only and assuming portfolio liquidation at the end of the period. The numbers are calculated based on Monte Carlo simulations⁶ that forecast after-tax performance across a wide range of market outcomes.

Hypothetical Harvesting Strategy Comparison

Harvesting Strategy	Total Losses Forecast Over 10-Year Period, % of Original Portfolio	Forecast Annual After-Tax Return Benefit from Harvesting
ETF	13%	0.23%
SMA	45%	0.81%

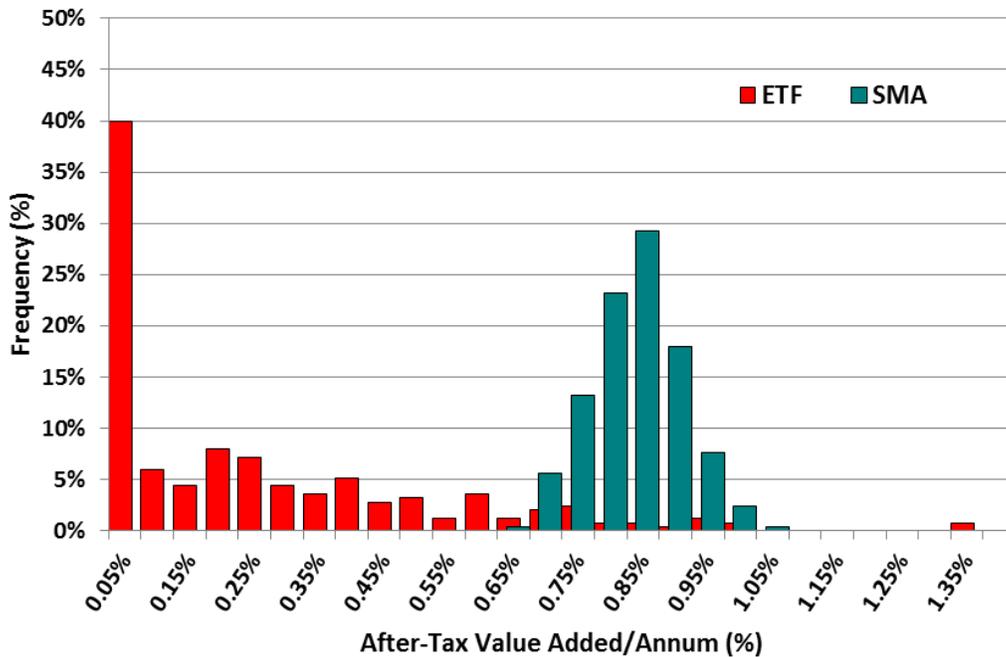
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As evidenced in the table above, SMAs can on average generate significantly greater after-tax value added than ETFs. In addition, a closer look at the simulation results indicates that the after-tax value added for SMAs is also significantly more consistent. The graph below shows the distribution of after-tax value added for both SMAs and ETFs. As can be seen, the SMA value added is tightly concentrated around the average value added, while the ETF has a much wider range of values. In approximately 40% of the simulations, the ETF value added is less than 0.05% per year. The lowest value-added SMA simulation had a tax alpha of 0.6% and outperformed approximately 90% of the ETF simulations.

⁵ IRS does not clearly establish what constitutes “substantially the same” asset.

⁶ See Appendix I for details.

**Hypothetical Distribution of Tax-Loss Harvesting
After-Tax Value Added: ETFs vs. SMAs**



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The table below describes benefits across different market return environments, presuming that the IRS wash sale rules do not limit loss harvesting.

Hypothetical Harvesting Across Market Conditions

Market Return	ETF	SMA
>+20%	No harvesting	Some harvesting
0% to +20%	No harvesting	Good harvesting
-20% to 0%	Some Harvesting	Excellent harvesting
<-20%	Good Harvesting	Excellent harvesting

For illustrative purposes only. The above is hypothetical and not based on any actual client. Client returns will vary.

Extra Costs Incurred

Now that we’ve seen the potential for substantial benefits from using SMAs over ETFs for taxable investors, the skeptic might ask, “That’s all well and good, but what are the disadvantages in terms of risk and fees?” We’ll begin with risk and then address fees.

Since both index SMAs and ETFs are really just variations of indexing, the appropriate metric is comparative risk to the benchmark. This risk, referred to as tracking error, reflects the probability of missing the benchmark, whether by outperforming or underperforming. While foreign ETFs

can introduce some tracking error of their own, for domestic benchmarks the ETFs produce only negligible tracking error, so we'll focus on the tracking of SMAs.

SMAs, like indexed ETFs, attempt to mimic the performance of an underlying benchmark index through holding some of its individual stocks. Because of the harvesting of losses in the SMA version, it's necessary to sell the stocks that have declined and immediately reinvest in companies with similar risk characteristics. Through highly sophisticated equity risk models, SMAs can tightly control this slight extra variation around a benchmark's returns.

Forecast tracking error for domestic SMA index accounts typically starts at around 0.30%, rising during the harvesting of losses to between 0.75% and 1.50%. Historically, Aperio's observed pre-tax tracking error has been 0.91% for the Aperio Total US Market Composite,⁷ which reflects the average variability of single accounts and includes performance both better and worse than the benchmark. When all of that variability is combined across large numbers of accounts, however, the ups and downs average out to a net difference versus the benchmark of +0.12% gross of fees.⁸

Speaking of fees, ETFs can sometimes offer a lower cost to the investor. For simple domestic portfolios, the fee advantage for ETFs typically ranges from 0.15% to 0.30% for smaller accounts, but that difference can drop dramatically for large portfolios. For foreign accounts, the difference is typically smaller, and for large accounts ETFs can actually cost more than SMAs even though they track the same benchmark. The table below shows the annual after-tax return advantage of SMAs as compared to ETFs across a wide range of tax scenarios and fee differentials. The numbers are calculated based on Monte Carlo simulations⁹ that forecast after-tax performance across a wide range of market outcomes.

Hypothetical Net After-Tax Return Improvement for SMA Compared to ETF

Cost Difference Between Approaches: SMA fee minus ETF fee		0.00%	0.05%	0.10%	0.15%	0.20%	0.25%	0.30%
Liquidated	No State Tax	0.81%	0.76%	0.71%	0.66%	0.61%	0.56%	0.51%
Liquidated	High State Tax	0.94%	0.89%	0.84%	0.79%	0.74%	0.69%	0.64%
Not Liquidated	No State Tax	1.57%	1.52%	1.47%	1.42%	1.37%	1.32%	1.27%
Not Liquidated	High State Tax	1.93%	1.88%	1.83%	1.78%	1.73%	1.68%	1.63%

For illustrative purposes only. The above is hypothetical and not based on any actual client. Client returns will vary.

⁷ Average annualized tracking error versus the benchmark Russell 3000 across all Aperio Total US Market Composite accounts with at least three years of monthly returns. Appendix III provides more information about tracking error.

⁸ Cumulative composite returns gross of fees since inception at 08/31/2003 through 12/31/2014 for the Aperio Total US Market Composite are +0.12% per year. Including 0.35% in fees would reduce comparative performance by that amount.

⁹ See Appendix I for details.

The question of course arises whether the benefit net of fees shown in the table above sufficiently justifies the incremental tracking error. To determine the value added by SMAs after adjusting for both incremental costs and risk, we'll utilize a metric commonly used by institutional investors: the information ratio, which compares the value added by a strategy to the amount of comparative risk borne, as measured by tracking error. Most investors are concerned with pre-tax tracking error, which averaged 0.91% for accounts in the Aperio Total US Market Composite. The ratio of after-tax alpha divided by pre-tax tracking error for these accounts is 1.94. However, the correct computation of an after-tax information ratio uses the after-tax tracking error, which averaged 2.19%. The after-tax tracking error is higher because it includes the tax alpha generated through loss harvesting. Unlike most sources of pre-tax alpha which can be positive or negative, after-tax alpha is skewed positive because the loss harvesting manager only looks to realize losses and avoid capital gains. Together with an average after-tax alpha of 1.84%, this yields an after-tax information ratio of 0.81.

To put the SMA after-tax information ratio in context, according to Grinold and Kahn's *Active Portfolio Management*,¹⁰ a widely respected authority on measuring active managers, an information ratio of 0.5 puts a manager in the top quartile of performance rankings and 1.0 puts a manager in the top decile. The SMA after-tax information ratio is even better, though, given that the rankings used by Grinold and Kahn were based on pre-tax information ratios, which means they hadn't been adjusted for the tax penalty for active management documented previously.

When Should Investors Use ETFs and When Should They Use SMAs?

We've seen the substantial and reliable value that SMAs can add for taxable investors, but that doesn't mean that SMAs are always preferable. For many investors, ETFs represent the wisest choice. The first and most obvious advantage of ETFs remains their ability to provide diversification even for smaller portfolios given that there is virtually no minimum size. Tax-indexed SMAs, on the other hand, usually require higher minimums. Unfortunately for those investors without large enough portfolios, the tax and other advantages of SMAs remain unavailable.

In addition to the size requirement, the economics of value added for indexed SMA investors depends on the presence of taxable gains that flow through to Schedule D, the part of IRS Form 1040 that reflects capital gains and losses. For a tax-exempt investor with no need for the customization available with SMAs, ETFs are frequently the lowest-cost option and thus the best choice to optimize wealth.

For most taxable investors, though, if they have the assets to qualify for SMAs, the advantages over ETFs clearly outweigh the drawbacks. For these investors, indexed SMAs offer consistently reliable tax benefits not available with ETFs. These benefits can translate directly into higher after-tax returns and higher after-tax wealth, as quantified earlier. In addition, SMAs offer flexibility and the ability to customize a portfolio well beyond what an ETF investor can achieve, as described in more detail in Appendix IV.

¹⁰ Richard Grinold and Ronald Kahn. *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk*. New York: McGraw-Hill, 1999.

Conclusion

While both ETFs and index SMAs offer comparatively low fees and the potential for superior pre-tax returns common to nearly all forms of indexing, only SMAs have the ability to provide sizable tax-loss harvesting to taxable high net worth (HNW) investors who have large enough portfolios. While ETFs remain a better choice for smaller investors or for tax-exempt accounts with no customization needs, for the vast majority of taxable HNW investors, the tax-loss harvesting advantages of SMAs can result in a much more profitable index strategy.

Appendix I: Assumptions Underlying Monte Carlo Simulations

The data shown in the Monte Carlo simulations reflect the following assumptions:

Time Horizon	10 years
Individual Stock Volatility	34.23%
Dividend Yield	2.0%
Bid/Ask Spread (round-trip)	0.10%
Annual Delisting from Index	4.0%
Per-Share Commissions	\$0.01
Expected Market Return	7.0%

The value added shown on page 5 reflects the comparison of the internal rate of return for an ETF with no tax consequences other than from delisting versus the internal rate of return for a loss harvesting SMA.¹¹

¹¹ Some ETFs and open-ended mutual funds can offset the distribution of net capital gains associated with company delistings, which can improve their after-tax returns.

Appendix II: Role of Volatility

In a tax-managed SMA, value can be created through the harvesting of losses while still hewing to the benchmark and thus maintaining the basic market exposure of an indexed ETF. This process reflects the difference between the lower risk of the overall market, as reflected in ETFs, and the higher risk of the individual stocks that comprise the overall market. For the 20-year period from 1995 to 2014, the Russell 3000 carried a risk in standard deviation of 18.08%, while the weighted average individual stock's risk was 34.23%.

Because of this difference between the risks of the overall stock market and the individual stocks within the market, the loss harvesting available in an SMA can be significantly higher than what's available by harvesting losses with ETFs. The higher the volatility of an asset, the more likely there will be a large enough drop in value at some point to warrant paying the small transaction costs necessary to realize the loss. To manage risk, this process is implemented through a multi-factor model, which allows for losses on individual securities to be realized while still ensuring that the overall SMA portfolio looks very much like an indexed ETF. Thus the overall risk of the SMA portfolio can be nearly identical to the overall risk of an ETF, but the higher volatility of the individual stocks within the portfolio allows for significant loss harvesting. Active managers cannot achieve this extra return without bearing additional benchmark risk, which is why their information ratios tend to be so much lower than an indexed SMA strategy. See page 9 for more details on information ratios.

Appendix III: Tracking Error

Tracking error is a statistical measure, the standard deviation around the benchmark's returns. Aperio's historical pre-tax tracking error of 0.91% compared to the Russell 3000 Index for accounts in the Aperio Total US Market Composite measures the annualized magnitude of the variation across time and across accounts. Like any stochastic variable, the mismatches have both a mean (average) deviation as well as a standard deviation. The mean impact of the return mismatches has been approximately 0% across time and accounts, which is to be expected from portfolio theory and the Monte Carlo simulations. A mean of 0% is also the goal of both ETF and SMA indexing on a pre-tax basis, i.e., investors want their index funds to return the same as their benchmarks. Thus the return mismatches have had a mean of approximately 0% and a standard deviation of 0.91%.

The 0.91% historical pre-tax tracking error for SMAs is the comparative risk borne by an SMA investor, and the question remains whether the extra return justifies the small incremental extra risk. The information ratio discussed on page 9 converts the extra return and extra risk into a single easy-to-compare number that for the SMA offers an extraordinarily strong and predictable relationship as to whether the tracking error is worth it. Based on these results, it most certainly is worth it for most taxable investors.

One additional issue often arises with tracking error, the challenge of understanding that it measures only comparative risk, not the increase in absolute portfolio risk. For example, if an ETF portfolio based on a broad-market index has a beta of 1.00 and an expected annualized standard deviation of 18.08%, as mentioned in Appendix II, that does not mean that adding 0.91% of pre-tax tracking error will increase the portfolio risk to 18.99%, because only variance risk terms can be added, not standard deviations, which are calculated as the square root of the variance, as shown in the table below.

	Variance	Standard Deviation
Market Risk (benchmark)	3.27%	18.08%
Incremental Pre-Tax Tracking Error	0.01%	0.91%
New Portfolio (combined risk)	3.28%	18.10%
Net Increase in Risk vs. Market		0.02%

Thus an investor *does* take on additional incremental overall portfolio risk with an indexed SMA, but it's only 0.02% higher than the benchmark itself.

Appendix IV: Special Situations

In addition to the potential higher after-tax return of straightforward tax-loss harvesting, SMAs offer additional benefits beyond the basic economics that can make them even more compelling in certain situations, as described below.

1. **Migration of an existing portfolio**
 Investors who seek to terminate one manager or deploy assets received from an exchange fund face negative tax consequences from liquidating a portfolio and paying the taxes. Index SMAs allow for evaluating the trade-offs between tracking error and tax impact to optimize a portfolio's conversion.
2. **Charitable contributions**
 SMAs allow for similar management of the tax consequences of allocating assets for charitable donations, enabling investors to optimize the impact of risk and taxes on gift planning.
3. **Ongoing liquidity management**
 Investors who need to withdraw cash can do so more efficiently from a tax perspective within an SMA than with ETFs. With a single ETF purchase, a withdrawal effectively forces any taxable gains at the average cost basis of the entire portfolio, unlike within an SMA, where the highest-cost lots can be selected to control the tax costs more efficiently.
4. **Customization**
 Taxable high net worth (HNW) investors often face highly complex portfolio issues that can be addressed more effectively through SMAs than through one-size-fits-all ETFs. While still taking advantage of all the improved risk-adjusted return benefits, HNW investors can sometimes best achieve the following goals through an SMA:
 - Constructing a risk-offset portfolio to build around an existing concentrated position, such as the stock of a company founder,
 - Reflecting the social or environmental values of an investor, such as excluding unwanted industries like tobacco or overweighting positively perceived behavior like clean energy,
 - Incorporating factor tilts sought by those who seek to outperform based on specific criteria selected by the investor, such as emphasizing quality companies or those with above-average dividend yields.

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Certain performance figures in this piece are hypothetical returns and have certain limitations. Unlike actual returns, hypothetical returns do not represent actual trading and since trades have not been executed, the results may have under- or over-compensated for the impact, if any, of certain market factors. Also, hypothetical returns are designed with the benefit of hindsight and no representation is being made that any account will or is likely to achieve any profit or loss similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any trading program. In addition, hypothetical trading does not involve financial risk and does not take into account that material and market factors may have impacted an advisor's decision making if the advisor were actually managing a client's assets. Hypothetical performance results have been prepared with the use of past performance, and past performance is no guarantee of future results. It should not be assumed that Aperio clients' investments will be profitable, or equal either the hypothetical results reflected or any corresponding index or benchmark presented. In addition, performance can, and does, vary between individuals.

The performance numbers shown are for the Aperio US Large Cap and Aperio Total US Market composites and are net of Aperio fees presumed to be 0.35% per annum, excluding other custodian fees. Trading commissions from flat-fee charges and cents-per-share fees are included. The composites include Aperio's actively managed, fully discretionary portfolios tracking the specified benchmark index. Fully discretionary portfolios are those without legacy holdings, constraints, guidelines, or other client-driven requirements that would impact the portfolio tracking a particular benchmark. Performance is calculated on a total return basis, which includes all dividends, interest, and accrued interest, plus realized and unrealized gains or losses. After-tax performance is an estimate based on the highest US federal tax rates, unless directed otherwise by the client or financial advisor. Portfolios in the composite are actively managed and the structure of the actual portfolios may be at variance to the benchmark index. The composite benchmarks shown are the S&P 500 Index and Russell 3000 Index. Index returns reflect reinvestment of dividends, but do not reflect fees, brokerage commissions, or other expenses of investing.

The S&P 500 Index is an unmanaged group of securities representative of the large-capitalization US equity market. The Russell 3000 Index is an unmanaged group of securities representative of the broad US equity market.

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