Vanguard

Vanguard research

March 2022

Personalized indexing: A portfolio construction plan

- In this paper, we examine how to set up a personalized indexing (PI, also known as direct indexing) implementation plan by answering two common questions confronting prospective investors.
- Question 1. How much difference can there be between two similar PI implementations? Answer: Differences in PI and tax-loss harvesting (TLH) can increase TLH alpha by from 20 to more than 100 basis points (bps) for capital-gains-rich PI investors.
- Question 2. How do investors create space for PI in their portfolios, and how much personalization can they pursue? Answer: A PI investor with a TLH alpha above 150 bps can replace existing taxable equity beta exposure with PI and personalize it relatively freely. For investors with a TLH alpha below 150 bps, however, personalizing PI may come at a significant cost in terms of lower expected return from the entire portfolio.

Authors


Kevin Khang, Ph.D.


Alan Cummings, Ph.D.


Thomas Paradise


Brennan O'Connor

Acknowledgments: We wish to thank Roger Aliaga-Díaz, Andrew Clarke, Joel Dickson, Jonathan Hudacko, Robert Mennow, Mohamed Ramadan, Giulio Renzi Ricci, Victor Zhu, and members of the Investment Strategy Group Global Leadership Team for helpful comments and suggestions.

Introduction

Personalized indexing (PI, also known as direct indexing) is on the rise because of the need for higher returns in a low-yield environment, the desire for personalized environmental, social, and governance (ESG) investing, interest in factor investing, and technological advancements in record-keeping and portfolio construction. Assets managed with a PI strategy grew more than threefold to roughly $350 billion between 2015 and 2021. This pace is expected to accelerate.[1] At its core, PI is a flexible portfolio management solution that tracks a personalized index for each investor—an investor-specific policy reflecting ESG preferences and/or factor tilts—while harvesting capital losses for tax-saving purposes.

From an asset allocation perspective, PI represents a modified beta exposure to U.S. equity[2] with an active return stream arising from personalization and tax-loss harvesting (TLH). When allocating to PI and integrating it into an existing portfolio, investors commonly have the following questions: "What is the best mode of PI implementation?" and "How much existing passive U.S. equity should it replace and how much tracking error (TE) against the market-capitalization-weighted benchmark can/should I run in my PI portfolio?" However, there is a general lack of discussion on these topics in the literature. In this paper, we investigate these questions.

To find the answers, we perform a two-part analysis. The first part examines various modes of TLH implementation with PI. Despite the number of options available in today's marketplace, not much work has been done to shed light on their relative strengths and weaknesses. A key difference involves the frequency of tax-loss harvesting, ranging from annual to daily. We find that more frequent screening leads to materially higher and more consistent loss harvesting in all volatility environments. These differences can span a wide range, increasing TLH alpha by from 20 bps to well over 100 for a prime PI investor with extensive recurring capital gains.

The second part explores how to integrate PI into an existing portfolio through the lens of the Vanguard Asset Allocation Model (VAAM). While PI's flexibility lends itself to a large variety of uses (including completion portfolios, ESG, and factors), we focus on its active risk-return property to identify an optimal allocation. Our recommendations vary sharply by investor profile and PI alpha potential—a highly predictable quantity based on the investor's capital gains profile (Khang, Paradise, and Dickson, 2021). The recommendation for investors with an expected PI alpha of 150 bps[3] or more is to largely replace their existing passive U.S. equity allocation with PI. These investors may also personalize their PI portfolio up to 275 bps of tracking error without having to change their overall asset allocation.

Notes on risk

Tax-loss harvesting involves certain risks, including, among others, the risk that the new investment could have higher costs than the original investment and could introduce portfolio tracking error into your accounts. There may also be unintended tax implications. Prospective investors should consult with their tax or legal advisor prior to engaging in any tax-loss harvesting strategy. Vanguard does not provide tax or legal advice.

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model (VCMM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modeled asset class. Simulations are as of September 2021. Results from the model may vary with each use and over time. For more information, see page 14.

1 Morgan Stanley and Oliver Wyman (2021) project total assets managed with PI to reach $1.5 trillion by 2025.

2 In today's marketplace, PI offerings are primarily based on U.S. equities. In the future they may include fixed income and international equity capability.

3 All PI alpha is shown net of fees. Typical PI management fees range from 20 to 40 bps.

On the other end of the spectrum, for investors with a low expected PI alpha of 25 bps or less, PI is much less attractive from the active risk-return perspective. Personalization beyond 75 bps of TE—a level considered minimal when tax-loss harvesting with PI—may come at the expense of reduced allocation to overall equity, with a lower return expectation for the entire portfolio. Investors with an expected PI alpha of between 25 and 150 bps can pursue some personalization beyond 75 bps of TE without adversely affecting expected return.

Throughout this paper, we conduct our analyses through the lens of stylized investor profiles "typical" of certain income and wealth brackets. In the real world, however, no two investors' financial circumstances are alike even if they have the same income and net worth. Accordingly, the PI implementation plan we introduce will be at best an approximation for any individual investor. For investor-specific financial advice on PI, we defer to financial advisors privy to a holistic view of the investor's financial life.

"A plan beats no plan" sums up our stance on how to view and use the takeaways of this paper. Said by former Secretary of Treasury Tim Geithner in the depth of managing the 2008–2009 financial crisis, the phrase highlights the importance of having an actionable framework for decision-making even in the face of heightened uncertainty. Regardless of how imperfect the plan might be, the odds of making good decisions are better with a plan than without one. The findings of this paper represent a sensible starting point for potential PI investors who do not have a plan for implementing and deploying PI to their advantage.

We begin with a description of two commonly observed individual PI investor profiles. Next, we introduce four modes of PI TLH implementation that cover a wide range of proactive loss harvesting; we quantify the differences in TLH capability and alpha. Next, we show how optimal asset allocation might differ based on the portfolio's risk-return profile. We conclude with a few observations on how to put our findings to use.

Part 1: Two PI investor profiles

One of the primary questions for advisors is whether PI is appropriate for a given investor. With this in mind, we consider two investor profiles with recurring capital gains and generally high tax rates, as shown in **Figure 1**. Both investor A and B are assumed to live in California and are subject to the 3.8% Medicare Net Investment Income Tax. They both make an initial investment at the inception of their account and add 20% of that figure quarterly (cash flow, or CF) thereafter.[4]

The two investors stand for two segments of the PI marketplace. Investor B represents ultra-high-net-worth investors with the highest short-term and long-term capital gains tax rates. They have significant recurring capital gains from extensive holdings of non-public equity assets (loss-offsetting income, or LOI).[5] Because the amount of capital gains they can offset easily outweighs the amount of capital losses they can generate with their allocation to U.S. public equity, we assume it to be unlimited for the purpose of calculating TLH alpha. They tend to have a long investment horizon, often informed by an intergenerational perspective; we assume that they do not liquidate (LIQ) their PI account. For the last two decades, these investors have been the mainstay of the PI marketplace.

Investor A, on the other hand, represents mass-affluent and high-net-worth investors whose interest in PI has grown more recently as it has become more accessible. These investors have appreciable capital gains on the order of 6% of their taxable equity holdings, but these gains may arise irregularly. They are assumed to liquidate 25% of their PI account upon the conclusion of the investment period. We anchor all subsequent analyses to these two investor profiles.

FIGURE 1.

Two PI investor profiles

	Investor A	Investor B
Net worth grouping	95th to 98th	Top 2%
LOI (as % of PI equity)	6%	Unlimited
CF	20%	20%
LIQ	25%	0%
Average income	351K	Well above 1,000K
Harvest tax rate/ liquidation tax rate (+ state taxes & net investment income tax)	32%/15% (42.3%/28.1%)	37%/20% (54.1%/37.1%)

Source: Vanguard, based on data from the *Survey of Consumer Finances* (2019).

Notes: LOI represents the amount of capital gains the investor has that may be offsetable with loss harvests, expressed as a share of PI holdings; CF represents the regular investment into PI for the duration of the investment, expressed as a share of the initial investment; LIQ indicates the portion of the PI portfolio the investor liquidates at the end of the investment horizon; and harvest tax rates are based on the average income and liquidation tax rates on 80% of the income 10 years out. We assume California residents for both profiles; net investment income tax of 3.8% is assumed for investor B throughout and at liquidation for investor A.

4 We also examine these two investor profiles in a lump-sum cash flow scenario in which they make only one contribution to the portfolio at the beginning of the investment period. These results are shown in **Figure 8**.

5 Examples include ownership in private business, investment in private equity or venture capital funds, and a portfolio of real estate properties.

Part 2: Optimal tax-loss-harvesting frequency for PI investors

In this section, we look at the effect of TLH frequency on loss generation capability and PI alpha outcomes. We begin with a description of the data and TLH algorithm and proceed to investigate the efficacy of various TLH implementation modes.

Data and the TLH algorithm

Using the top 400 securities by market capitalization contained in the Axioma US4 risk model (AXUS4), we create a synthetic capitalization-weighted index (the Axioma 400, as described in Khang et al., 2021). This index reconstitutes on the first day of each calendar year, using market caps as of the last day of the prior year. Daily returns are from the beginning of 1982 to the end of 2020.[6]

Our TLH algorithm maintains individual tax lot holdings of all positions and updates them with associated returns at the periodicity we specify (daily, monthly, quarterly, or annually). Loss harvesting is initiated if a tax lot is in breach of a loss threshold of 5% relative to cost basis.[7] As is convention in the literature (such as Dickson, Shoven, and Sialm, 2000) and investment practice in the U.S., our algorithm prioritizes the tax lots with the greatest loss per share under HIFO (highest in, first out) accounting. When a position is sold for loss harvest, we assume that there is an identical replacement investment vehicle to navigate the wash-sale rule. We further assume that the replacement position cannot be sold for another loss realization until the 31st day after the initial harvest date. Finally, we apply trading costs of 10 bps per one-way transaction.

We use a 10-year horizon when computing TLH alpha. In each calendar year, we use cumulative losses to offset any LOI the investor is assumed to have outside of the TLH account. The resultant tax savings are reinvested into the portfolio at the end of each calendar year, and unused losses are carried forward to offset future income.

Four frequencies of PI TLH implementation and annual TLH with an index fund

The current PI marketplace features a large variety of TLH implementation methods. We explore four harvesting frequencies, as shown in **Figure 2**: annual (PI-annual), quarterly (PI-quarterly), monthly (PI-monthly), and daily (PI-daily). We also consider one additional mode as the ultimate baseline: a market index fund-based TLH with annual harvesting (F-annual). While F-annual is not PI, it sets the "floor" in terms of loss-harvesting capability and is useful for understanding the marginal value of the four PI modes. All loss harvesting takes place at the end of the respective period.

FIGURE 2.

Five modes of TLH: Four PI frequencies and a fund-based approach

Mode	Breadth	Frequency	Type of volatility enabling loss generation
Fund TLH annual (F-annual)	Single fund	Annual	Time series (TS) linked to annual periodicity
PI TLH annual (PI-annual)	Individual securities	Annual	TS + individual security cross-sectional (IS CSV), annual
PI TLH quarterly (PI-quarterly)	Individual securities	Quarterly	TS + IS CSV, quarterly
PI TLH monthly (PI-monthly)	Individual securities	Monthly	TS + IS CSV, monthly
PI TLH daily (PI-daily)	Individual securities	Daily	TS + IS CSV, daily

Source: Vanguard.

6 Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

7 In unreported analysis, we considered other thresholds and found no economic difference using values up to 10%.

F-annual and PI-annual both implement TLH annually, screening for and harvesting losses just once a year. By comparing these, we can measure the efficacy of cross-sectional volatility in TLH at this frequency. As we move down the figure toward PI-daily, each level improves by exploiting an additional avenue for loss harvesting unavailable in the preceding mode: time-series and/or cross-sectional volatilities available within a year, a quarter, or a month. A companion paper by Khang, Cummings, and Paradise (2022) shows that PI-daily consistently generates more losses than any other implementation mode in virtually all volatility environments. The remainder of this paper refers to PI-daily as the "maximal loss harvest."

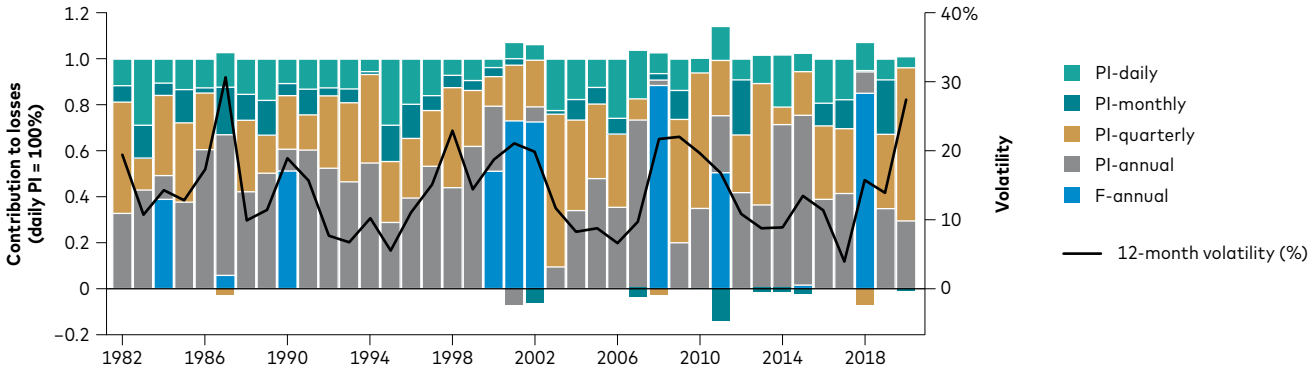
Attributing maximal loss harvest to harvesting frequencies

In **Figure 3**, we plot the time series of each mode's contribution to the maximum harvest; the five marginal contributions sum up to 100% each year. Figure 3 adds more color to the initial observation by Khang et al. (2021) that the value of PI TLH over a single-fund-based TLH comes through most clearly in a low-volatility environment.

Not only is there very irregular loss harvesting with F-annual, but it also misses out on the historic loss-harvesting opportunities of 1987 and 2020 because the harvesting occurs at the end of the calendar year. As we transition from F-annual to PI-annual, the potency of cross-sectional volatility is apparent even at an annual frequency; with PI-annual, it is possible to reach about 50% of the maximal loss harvest much of the time.

With PI-quarterly, the investor can reach about 80% in a typical year. To reach the maximal loss harvest, it is important to implement TLH on a daily basis. Interestingly, while moving from PI-quarterly to PI-monthly does increase loss harvest on average, the improvement is relatively small. It is the transition from PI-monthly to PI-daily that drives most of the improvement.

FIGURE 3.
Attribution of maximal loss harvest to the modes of TLH



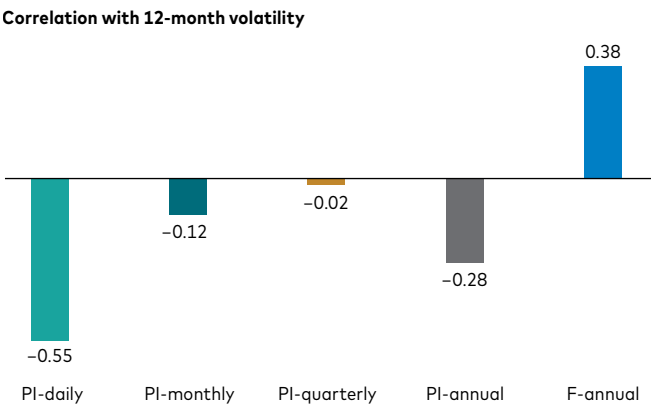
Source: Vanguard, based on data from AXUS4.

As Figure 3 shows, the relative importance of more frequent loss harvesting—PI-quarterly, PI-monthly, and PI-daily—grows in most non-high-volatility environments such as the mid-1990s. In **Figure 4**, we investigate this further by computing the correlation between each mode's marginal contribution to the maximum harvest and the volatility environment.

With a correlation of 0.38 for F-annual, annual time-series volatility is the most important driver of loss generation in a high-volatility environment. The importance of cross-sectional volatility is evidenced by the negative correlations of the remaining four modes. For generating losses in a typical (non-high) volatility environment, investors need to lean on the channels negatively correlated with volatility to varying degrees. With a correlation of −0.55, PI-daily is especially critical to achieving the maximum harvest in a non-high-volatility environment.

FIGURE 4.

Correlation between maximal loss harvest contribution and volatility environment



Source: Vanguard, based on data from AXUS4.

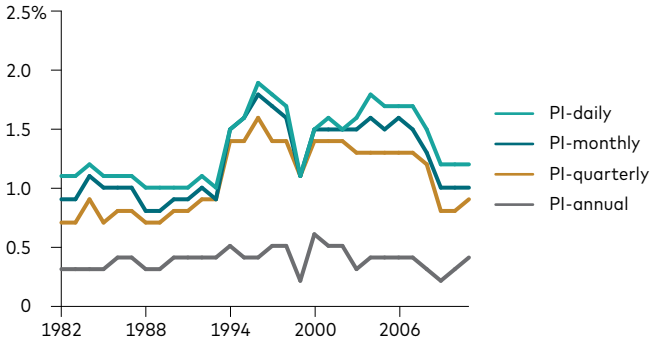
TLH alpha results

Next, we examine how the four modes of PI loss-harvesting capability translate to differences in TLH alpha. For each investor profile discussed in Figure 1, we launch a 10-year TLH strategy every January from 1982 to 2011 using one of the four modes shown in Figure 2. At the end of the investment horizon, we compute the TLH alpha—the difference in annual internal rate of returns (IRR) of the baseline portfolio without tax-loss harvesting and the portfolio with TLH—after netting out the final tax liability from liquidation. The results in **Figure 5** show the TLH alpha for each starting year.

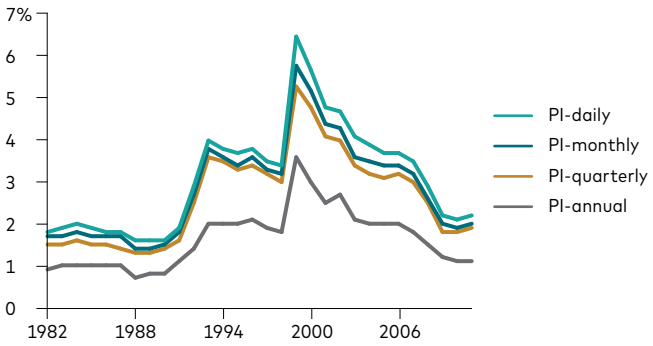
FIGURE 5.

TLH alpha over time

Investor A: High-net-worth investor



Investor B: Ultra-high-net-worth investor



Source: Vanguard, based on data from AXUS4.

We see a consistent result of higher frequency leading to higher TLH alpha for both investors across all four frequency modes. The size of the alpha differences depends on the return environment, but the general pattern is clear. We take stock of these TLH alpha differences in **Figure 6** and **Figure 7**.

Figure 6 shows the average 10-year TLH alpha for each mode and investor type. For example, the right chart shows that for investor B (with unlimited LOI), TLH alpha rises from 164 bps with PI-annual to 310 bps with PI-daily—a significant difference of 146 bps. Figure 7 breaks down the maximum TLH alpha of 310 bps to the four PI modes' marginal contributions. Continuing with the example of investor B, switching from PI-annual to PI-quarterly adds 100 bps of alpha. Subsequent switches to PI-monthly and PI-daily add 20 bps and 26 bps of alpha.

Figure 7 shows how each mode contributes to the maximal TLH alpha of PI-daily by comparing the alphas of two adjacent modes. For example, for investor B, switching from F-annual to PI-annual leads to 80 bps of additional TLH alpha, or about 25% of the maximal alpha for investors.

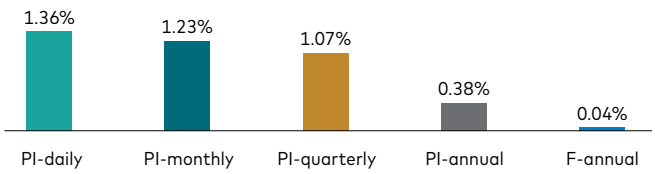
The biggest margin of improvement arises from switching to PI-quarterly from PI-annual. Much loss-harvesting opportunity is capturable at the quarterly frequency but not at the annual (for example, in 1987 and 2020, as shown in Figure 3). This switch accounts for one-third to one-half of the maximal alpha. More frequent harvesting with PI-monthly and PI-daily adds roughly the same amount of alpha; if switching to PI-monthly helps the investor, moving to PI-daily may be equally additive.

Of course, TLH alpha varies significantly around the average behaviors described above. In **Figure 8**, we show the distribution of these alphas with a box-whisker chart for each investor profile and mode of PI.

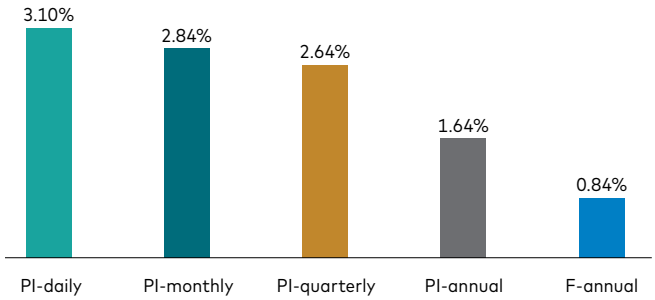
In addition to the TLH alphas underlying Figure 5, which assumes a quarterly cash contribution equal to 20% of the initial investment for the 10-year TLH period, Figure 8 also includes the TLH alpha distribution arising from a lump-sum contribution into the PI account. While certainly not ideal for maximizing TLH alpha, lump-sum contributions are very common among PI investors. With a sensible implementation of PI—quarterly or more frequently—investor A has a median TLH alpha of at least 92 bps, while the equivalent for investor B is 200 bps. These estimates are useful in determining how to allocate with PI in the presence of other assets—which we consider next.

FIGURE 6.
Average TLH alpha by harvest frequency

Investor A: High-net-worth investor



Investor B: Ultra-high-net-worth investor

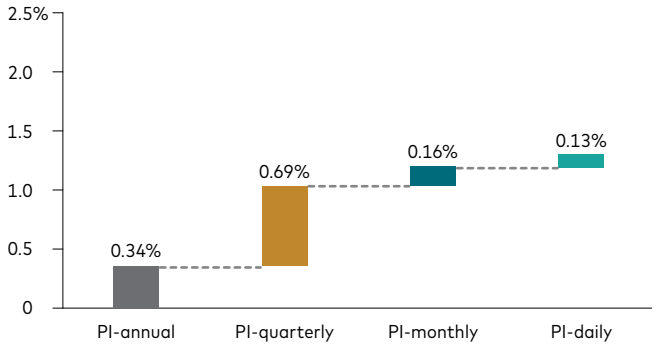


Source: Authors' calculations based on data from AXUS4.

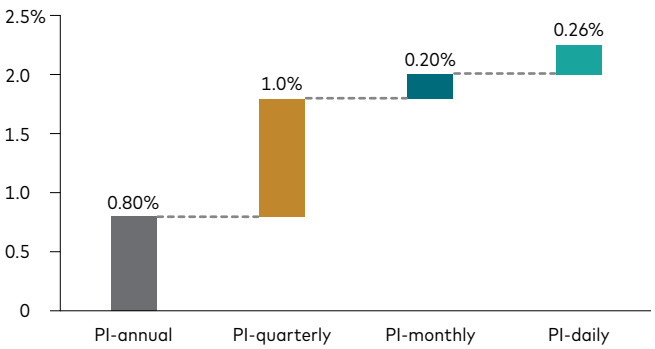
FIGURE 7.

Marginal contribution to maximal TLH alpha

Investor A: High-net-worth investor



Investor B: Ultra-high-net-worth investor

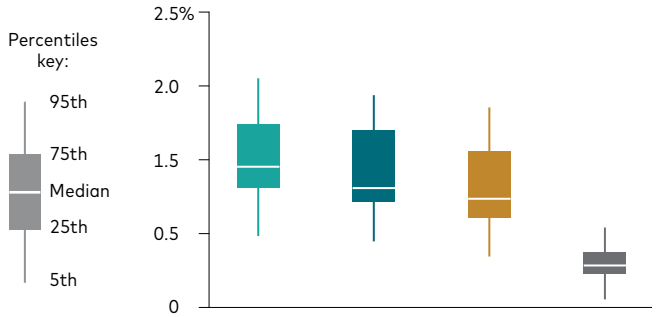


Source: Authors' calculations based on data from AXUS4.

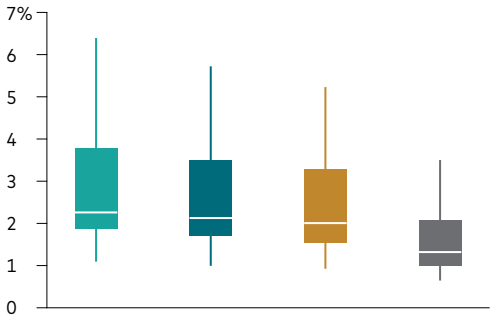
FIGURE 8.

Distribution of TLH alpha for two cash flow assumptions: 20% CF and lump sum

Investor A's TLH alpha: 20% CF and lump sum



Investor B's TLH alpha: 20% CF and lump sum



	PI-daily	PI-monthly	PI-quarterly	PI-annual	PI-daily	PI-monthly	PI-quarterly	PI-annual
95th percentile	1.94%	1.79%	1.69%	0.64%	6.47%	5.77%	5.31%	3.51%
75th percentile	1.54%	1.48%	1.31%	0.44%	3.78%	3.47%	3.26%	2.01%
Median	1.18%	1.02%	0.92%	0.35%	2.22%	2.07%	2.00%	1.23%
25th percentile	1.00%	0.89%	0.75%	0.28%	1.82%	1.66%	1.50%	0.95%
5th percentile	0.59%	0.54%	0.42%	0.05%	1.04%	0.95%	0.88%	0.54%

Source: Authors' calculations based on data from AXUS4.

Part 3: Optimal asset allocation with PI

In this section, we examine how to integrate PI with other assets from a holistic allocation perspective. This calls for an understanding of how a PI portfolio is constructed and managed in practice.

PI through the lens of portfolio management

For individual investors, a PI portfolio is managed as a separately managed account. Typically, the investor determines the market cap-weighted benchmark (such as the S&P 500 Index) from which they create a personalized index and specify a desired factor tilt, ESG preferences (negative or positive screening), and/or specific securities or industries to build the portfolio around. On the first day, a risk model-based optimization identifies the securities and portfolio weights—the PI portfolio—that will track the personalized index closely. The number of securities is usually 100 to 200 in a typical large-cap PI portfolio. From this point on, portfolio management involves trading based on tracking the personalized index and seeking to maximize tax-loss harvests (or minimize capital gains realizations).

The flexibility of PI is a double-edged sword from the asset allocation perspective. On one hand, a wide range of personalized portfolios is feasible. On the other, the myriad of possible indexes makes it more challenging to provide generalizable asset allocation guidance. To discipline our thinking, we approach PI exclusively as an active equity strategy benchmarked to a market cap-weighted U.S. equity index (benchmark). An active strategy has two parts to it: tracking error and active return.

Reflecting the "active" decisions embedded in the personalized index, a PI portfolio typically runs a TE against the benchmark of between 75 to 275 bps; 75 bps represents the minimal level arising from tax-loss harvesting with individual securities and navigating the wash-sale rule. Additional personalization for ESG and/or factors is the main reason it rises to 275 bps.[8] The TE of a PI portfolio is adjustable, as investors can revise their personalization preferences, perhaps after having assessed the portfolio and allocation implications of their initial wish list. This is an important distinction from virtually all other commingled vehicles, in which investors lack such control on demand.

Assuming that active return is entirely made up of the TLH alpha of the PI portfolio,[9] we continue with the two investor profiles A and B and their expected TLH alpha estimates from Figure 8. Based on a PI management fee of 40 bps, we assume that investor A's TLH alpha will be roughly 50 bps and investor B's will be slightly above 150 bps. For the remainder of this paper, we refer to investor A as our "low-alpha investor" and investor B as our "high-alpha investor." The predictable TLH alpha difference subject to the investor's profile represents another unique feature of PI as an active strategy. A well-informed financial advisor can help investors form expectations around this important input.[10]

PI is an interesting variant of an active strategy: Its active return is more predictable, and TE is more adjustable than in a traditional alternative. Once PI alpha and TE expectations are formed, however, the optimal asset allocation can be determined by familiar forces in similar contexts—the attractiveness of the portfolio's information ratio (the risk-adjusted return of the active return stream, or IR) and how this interacts with the rest of the portfolio to determine the amount of risk. We conduct this analysis through the optimal asset allocation framework developed by Aliaga-Díaz et al. (2020): the Vanguard Asset Allocation Model (VAAM).

8 Typical PI portfolios have TE (well) below 275 bps, but it may rise above this level in some cases. One notable source of such a high level is completion portfolios, whereby a PI portfolio is built around the securities that account for a significant fraction of the benchmark (for example, excluding Facebook, Amazon, Apple, Netflix, and Google stocks in PI).

9 "PI alpha" and "TLH alpha" are used interchangeably in this paper, assuming that all alpha comes from TLH. This is without loss of generality for our purpose of identifying optimal allocation with PI. For example, some PI investors may have a conviction that their ESG or factor preferences would result in additional alpha. Others may use loss harvesting from PI to engage in a tax-effective rebalancing of the non-PI portion of the portfolio. Either can factor in these considerations as they calibrate their PI alpha expectation.

10 See Khang, Paradise, and Dickson (2021).

Optimal allocation with PI: A Vanguard Asset Allocation Model-based solution

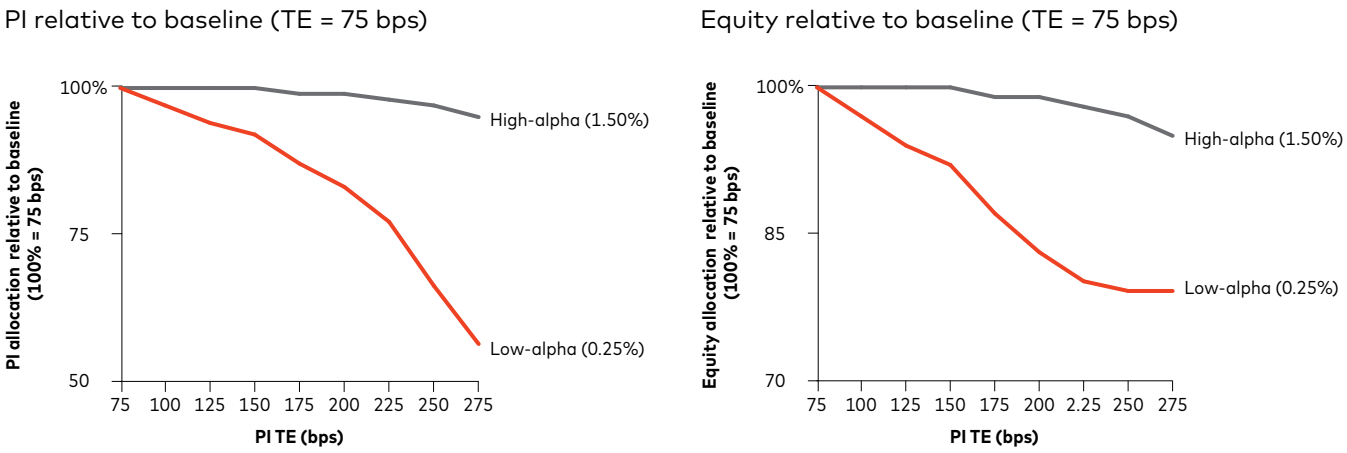
We consider three investment categories: two passive strategies (U.S. equity and bonds) and a PI strategy benchmarked to U.S. equity.[11] The left panel of **Figure 9** shows how optimal PI allocation changes with a rising TE, expressed as a share of the optimal allocation under the baseline case with 75 bps of TE (the baseline allocation).[12] For the low-alpha investor, allocation declines dramatically and reaches 56% of the baseline allocation as TE rises to 275 bps. This contrasts with the high-alpha investor, whose lowest PI allocation remains at 95% of the baseline allocation even with a TE of 275 bps.

This difference reflects the divergent attractiveness of PI's IR between the two investors. With 150 bps of PI alpha, the high-alpha investor faces a highly attractive range of between 0.55 and 2. Indeed, even the lowest IR (0.55, based on 275 bps of TE) in this range is considered outstanding among traditional active equity strategies.[13] On the other hand, the low-alpha investor works with a dramatically less attractive range. At best, the IR is 0.33, a respectable level. However, as TE rises, it declines rapidly toward 0.09—a level at which additional active return may not be worth the additional TE required for many investors. This explains the contrast in PI allocation's sensitivity to TE between the two investors.

The right panel of Figure 9 shows how optimal allocation to equity—PI and passive equity combined—changes with rising TE as a share of the baseline allocation. The high-alpha investor maintains a largely static equity allocation despite the rising TE. Further, the optimal equity allocation for this investor is always in PI even as the TE rises toward 275 bps. In sharp contrast, equity allocation declines to as low as 79% of the baseline equity allocation for the low-alpha investor. In addition, as the PI TE approaches 275 bps, a notable substitution takes place between passive equity and PI allocations: As PI's IR becomes more nondescript, a greater share of equity allocation moves into the passive strategy (and out of PI).

FIGURE 9.

Optimal allocation to PI and equity: low-alpha versus high-alpha investors



Source: Authors' calculations using VAAM and steady-state distribution from VCMM simulations as of Q3 2021 with a 10-year investment horizon.

11 Our main findings remain very similar under another common scenario with five investment categories—four passive strategies (U.S. equity and bonds and international equity and bonds) and PI benchmarked to U.S. equity. Investigation of optimal allocation in the presence of both PI and other active strategies presents an interesting area of future research.

12 This figure assumes a passive risk-aversion parameter of 5 and an active risk-aversion parameter of 10. Our results are robust across different configurations, and this paper's key takeaways hold for most sensible parameters.

13 Only the top 10% to 25% of active managers of U.S. equity have been able to attain this level. See Goodwin (1998), Cremers and Petajisto (2009), and Madhavan, Sobczyk, and Ang (2020).

These divergent optimal allocations are accompanied by important differences in portfolio outcomes. **Figure 10** shows how the above-mentioned allocations affect portfolio return (left panel) and volatility (right panel), expressed as a difference from the baseline allocation.

The left panel shows that the low-alpha investor has to give up returns for the entire portfolio with any level of additional PI personalization, with the maximum return difference reaching 57 bps with TE of 275 bps. Personalization in PI is far less costly for the high-alpha investor; it is negligible up to 200 bps of TE and reaches just 17 bps even with 275 bps of TE.

The right panel shows what the divergence in asset allocation implies for the volatility of the entire portfolio. In keeping with minimal allocation differences, the high-alpha investor's portfolio largely maintains the same level of portfolio risk across the full range of TE. The low-alpha investor's portfolio, on the other hand, takes much less risk with a rising TE in order to accommodate a PI strategy that is increasingly less attractive in terms of IR.

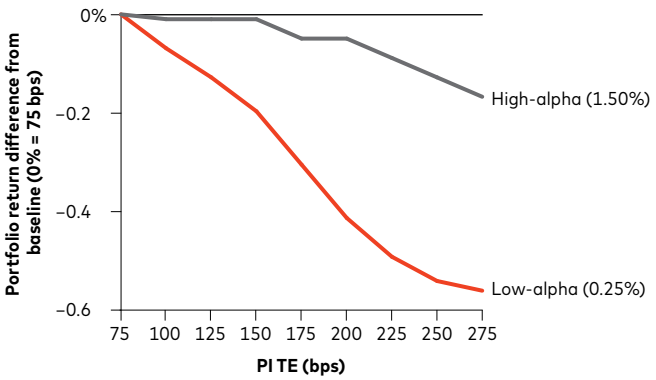
From an asset allocation perspective, the implication for PI and personalization for the high-alpha investor is straightforward. The pursuit of personalization may result in greater tracking error against the benchmark, but the optimal allocation and expected risk-return profile of the entire portfolio will remain largely unaffected. In addition, the optimal allocation to equity effectively equals the allocation to PI at all reasonable levels of TE. The asset allocation recommendation is easy for these investors: Replace the existing allocation to passive taxable U.S. equity with PI and personalize freely.[14]

On the other hand, for low-alpha investors, greater personalization has important performance and implementation implications. First, greater TE in PI calls for less allocation to equity and therefore a lower expected return from the entire portfolio. Second, as TE rises above 75 bps and optimal equity allocation declines, the optimal mix between PI and passive may also change. Asset allocation decisions are difficult and nuanced, requiring more guidance for low-alpha investors. They may want to lower their overall equity allocation in order to accommodate meaningful personalization in the PI portfolio; the breakdown will depend on the desired level of personalization.

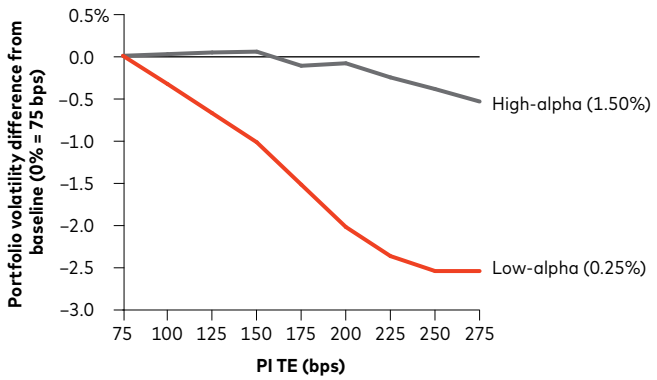
FIGURE 10.

Portfolio outcomes: low-alpha versus high-alpha investors

Return relative to baseline (TE = 75 bps)



Volatility relative to baseline (TE = 75 bps)



Source: Authors' calculations using VAAM and steady-state distribution from VCMM simulations as of Q3 2021 with a 10-year investment horizon.

14 This paper assumes that all asset allocation takes place in taxable accounts. The practical implications are applicable as long as the investor has a current allocation to taxable equity, which is extremely common for suitable PI investors.

Conclusion

PI's ability to generate TLH alpha and flexibility to personalize investment have contributed to its rapid rise among investors. While significant literature exists on TLH, ESG, and factor investing separately, the marketplace lacks general guidance on two important portfolio construction questions:

1. How much difference can there be between two similar PI and TLH methods?
2. How do I create space for PI in my portfolio, and how much personalization can I pursue?

In this paper, we address these questions and share the following answers:

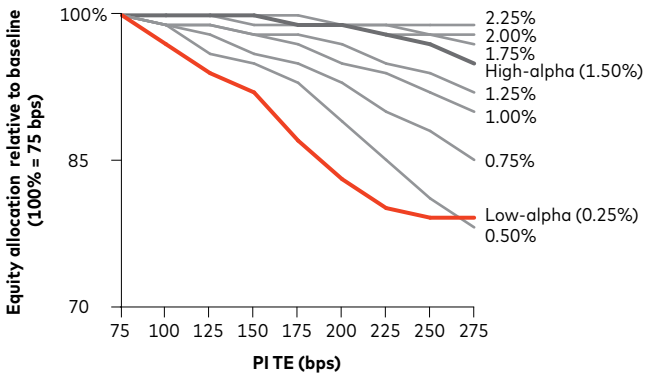
1. A lot—potentially up to 100 bps of TLH alpha—*if* we are answering this question for a TLH-motivated PI investor with extensive capital gains to offset every year.
2. Personalization in PI may come at a cost, ranging from negligible for high PI-alpha investors to significant—on the order of 60 bps of return reduction for the *entire* (not just PI) portfolio—for low PI-alpha investors. Doing the homework to form a reasonably accurate expectation of PI alpha is central to deploying PI in a way consistent with an investor's return objective for the entire portfolio.

This paper presents a broad-brush (yet evidence-based) plan for implementing PI. As acknowledged in the beginning, individual investors and advisors will need to customize this plan to determine the optimal PI implementation specific to them. That said, our plan provides a sensible framework that any serious PI investor can apply to their decision-making process as a starting point. This is a notable improvement of the current state: a world without such a plan. A plan beats no plan.

Appendix

APPENDIX 1.

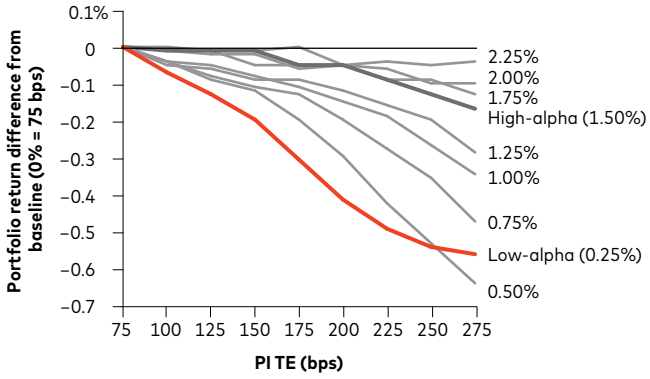
Equity allocation with 9 PI alphas



Source: Authors' calculations using VAAM and steady-state distribution from VCMM simulations as of Q3 2021 with a 10-year investment horizon.

APPENDIX 2.

Portfolio return with 9 PI alphas



Source: Authors' calculations using VAAM and steady-state distribution from VCMM simulations as of Q3 2021 with a 10-year investment horizon.

References

Aliaga-Díaz, Roger, Giulio Renzi-Ricci, Ankul Daga, and Harshdeep Ahluwalia, 2020. Portfolio Optimization With Active, Passive, and Factors: Removing the Ad Hoc Step. *The Journal of Portfolio Management* 46(4): 39–51.

Cremers, K. J. Martijn, and Antti Petajisto, 2009. How Active Is Your Fund Manager? A New Measure That Predicts Performance. *The Review of Financial Studies* 22(9): 329–3365.

Dickson, Joel M., John B. Shoven, and Clemens Sialm, 2000. Tax Externalities of Equity Mutual Funds. *National Tax Journal* 53(3): 607–628.

Geithner, Timothy F., 2014. *Stress Test: Reflections on Financial Crises*. New York: Crown Publishing Group.

Goodwin, Thomas H., 1998. The Information Ratio. *Financial Analysts Journal* 54(4): 34–43.

Khang, Kevin, Thomas Paradise, and Joel Dickson, 2021. Tax-Loss Harvesting: An Individual Investor's Perspective. *Financial Analysts Journal* 77(4): 128–150.

Khang, Kevin, Alan Cummings, and Thomas Paradise, 2022. *Optimal Tax-Loss Harvesting Implementation*. Vanguard Working Paper.

Madhavan, Ananth, Aleksander Sobczyk, and Andrew Ang, 2020. "Alpha vs. Alpha: Selection, Timing, and Factor Exposures From Different Factor Models." *The Journal of Portfolio Management* 46(5): 90–103.

Morgan Stanley and Oliver Wyman, 2021. *Wealth & Asset Management: Competing for Growth*, available at https://www.oliverwyman.com/content/dam/oliver-wyman/MSOW%20-%20Wealth%20and%20Asset%20Management%20Report.pdf.

About the Vanguard Capital Markets Model

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model® regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantee of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group.

The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the VCMM is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

Connect with Vanguard®

vanguard.com

All investing is subject to risk, including possible loss of principal. Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income.

ESG portfolios are subject to ESG investment risk, which is the chance that the stocks or bonds screened by the data provider for ESG criteria generally will underperform the market as a whole or, in the aggregate, will trail returns of other portfolios screened for ESG criteria. The data provider's assessment of a company, based on the company's level of involvement in a particular industry or the data provider's own ESG criteria, may differ from that of other portfolios or of the advisor's or an investor's assessment of such company. As a result, the companies deemed eligible by the data provider may not reflect the beliefs and values of any particular investor and certain screens may not exhibit positive or favorable ESG characteristics. The evaluation of companies for ESG screening or integration is dependent on the timely and accurate reporting of ESG data by the companies. Successful application of the customized investment strategy will depend on the data provider's proper identification and analysis of ESG data.

Factor investing is subject to investment style risk, which is the chance that returns from the types of stocks selected will trail returns from U.S. stock markets. Factor investing is subject to the risk that poor security selection will cause underperformance relative to benchmarks or funds with a similar investment objective.

The information contained herein does not constitute tax advice, and cannot be used by any person to avoid tax penalties that may be imposed under the Internal Revenue Code. Each person should consult an independent tax advisor about his/her individual situation before investing in any security.

Vanguard®

ISGPIAP 032022