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Tax Management for Smart-Beta Indices

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QONTIGO AXIOMA | DAX | STOXX

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Introduction

Tax alpha is an often-overlooked source of improving passive and smart-beta index performance. Direct indexing offers an investment approach to harvest tax alpha in practice. It has lately emerged as a prominent investment theme where a portfolio manager replicates an index by "directly" holding the basket of securities in the index rather than a wrapper containing the individual assets such as an ETF or a mutual fund. Direct indexing provides a customized portfolio for an investor that:

a) includes passive and smart-beta investing;
b) promotes tax efficiency;
c) incorporates personal views on security selection including sustainability and ESG;
d) avoids the expense ratios of ETFs and where the investor only pays negligible costs with zero-commission trades.

With the proliferation of separately managed accounts (SMAs) from online brokerages, zero-commissions, and fractional share trading, direct indexing is no longer confined to "high net-worth" investors and is slowly replacing ETFs as the investment vehicle of choice: (Geraci, 2019) and (Nadig, 2019).

We are particularly interested in the tax-efficiency of direct indexing in this paper since the investor can harvest losses and defer gains on individual securities in the portfolio according to their personal needs. With an ETF or a mutual fund, the investor has no control over what gets bought or sold within the portfolio offering fewer opportunities for tax optimization. Furthermore, we consider tax efficient smart-beta portfolios based on the flagship STOXX Factor Index Suite with direct indexing to realize the tax advantages. Smart-beta strategies naturally lend themselves to tax alpha given their high turnover. A companion research paper (Yildiz, Generating Tax Alpha with Optimized Index Tracking, 2021) discusses tax-efficiency in passive investing where the client portfolio closely tracks a market-cap weighted index.

Smart-beta factors are measurable attributes that explain the cross-section of asset returns and generate excess returns over a market-cap weighted benchmark in the long-run. The STOXX Factor Index suite consists of five single-factor indices and a multifactor index engineered to deliver the risk premium associated with each factor using a diversified index of securities with carefully managed exposure, liquidity, and risk characteristics ((Qontigo, Factor-based Indices, 2021), (Qontigo, STOXX Factor Indices: Targeted Factor Exposures with Managed Liquidity and Risk Profiles, Jan 2020)). The index construction methodologies leverage STOXX's market-cap benchmarks to define the selection universe, as well as Qontigo's factor risk modeling and portfolio construction expertise to define the factors and build the indices. The five factors are Value, Momentum, Small Size, Low Risk, and Quality. The Multifactor index is an equal weighted sum of the five single-factor exposures. In this paper, we show that, although, the factor strategies deliver impressive factor risk premia, they are not designed with tax efficiency in mind. There is a dichotomy among factor portfolios where some strategies are less tax efficient than others. (Israel & Moskowitz, 2012) illustrates this with Value and Momentum. They show that the Value portfolio that generates dividends and sells overpriced stocks to generate gains is not tax efficient. A turnover constrained Momentum portfolio, on the other hand, holds on to recent winners and sells recent underperformers, thereby, harvesting losses and promoting tax efficiency. Other papers showing the efficiency of tax-managed equity factor portfolios (Santadomingo, Fall 2016), (Dunn, 2018), and (Goldberg, Hand, & Cai, 2019). Our paper is the first to apply the concept of tax efficiency to the flagship STOXX Factor Indices that are rebalanced on a quarterly basis.

This paper is organized as follows:

1) We first document the modest post-tax performance of the tax agnostic STOXX Factor Indices between December 2001 to September 2020.

2) We generate novel tax-efficient smart-beta portfolios by running a novel supplementary optimization that minimizes the tax gains of the portfolio while preserving the factor tilts, liquidity, and risk characteristics of the tax-agnostic portfolio. The tax-efficient factor portfolio attempts to maintain the risk-premium coming from the smart-beta factor and promotes tax efficiency. When the investor can make optimal use of the harvested losses by offsetting gains in other accounts, we show a tax alpha ranging from 0.7% - 1.1% over the factor premium across all smart-beta portfolios. We develop an attribution that shows that the tax-alpha is being systematically harvested over time. We also show that the tax alpha is significant when the investor liquidates the portfolio at the end of the last rebalancing for consumption.

3) We show that assumption of unlimited benefit from harvested losses is not crucial for our findings, and we get similar tax alpha in the "stand-alone" portfolio scenario where the investor only has a single account, can at most drive the tax liability to zero, and does not get an immediate credit for harvesting losses more than the gains in the portfolio.

4) Finally, we show that our tax alpha results are robust by generating a hierarchy of tax-efficient portfolios that trade-off factor alpha and tax efficiency, starting our backtests in different market environments, and running the tax optimization with different short-term and long-term tax rates.

STOXX US Smart-Beta Indices

We focus on the STOXX US Smart-Beta Indices in this section. We start with a brief description of the five single-factors and the multi-factor exposures:

1) **Low Risk:** Exploits the low-risk anomaly where assets with lower risk deliver higher risk-adjusted returns. Equal weighted combination of low beta and low residual volatility. Beta is computed by regressing the time-series of asset returns against market returns. Residual volatility is computed as the 125-day average of the asset's absolute return divided by the cross-sectional volatility of the market, orthogonalized to the beta factor.
2) **Momentum:** Captures the stock's past performance, which is defined as the stock's cumulative return over the past year (250 days) excluding the last month (20 days). The past month contains a reversal effect that is excluded from the stock's momentum score.
3) **Multifactor:** Combines the five single-factors with equal weighting. The multi-factor portfolio is based on empirical evidence that it is superior to generate a portfolio that maximizes its exposure to the "integrated" factor score rather than equally combining the five single-factor portfolios. The multi-factor portfolio combines the relatively uncorrelated single-factor exposures to generate a better IR.
4) **Quality:** Targets profitable stocks that have low leverage. Quality is 75% profitability and 25% low leverage. Profitability is the equal weighted average of the following descriptors: return-on-equity (ROE), return-on-assets (ROA), cashflow-to-assets, cashflow-to-income, gross margins, and sales-to-assets. Leverage is the equal weighed sum of the following descriptors: debt-to-assets, and debt-to-equity. Note that we target a negative exposure to leverage in the quality factor.
5) **Small Size:** Relies on the empirical evidence that smaller capitalization stocks outperform larger capitalization stocks over time. Size is the negative of the natural logarithm of the assets' market capitalization.
6) **Value:** Measures how cheap a stock is relative to its fundamentals. Value is the weighted sum of book-to-price (33%) and earnings yield (67%). Book-to-price is the ratio of common equity to the market-capitalization. Earnings yield is the average of realized and forecasted earnings-to-price. Realized earnings-to-price is calculated as the ratio of annual net income to current market-capitalization while forecasted earnings-to-price is calculated as the ratio of the 12-month forward-looking earnings estimate to the current market-capitalization.

The US portfolios are rebalanced quarterly in December, March, June, and September. They use the STOXX® USA 900 market capitalization weighted benchmark, which includes the large and medium-cap stocks in the US market, as the investible universe. Each smart-beta portfolio maximizes its factor exposure and satisfies the following exposure, liquidity, and risk constraints.

- Long-only and fully invested.
- Annualized ex-ante tracking error less than 5%.
- Active absolute industry and country exposures of at most 5%.
- Active absolute non-factor active exposures of 25%.
- 4.5/8/35 diversification rule.
- Round-trip 25% turnover threshold in each quarterly rebalancing.
- Minimum asset threshold holding of 3 bps.
- Hold at most 25% of the benchmark names.

- Target 30 % of the effective number of names of the benchmark to maintain a minimum number of names.
- Max asset weight less than 20 times the benchmark weight.
- Maximum weighted days-to-trade (WDTT) of bottom two liquidity quintiles less than 10 times the benchmark WDTT in each quintile.
- No trading in stocks with zero or missing trading volume.

The US factor portfolios use the Axioma US Fundamental Medium-Horizon Risk Model (AXUS4-MH), and the weights are constructed using the Axioma Portfolio Optimizer™ (APO).

Backtesting results on STOXX US Smart-Beta Indices

We present backtesting statistics in Table 1, including active pre-tax return, ex-post active risk, and information ratio, for different tax-agnostic factor indices. We see that Momentum, Multifactor, Quality, and Small Size are the best performing factors with impressive IRs. Value, however, has been an inconsistent performer since 2007 and has a negative performance over our backtesting period.

Table 1. Statistics for Different Tax-Agnostic Factor Indices (Dec 2001 – Sep 2020)

	Low Risk	Momentum	Multifactor	Quality	Small Size	Value
Active return (%)	0.41	2.86	2.94	2.70	1.56	-0.48
Active risk (%)	5.78	5.88	4.49	4.70	4.37	6.85
Information ratio	0.07	0.49	0.65	0.57	0.36	-0.07

Source: Qontigo

We compare the active pre-tax and post-tax returns for the different tax-agnostic factor indices in Table 2. Details on how the post-tax return is computed are given in the next section. We see that the active post-tax returns are consistently lower than the active pre-tax returns for all factor indices. We will consider tax-managed smart-beta indices in the following section. Our aim is to show that the post-tax performance can be improved by generating tax-efficient factor portfolios while preserving the pre-tax performance representing the smart-beta risk premium.[1]

Table 2. Active Pre-Tax Returns and Post-Tax Returns for Different Tax-Agnostic Factor Indices (Dec 2001 – Sep 2020)

	Low Risk	Momentum	Multifactor	Quality	Small Size	Value
Active Pre-tax Return (%)	0.41	2.86	2.94	2.70	1.56	-0.48
Active Post-tax Return (%)	-0.45	2.29	2.06	1.76	0.71	-1.08

Source: Qontigo

[1] The post-tax performance can be better than the pre-tax performance. We assume that the investor has several separately managed accounts (SMAs) and has unlimited short-term and long-term gains in other accounts to make optimal use of the harvested losses in the current account.

Tax-Managed Smart-Beta Indices

We start this section with some tax terminologies. A holding lot is created each time an asset is purchased in the portfolio and it is a tuple with book-keeping information, such as the asset-ID, number of shares purchased, prevailing asset price, and date of purchase. An investor realizes a gain (loss) when the shares in the holding lot are sold for a price that is greater (lower) than the lot's purchase price. The gain (loss) is short-term (long-term) if the lot has been held for less (more) than a year. The investor pays weighted taxes on the short-term and long-term gains and dividends in the portfolio, basing on the long-term and short-term rates, which currently are 23.8% and 40.8%, respectively, for our base portfolios. For simplicity, we assume that the dividends are all qualified dividends that are subject to the long-term tax rate. We also assume that the investor has several separately managed accounts (SMAs) and can harvest unlimited losses in the current account to offset gains in other managed accounts at the end of the year.

We define LTG as the long-term gains variable that is the sum of the long-term gains over all the holding lots of assets in the portfolio. Similarly, LTL, STG, and STL denote the long-term losses, short-term gains, and short-term losses variables, respectively. Our tax objective function is the following:

$$Weighted\ Net\ Tax\ Gains\ (WNTG) = \ 0.238 * (LTG - LTL) + 0.408 * (STG - STL)$$

The tax liability at the end of the year is the sum of the WNTG and taxes paid on any dividends collected during the year.

We first introduce a metric called the "excess pre-tax return" [2] of a portfolio, defined by

$$Excess\ pre\text{–}tax\ return\ = Tax\text{–}aware\ pre\text{–}tax\ return - \ Tax\text{–}agnostic\ pre\text{–}tax\ return \tag{1}$$

Similarly, we define 'excess post-tax return' by:

$$Excess\ post\text{–}tax\ return\ = Tax\text{–}aware\ post\text{–}tax\ return - \ Tax\text{–}agnostic\ post\text{–}tax\ return \tag{2}$$

The active performance is measured against the STOXX USA 900 portfolio. We want to emphasize that a tax-managed portfolio can have an active post-tax return that exceeds its active pre-tax return. This will happen, for instance, if this portfolio harvests plenty of losses that the investor can presumably use to offset gains in other accounts before paying the tax for the year.

We define the "tax alpha" of the portfolio as:

$$Tax\ alpha = \ Excess\ post\text{–}tax\ return - Excess\ pre\text{–}tax\ return \tag{4}$$

We ideally want the excess pre-tax return of the portfolio to be zero, ensuring that the tax-managed portfolio harvests the same factor performance as its tax-agnostic counterpart. In this case, the tax alpha is simply the excess post-tax return of the tax-managed portfolio over its tax-agnostic counterpart.

Assuming returns compound geometrically and taxes are paid throughout the year, we can approximately estimate:

$$Cumulative\ post\text{–}tax\ return\ = \ Cumulative\ pre\text{–}tax\ return - \sum_i \frac{tax_i}{portfolio\ size\ i} \tag{5}$$

where $\sum_i tax_i$ is the sum of the taxes paid across all periods. One can then estimate the smart-beta cumulative tax alpha by:

$$Cumulative\ tax\ alpha = \frac{Excess\ tax\ return}{portfolio\ size\ i}$$
$$= Cumulative\ excess\ post\text{–}tax\ return - Cumulative\ excess\ pre\text{–}tax\ return \tag{6}$$

[2] We use "excess" return when comparing the tax-managed portfolio against the tax-agnostic portfolio and "active" return when comparing the performance of a portfolio against the STOXX USA 900 benchmark.

with

$$Excess\ tax\ return = \sum_i \left(tax_{\{i,ag\}} - tax_{\{i,aw\}}\right) = \sum_i \left(WNTG_{\{i,ag\}} - WNTG_{\{i,aw\}}\right) + \sum_i \left(taxd_{\{i.ag\}} - taxd_{\{i,aw\}}\right) \quad (7)$$

where the subscript *ag* and *aw* denote the tax-agnostic and tax-managed portfolios, respectively, and *taxd* refers to the tax paid on dividends. We will use formula (6) to illustrate how the tax-managed portfolios obtain tax alphas systematically.

Our tax-efficient smart-beta portfolio minimizes the WNTG, subject to the following constraints:

- All the constraints imposed on the tax-agnostic smart-beta portfolio.
- Active exposure of tax-managed portfolio ≥ $(1 - \epsilon)$ * active exposure of corresponding tax-agnostic portfolio.
- Tracking error ≤ t, with the tax-agnostic portfolio as benchmark.

Note that the tolerance $\epsilon > 0$ determines the trade-off between the smart-beta alpha and the tax alpha, whereby a tighter tolerance puts more emphasis on the smart-beta alpha while a looser tolerance allows the strategy to harvest more tax alpha at the expense of the smart-beta alpha. On the other hand, the parameter $t > 0$ limits the tracking error of the tax-managed smart-beta portfolio from the tax-agnostic smart-beta portfolio, where a tighter value gives a tax-managed portfolio that better tracks the tax-agnostic portfolio while harvesting less tax alpha. Like the tolerance ϵ, one can interpret the tracking error limit as a trade-off between the excess pre-tax return and the tax alpha. We use both parameters to make sure that the tax-managed smart-beta portfolios can target certain levels of smart-beta alpha and tracking error at the same time.

The tax-managed factor portfolio is designed to track the carefully managed exposure, liquidity, and risk characteristics of its tax-agnostic counterpart, and thus we expect that the two portfolios have similar exposures to dividend yield, one of the factors in the AXUS4-MH risk model. Given this, we expect that both portfolios pay similar taxes on dividends during the year, and that the excess tax return is primarily coming from differences in the cumulative WNTG. Moreover, the difference in the cumulative WNTG is positive in general since the tax-managed smart-beta portfolio is minimizing this term in the taxable phase of the optimization.

To summarize the tax-managed portfolio is attempting to maximize the tax alpha by maximizing the excess post-tax return, while maintaining the factor exposure, liquidity, and risk profile of the tax-agnostic portfolio to harvest a similar factor risk premium. We will henceforth use the tax alpha to demonstrate the tax advantage of the tax-managed factor portfolios.

Results and Discussion

Frontiers on Tracking Error Limit

In this section we show the excess pre/post-tax performances for the tax-managed STOXX Factor Indices, including Low Risk, Momentum, Multifactor, Quality, Small Size, and Value, against the tax-agnostic counterpart. The portfolios are rebalanced on a quarterly schedule (Dec, Mar, Jun, and Sep) between Dec 2001 to Sep 2020. The benchmark is the STOXX USA 900. We want to emphasize that the tax-agnostic factor portfolios represent the flagship STOXX factor indices that were released in Mar 2020.

The tax-managed portfolios run a supplementary optimization that minimizes the tax gains while satisfying all the constraints of the flagship STOXX Factor Indices. There are two adjustable parameters, the alpha active exposure threshold ϵ and the tracking error threshold t that control the proximity of tax-managed factor portfolio from the supplementary optimization to the tax-agnostic factor portfolio from the smart-beta portfolio construction phase. We investigate the choice of the tracking error threshold t. We fix the active exposure threshold at 10% ensuring that each tax-managed portfolio targets an active exposure that is at least 90% of the active exposure of the corresponding tax-agnostic factor portfolio. We use APO to carry out the taxable optimization. Short-term tax rate is 40.8% and long-term tax rate is 23.8%.

A short comment on how the post-tax performance is computed is in order. We assume that taxes are paid during the December rebalancing of the year. The tax-liability is the sum of the WNTG and any long-term taxes on dividends and can be negative if tax losses exceed gains during the year. Note that we are assuming that we can harvest unlimited losses to offset gains in other accounts of the client portfolio and that a negative tax liability appears as a net credit in the portfolio.

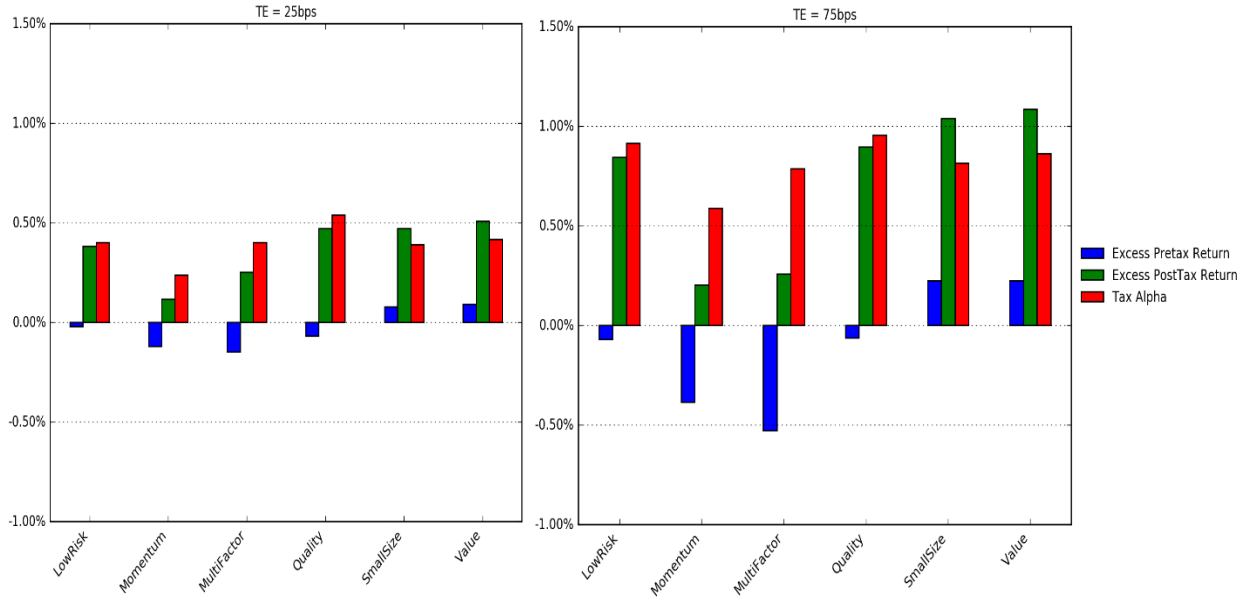
Table 3. Performances for Different Tax-Managed Factor Indices with Different TE Values Against Corresponding Tax-Agnostic Portfolios (Dec 2001 – Sep 2020)

	TE = 25bps	TE = 50bps	TE = 75bps	TE = 100bps
Low Risk				
Excess pre-tax return (%)	-0.02	-0.02	-0.07	-0.02
Excess post-tax return (%)	0.38	0.68	0.85	1.05
Excess liquidated post-tax return (%)	0.28	0.46	0.54	0.69
Realized tracking error (%)	0.29	0.54	0.82	1.05
Tax alpha (%)	**0.40**	**0.70**	**0.92**	**1.07**
Liquidated tax alpha (%)	**0.30**	**0.48**	**0.61**	**0.71**
Momentum				
Excess pre-tax return (%)	-0.12	-0.26	-0.38	-0.56
Excess post-tax return (%)	0.12	0.17	0.20	0.14
Excess liquidated post-tax return (%)	0.06	0.04	0.02	-0.08
Realized tracking error (%)	0.22	0.43	0.65	0.92
Tax alpha (%)	**0.24**	**0.43**	**0.58**	**0.70**
Liquidated tax alpha (%)	**0.18**	**0.30**	**0.40**	**0.48**
Multifactor				
Excess pre-tax return (%)	-0.15	-0.37	-0.53	-0.74
Excess post-tax return (%)	0.25	0.25	0.26	0.16
Excess liquidated post-tax return (%)	0.16	0.11	0.07	-0.05
Realized tracking error (%)	0.30	0.65	0.94	1.19
Tax alpha (%)	**0.40**	**0.62**	**0.79**	**0.90**
Liquidated tax alpha (%)	**0.31**	**0.48**	**0.60**	**0.69**
Quality				
Excess pre-tax return (%)	-0.07	-0.11	-0.06	-0.09
Excess post-tax return (%)	0.47	0.67	0.90	1.00
Excess liquidated post-tax return (%)	0.38	0.50	0.67	0.73
Realized tracking error (%)	0.32	0.63	0.95	1.16
Tax alpha (%)	**0.54**	**0.78**	**0.96**	**1.09**
Liquidated tax alpha (%)	**0.45**	**0.61**	**0.73**	**0.82**
Small Size				
Excess pre-tax return (%)	0.07	0.01	0.22	0.20
Excess post-tax return (%)	0.48	0.67	1.05	1.10
Excess liquidated post-tax return (%)	0.36	0.45	0.73	0.74
Realized tracking error (%)	0.29	0.58	0.92	1.26
Tax alpha (%)	**0.41**	**0.66**	**0.83**	**0.90**
Liquidated tax alpha (%)	**0.29**	**0.44**	**0.51**	**0.54**
Value				
Excess pre-tax return (%)	0.09	0.14	0.22	0.41
Excess post-tax return (%)	0.51	0.83	1.08	1.37
Excess liquidated post-tax return (%)	0.41	0.62	0.79	1.01
Realized tracking error (%)	0.31	0.62	0.86	1.18
Tax alpha (%)	**0.42**	**0.69**	**0.86**	**0.96**
Liquidated tax alpha (%)	**0.32**	**0.48**	**0.57**	**0.60**

Source: Qontigo

Table 3 compares the annualized performance of the tax-managed and tax-agnostic portfolios for a fixed active exposure limit of 10%, and the tracking error limit varying from 25 bps to 100 bps. The left exhibit of Figure 1 shows that the pre-tax return of each tax-managed factor portfolio is in line with the pre-tax return of the tax-agnostic portfolio for the tighter tracking error of 25 bps, ensuring that both portfolios harvest the same factor return. Each tax-managed portfolio also closely tracks its tax-agnostic counterpart, and the realized TE is in the 25-30 bps range. Moreover, for this case, the excess annualized tax alpha varies from 24 bps for the Momentum portfolio to 54 bps for the Quality portfolio with the tax alpha representing the excess post-tax return of the tax-managed portfolio over its tax-agnostic counterpart. The higher tax alpha for the Value and Quality portfolios and the somewhat lower tax alpha for Momentum is not surprising and in line with previous results (Israel & Moskowitz, 2012) and (Santadomingo, Fall 2016). A general observation is that the Momentum portfolio sells recent underperformers harvesting plenty of short-term losses and is already tax efficient. The tax-agnostic Value and Quality, on the other hand, sell recent winners and generate plenty of short-term gains. Consequently, when one imposes tax-efficiency, the tax-managed Value and Quality portfolios generate plenty of tax alpha over their tax-agnostic counterparts.

Figure 1. Tax Alpha Decompositions for Different Factors with TE = 25bps and 75bps, Respectively (Dec 2010 - Sep 2020)

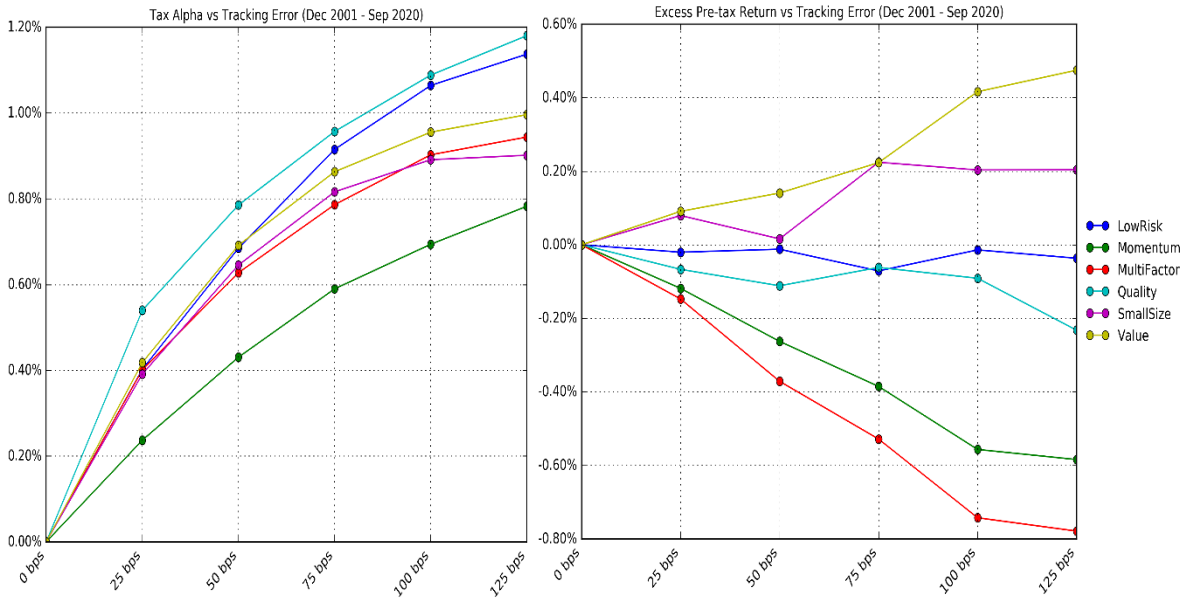


Source: Qontigo

The right exhibit of Figure 1 shows that the factor portfolios deliver more tax alpha for a looser tracking error limit of 75 bps with the tax alpha varying from an annualized 58 bps for the Momentum portfolio to an annualized 96 bps for the Quality portfolio. However, the tax alpha comes with a degradation with the pre-tax return for some of the factor portfolios, especially the Momentum and Multifactor portfolios. Table 3 also indicates that the excess pre-tax returns for the Momentum and Multifactor portfolios are -38 bps and -53 bps indicating that the tax-managed Momentum and Multifactor portfolios are giving up a little factor alpha. To further reinforce this point, we run a frontier on the TE limit from 0 bps to 125 bps in Figures 2 and 3. Figure 2 shows that the tax alpha increases steadily with tracking error and levels off when the tracking error limit is

100bps. Furthermore, Figure 3 shows that the excess pre-tax return is relatively unchanged around zero until a tracking error of 25 bps. From t = 25 bps to t = 50 bps, the increase in the tax alpha is coming at the expense of a reduced pre-tax return, i.e., diminished factor performance. Given that our objective is to boost tax-performance through improved post-tax performance while preserving the factor performance, we will henceforth use a compromise tracking error limit of 75 bps for our base strategy. Table 3 shows that the realized TE between the tax-managed and the tax-agnostic portfolios varies between 65 bps for the Momentum portfolio to 95 bps for the Quality portfolio, ensuring that the realized TE in line with the ex-ante TE limit of 75 bps.

Figure 2 (left). Tax Alpha vs Tracking Error (Dec 2001 - Sep 2020)
Figure 3 (right). Excess Pre-Tax Return vs Tracking Error (Dec 2001 - Sep 2020)



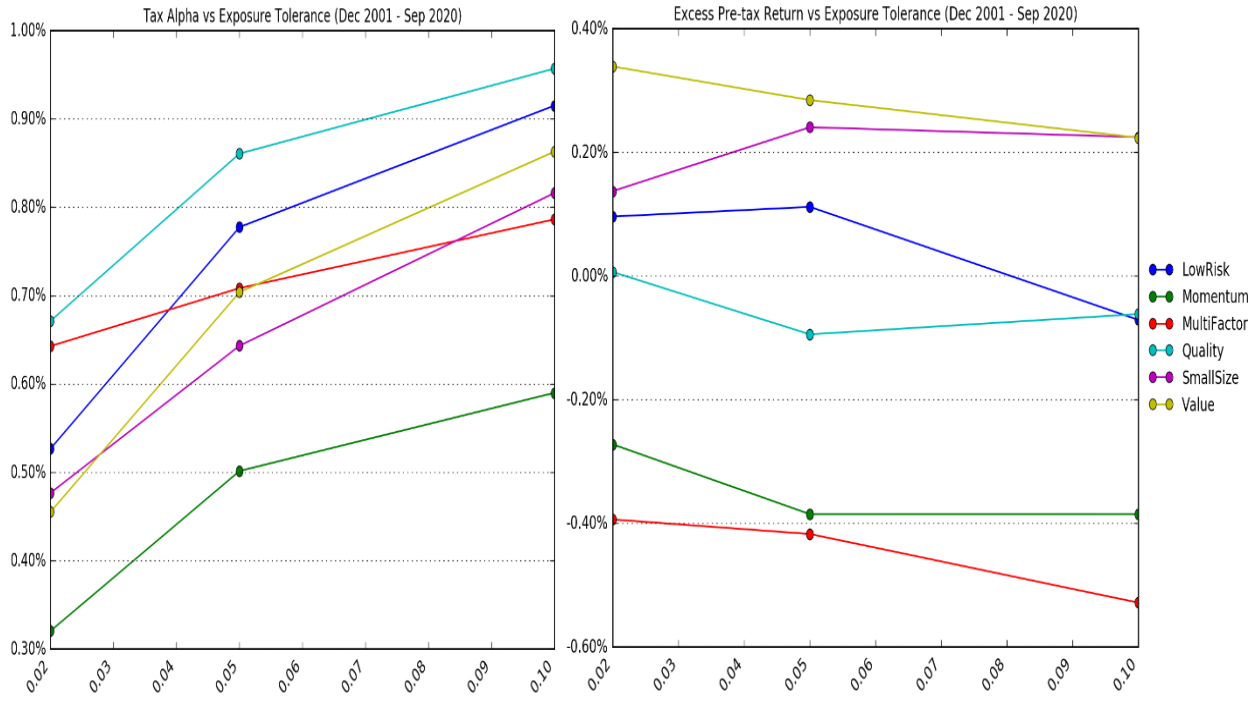
Source: Qontigo

Frontiers on the Exposure Tolerance

We want to emphasize that our tax-managed smart-beta strategy is customizable. We can tune the targeted tracking error and smart-beta exposure of the tax-managed portfolio and, thereby, control the trade-off between factor alpha and tax efficiency. The previous section discussed our choice of tracking limit of 75 bps. We discuss our choice of factor exposure tolerance of ϵ = 10%, where the tax-managed portfolio targets an active factor exposure that is at least 90% of the active exposure of the corresponding tax-agnostic factor portfolio in this section.

We run a frontier on the factor exposure threshold with ϵ = 2%, 5%, and 10% in turn. Results are discussed in Figures 4 and
Figure . Figure 4 shows that the tax alpha increases rapidly when ϵ increases from 2% to 10%; the increase in the tax-alpha is especially rapid when ϵ increases from 2% to 5%. Figure 5 shows that the improved tax alpha is coming with a minor degradation in the pre-tax excess return. Given this, we calibrate our factor exposure tolerance ϵ = 10% in the base strategy. For the rest of the paper, our base strategy uses a calibrated TE limit of 75 bps and a factor exposure tolerance of ϵ = 10%.

Figure 4 (left). Tax Alpha vs Exposure Tolerance (Dec 2001 - Sep 2020)
Figure 5 (right). Excess Pre-Tax Return vs Exposure Tolerance (Dec 2001 - Sep 2020)

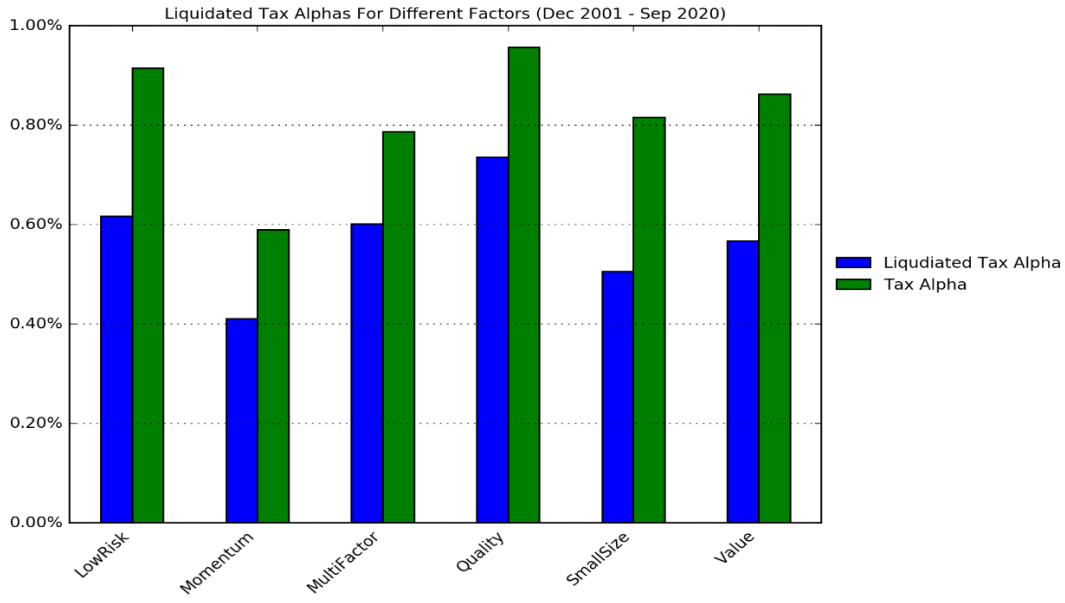


Source: Qontigo

Liquidated Tax Alpha

The liquidation at the end of the last rebalancing can affect the tax alpha of the tax-managed portfolios. This is because the tax-managed portfolio defers gains and is forced to pay taxes on these gains at liquidation. Figure 6 compares the liquidated tax alpha with the tax alpha without liquidation. As expected, the liquidated tax alpha is less than the tax alpha for all the factor portfolios. Nevertheless, the tax-managed factor portfolios get significant annualized liquidated tax alpha ranging from 40 bps for Momentum to 73 bps for the Quality portfolio.

Figure 6. Liquidated Tax Alpha for Different Factors (Dec 2001 - Sep 2020)

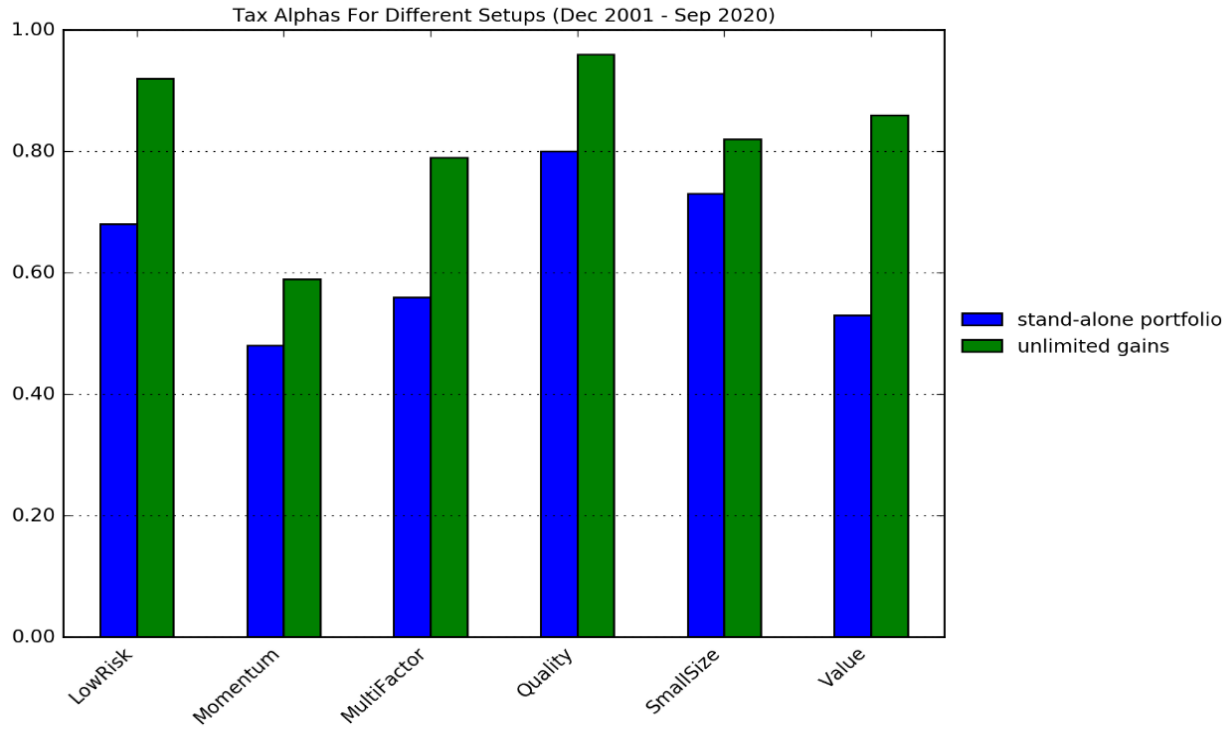


Source: Qontigo

Stand-Alone Portfolio vs Unlimited Gains

We assume that the investor has several separately managed accounts (SMAs) and can harvest unlimited losses in the current account to offset gains in other managed accounts at the end of the year. We want to emphasize that each tax-managed factor portfolio also generates a positive tax alpha when we assume that the investor has a single account and can only use losses to offset the gains in this account. In this case, the investor can at most drive the tax liability to zero and does not get an immediate credit for harvesting losses more than the gains in the portfolio. We refer to this strategy as the "stand-alone-portfolio" perspective, where the investor can carry their excess losses to offset gains in future years. Figure 7 compares the stand-alone with the default unlimited-gains perspective. We can see the tax alpha in the stand-alone setting is comparable to the tax alpha in the unlimited gains setting. Moreover, the tax alpha in the stand-alone setting varies from an annualized 48 bps for the Momentum portfolio to 80 bps for the Quality portfolio.

Figure 7. Factor Tax Alphas for Different Setups (Dec 2001 – Sep 2020)



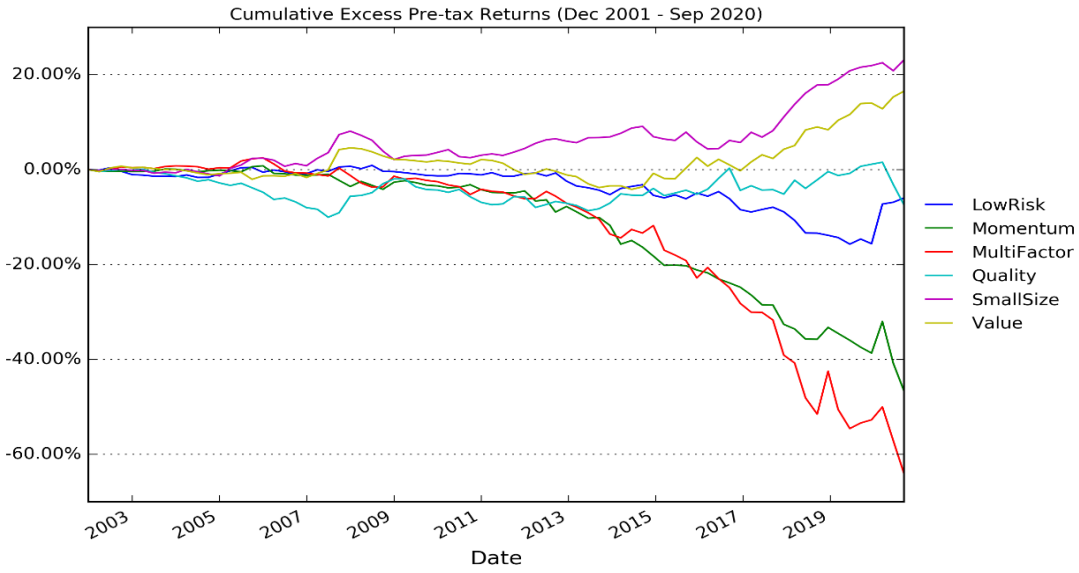
Source: Qontigo

Systematic Tax Alpha Harvesting

Figures 8 and 9 show the cumulative excess pre-tax and post-tax factor portfolio returns of the tax-managed portfolios against their tax-agnostic counterparts, respectively. We see a downward trend in the cumulative excess pre-tax returns for several of the factor portfolios since the tax-managed portfolios are sacrificing some of factor risk premia while promoting tax efficiency. On the other hand, we see an upward trend in the cumulative post-tax returns for all the factor portfolios in Figure 9 due to tax efficiency. Figure 10 shows the cumulative tax alpha that is the difference between the cumulative excess post-tax and the cumulative excess pre-tax returns for different factors from Figures 8 and 9. We see a consistent upward trend in the cumulative tax alpha across all the factors. Figures 8 and 9 also show that the tax alphas for most portfolios are coming primarily from the better post-tax returns of the tax-managed portfolios over the corresponding tax-agnostic portfolios. The exceptions are the Momentum and Multifactor portfolios where the excess tax alphas are coming from the poor factor performance of the tax-managed portfolios.

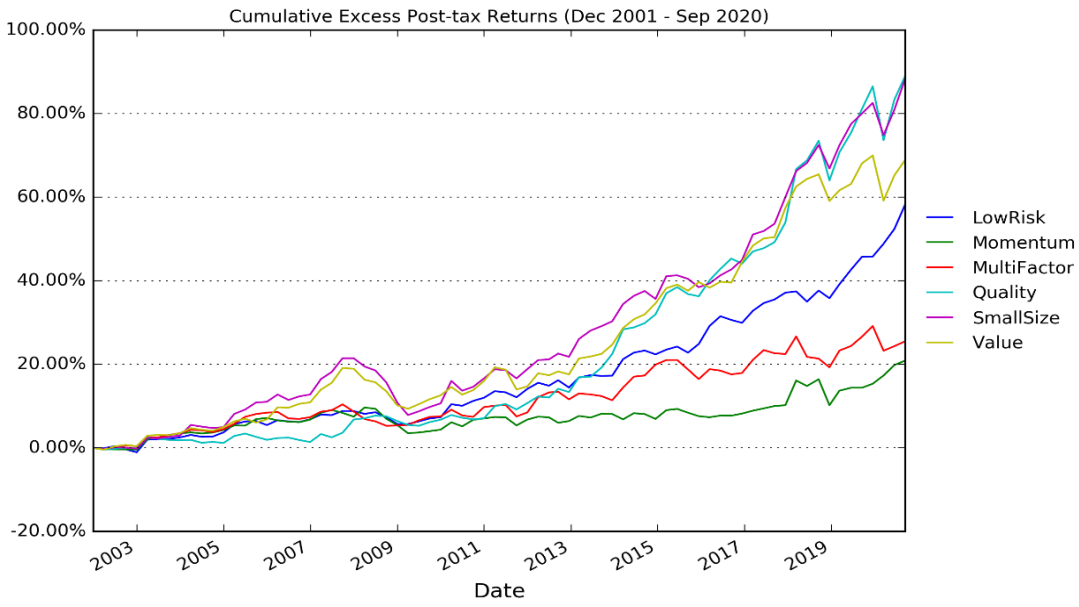
Figure 11 plots the time-series of the ratio of the realized loss to total loss for the Value factor. The total loss includes the sum of the realized and the unrealized loss in the portfolio where the unrealized loss is computed over all the holding lots that are not yet sold and whose current value is less than the cost basis. One can see that the tax-managed portfolio is realizing more losses than its tax-agnostic counterpart and these losses are used to offset gains and minimize the tax liability of the portfolio. Similarly, Figure 12 plots the time-series of the ratio of the unrealized gain to total gain for the Value portfolio. The unrealized gain is computed over all the holding lots that are not yet sold and whose current value is more than the cost basis. One can again see that the tax-managed portfolio is trying to defer gains into the future with a view to minimize the tax liability. These twin objectives, i.e., harvesting losses immediately for credit and deferring gains into the future, explain the improved post-tax active performance of the tax-managed portfolios.

Figure 8. Cumulative Excess Pre-Tax Returns (Against the Tax-Agnostic Index) for All Factors (Dec 2001 - Sep 2020)



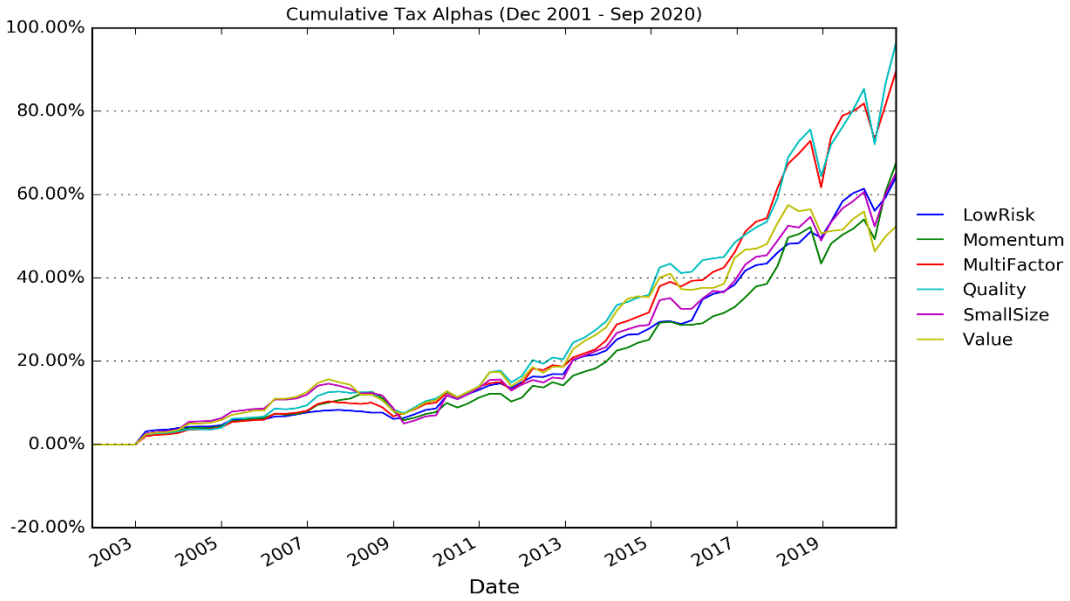
Source: Qontigo

Figure 9. Cumulative Excess Post-Tax Returns (Against the Tax-Agnostic Index) for All Factors (Dec 2001 - Sep 2020)



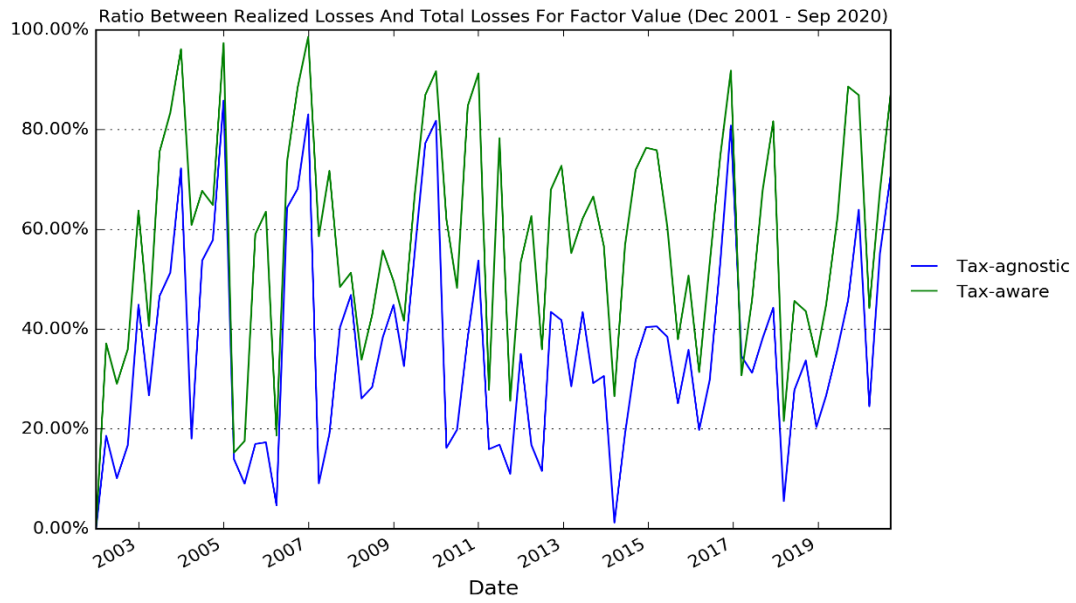
Source: Qontigo

Figure 10. Cumulative Tax Alphas for Different Factors (Dec 2001 – Sep 2020)



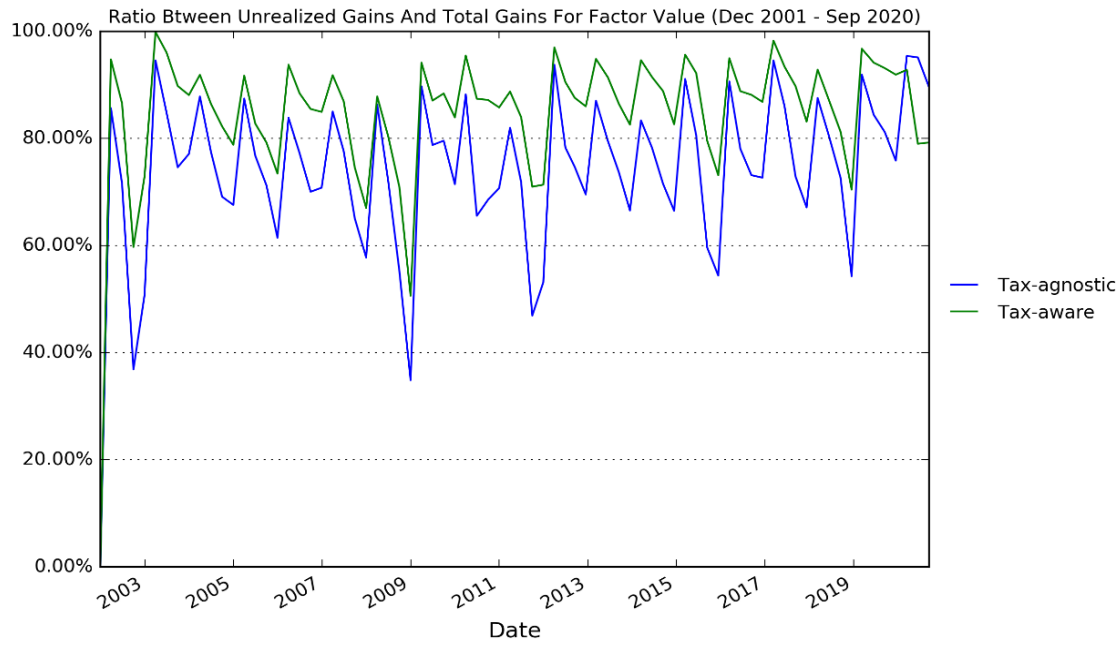
Source: Qontigo

Figure 11. Ratio Between Realized Losses and Total Losses for Each Period for Factor Value (Dec 2001 - Sep 2020)



Source: Qontigo

Figure 12. Ratio Between Unrealized Gains and Total Gains for Each Period for Factor Value (Dec 2001 - Sep 2020)



Source: Qontigo

Robustness of Tax Alpha

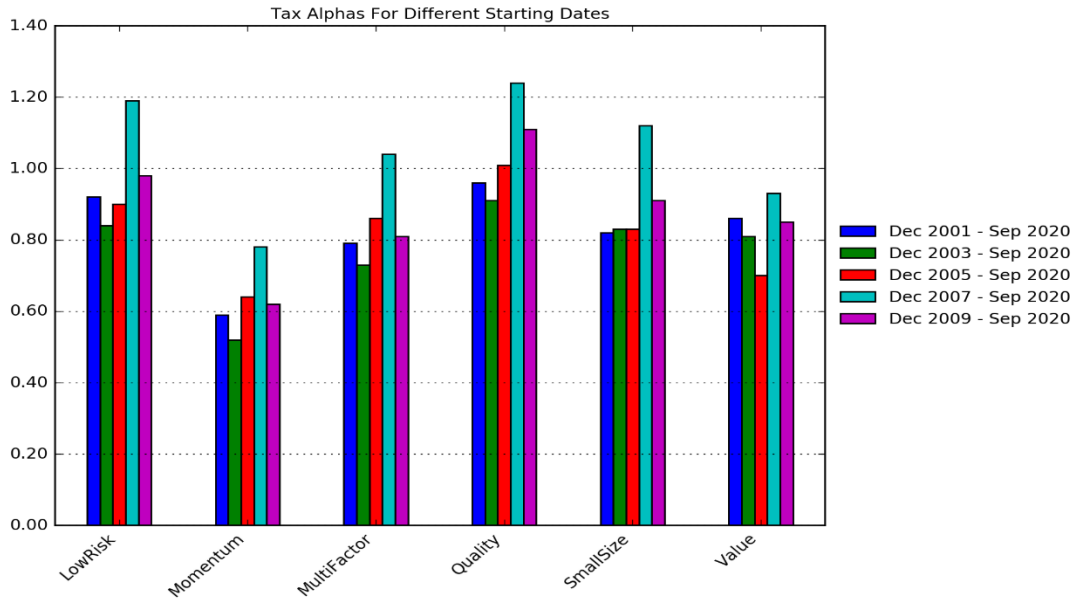
In this section, we present two case studies to discuss the robustness of the tax alpha. First, we show that we continue to harvest tax alpha even when we start the backtest in different market environments. Then we show that our tax alpha is also robust under different long-term and short-term tax rates.

Tax Alpha with Different Starting Dates

Tax alpha is time dependent since it depends on the prevailing market conditions when the assets were sold. For instance, a backtest that starts at the beginning of a downturn, such as the "dotcom" crash or the GFC, has greater opportunities to harvest losses than a backtest that begins in a bull market.

Figure 13 shows the tax alpha for different factor strategies for 5 staggered starting dates, i.e., Dec 2001, Dec 2003, Dec 2005, Dec 2007, and Dec 2009. All backtests run for at least 10 years and end in Sep 2020. We start all the backtests in December so that we have the entire year to impose tax efficiency for the tax-managed portfolios. Although, there is some variation in the tax alphas, i.e., the backtests that start just before a bear market (like Dec 2007) outperform those that start after the market is recovering (like Dec 2009), we can harvest a robust tax alpha for these different starting dates across all factors.

Figure 13. Tax Alphas for Different Starting Dates for Different Factors



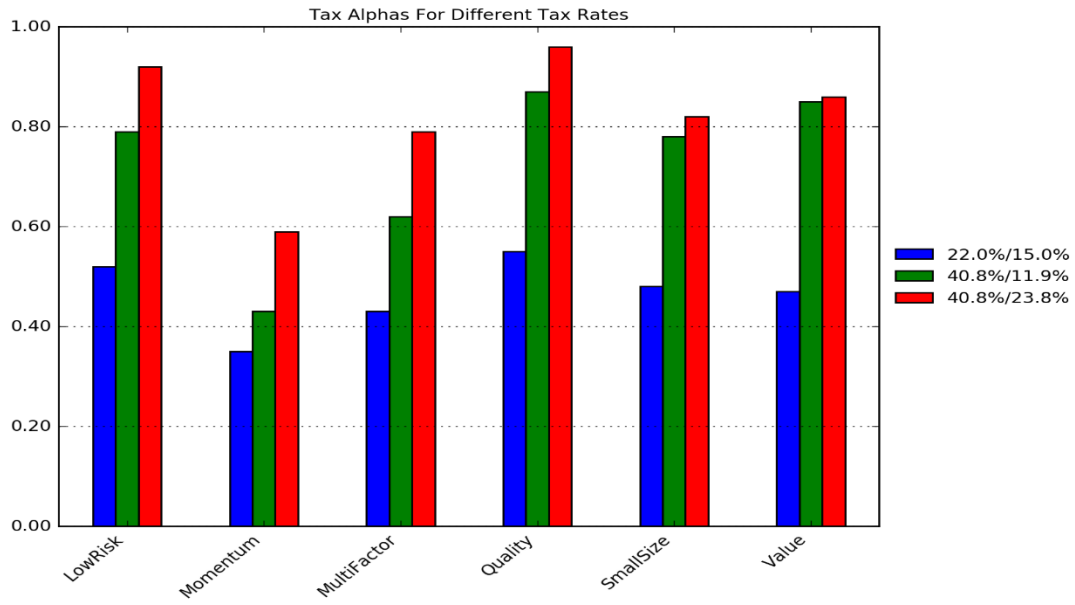
Source: Qontigo

Tax Alpha for Different Tax Rates

For our base tax-managed strategy, we use short-term tax rate of 40.8% and a long-term tax rate of 23.8%. In this section, we study the effect of the tax rates on the tax alpha. We consider two other tax rates regimes: First considers short-term tax-rate of 22.0% and long-term tax-rate of 15.0%. Although, both short-term and long-term rates are lower than those of our base strategy, there is less variation between the two rates, i.e., the tax optimizer has less incentive to defer gains. Second one has a short-term rate of 40.8% and a long-term rate of 11.9% that incentivizes the optimizer to further defer gains from short-term to long-term to promote tax efficiency.

Figure 14 shows the robustness of the tax alpha for the different factors across the three tax regimes. For each factor, the best tax alpha is obtained for the 40.8%/23.8% tax rate, with the 40.8%/11.9% rate in the middle, and 22.0%/15.0% the lowest. This is not surprising since the 40.8%/23.8% tax rate corresponds to the "high-tax" regime, and the tax-managed portfolio is able to deliver a higher alpha by promoting greater tax efficiency.

Figure 14. Tax Alphas for Different Rates (Dec 2010 - Sep 2020)



Source: Qontigo

Conclusion

We present tax-managed smart-beta equity factors that harvest both factor and tax alpha and deliver better post-tax performance than their tax-agnostic counterparts.

We first document the impressive pre-tax performance of our flagship STOXX Factor Indices between December 2001 to September 2020. We then show that the post-tax performance of the index portfolios is somewhat modest since they are not designed with tax efficiency in mind. Our aim in this paper is to construct tax-efficient factor portfolios by running a supplementary optimization that minimizes the tax gains of the portfolio while preserving the factor tilts, liquidity, and risk characteristics of the tax-agnostic factor portfolio.

The paper has the following contributions:

1) When the investor can make optimal use of the harvested losses by offsetting gains in other accounts, we show a tax alpha ranging from 0.7% - 1.1% over the factor premium across all smart-beta portfolios. We develop an attribution that shows that the tax alpha is being systematically harvested over time. We also show that the tax alpha is significant when the investor liquidates the portfolio at the end of the last rebalancing for consumption.
2) We show that our tax alpha results are robust by generating a hierarchy of tax-efficient portfolios that trade-off factor alpha and tax efficiency, starting our backtests in different market environments, and running the tax optimization with different short-term and long-term tax rates.
3) We show that assumption of unlimited benefit from harvested losses is not crucial for our findings, and we get similar tax alpha in the “stand-alone” portfolio scenario where the investor only has a single account, can at most drive the tax liability to zero, and does not get an immediate credit for harvesting losses more than the gains in the portfolio.

In the present paper, we assume that the investor has access to the weights to the STOXX Factor Indices. If the investor also wants to customize the factor performance, we recommend the following two-phase hierarchical approach to generate the tax-managed portfolios that can be easily implemented within the Axioma Portfolio Optimizer (APO):

1) Phase 1 generates a factor portfolio that maximizes factor exposure while maintaining the investors’ exposure, liquidity, and risk characteristics. This is customizable.
2) Phase 2 portfolio generates the tax-managed portfolio by minimizing tax gains while preserving the factor tilts, liquidity, and risk characteristics of the Phase 1 portfolio. Note that the only difference is that the Phase 2 portfolio is closely tracking the weights of the Phase 1 portfolio, while the tax-managed portfolios in our paper are tracking the weights of the STOXX Factor Indices.

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