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"A 'new phenomenon' needs to be analyzed: FOMO, or the fear of missing out. No dramatic investment process or policy changes may be needed, but some accommodations may help individuals resist the siren's song and keep the right focus."

Jean Brunel

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Should Taxable Investors Shun Dividends?

PORTFOLIO MANAGEMENT RESEARCH

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KEY FINDINGS

- We find that dividend avoidance generally reduces implementation efficiency of quantitative multi-style strategies, thus lowering their expected pre-tax returns. The reduction in implementation efficiency is particularly pronounced for strategies with naturally higher dividend yields, such as strategies with a large exposure to the value style.
- Moreover, dividend avoidance detracts from the ability to manage capital gains.
- All things considered, we conclude that the tax benefit of lowering the dividend yield is not enough to compensate for the associated increase in capital gains taxes and decrease in expected pre-tax returns.

ABSTRACT: *While the benefits of capital gains management to the tax efficiency of investment strategies have been extensively documented in the literature, evidence on the benefits of avoiding high-dividend-paying stocks is less conclusive. We evaluate the tax benefit of dividend avoidance for quantitative multi-style strategies and find that it generally reduces implementation efficiency, thus lowering expected pre-tax returns. The reduction in implementation efficiency is particularly pronounced for strategies with naturally higher dividend yields, such as those with a large exposure to the value style. Importantly, dividend avoidance detracts from the ability to manage capital gains. All things considered, the tax benefit of lowering the dividend yield is not enough to compensate for the associated increase in capital gains taxes and decrease in expected pre-tax returns.*

TOPICS: ***Factor-based models, equity portfolio management****

While the benefits of capital gains management to the tax efficiency of investment strategies have been extensively documented in the literature,[1] evidence on the benefits of avoiding high-dividend stocks is less conclusive. The total return of a stock comprises capital gain and dividend yield. Since capital gains can be deferred but dividend income is taxed when received, intuition suggests that taxable investors

[1]Stein and Narasimhan (1999); Arnott, Berkin, and Ye (2001a); and Berkin and Ye (2003) showed the tax benefits of a capital gains management overlay applied to passive equity investing. Israel and Moskowitz (2012); Vadlamudi and Bouchey (2014); Santodomingo, Nemtchinov, and Li (2016); and Goldberg, Hand, and Cai (2019) showed that capital gains management meaningfully enhanced after-tax returns of factor-based long-only strategies. Sialm and Sosner (2018) extended this evidence on the benefits of capital gains management to long–short factor-based strategies.

should favor stocks whose returns come from capital gain rather than dividend yield. Indeed, early literature suggests that there might be a place for a low dividend tilt in portfolios of tax-conscious investors.[2] However, other authors caution that a low dividend tilt might change the characteristics of the investment portfolio, and thus investors should evaluate the tax benefits of low yield tilts in the context of their views on stocks.[3]

An important development in dividend taxation occurred in 2003 when the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) introduced a reduced tax rate for qualified dividends. Under the JGTRRA, ordinary common stock dividends on positions held for 61 days or longer around the ex-dividend date generally qualify for the long-term capital gains tax rate rather than the ordinary income tax rate. As a result of this change, the recommendation for taxable investors shifted from completely avoiding dividends to holding stocks for at least 61 days around dividend ex-dates.[4]

It is reasonable to expect that the low tax rate on qualified dividends combined with the generally low level of dividend yields during the past few decades should reduce the potential benefits of dividend avoidance, in particular when dividend avoidance affects the otherwise desirable composition of a stock portfolio. Israel and Moskowitz (2012) undertook a horse race between capital gain and dividend exposure management as two ways to achieve tax efficiency for value, growth, and momentum long-only style indexes. They concluded that while capital gains management improves tax efficiency by increasing after-tax returns and reducing effective tax rates, dividend exposure management adds little value and comes at the cost of significant style drift, especially for the value style that tends to have naturally higher dividend exposure. This is consistent with the intuition of Horvitz and Wilcox (2003) who pointed out a decade earlier that anti-dividend tilts "significantly change the character of pre-tax returns."

Faber (2017) came to a different conclusion. He formed a 100-stock composite value index for US stocks and tested whether this index produced higher after-tax returns when constructed over the full large-capitalization universe of 2,000 stocks or over a truncated universe that excludes high-dividend stocks. He found that *after taxes*, for US taxpayers in the highest tax bracket, the value index constructed over a truncated universe meaningfully outperformed the index constructed over the full 2,000-stock universe. Further, although pre-tax returns were lower when the highest-dividend-yield stocks were excluded from the universe, the reduction in dividend tax costs more than compensated for the loss in pre-tax returns. This is consistent with an earlier recommendation by DeMuth (2016, p. 260): "A portfolio of carefully selected, buy-and-hold, zero-dividend stocks offers the best after-tax prospects for high-income dogs."[5]

Whether dividend avoidance can improve after-tax returns is an important question for taxable investors and tax-aware managers. Using portfolio construction methods based on simple characteristic sorting and universe truncation, Israel and Moskowitz (2012) and Faber (2017) arrived at contradictory answers to this question. While it is not realistic to test the tax efficiency benefit of dividend avoidance for every conceivable portfolio construction methodology, there is a class of investment strategies that is particularly relevant to a systematic tax-aware manager—quantitative multi-style strategies utilizing mean-variance optimization that have been a part and parcel of systematic factor investing over the past few decades.[6] In this study we focus on low dividend tilts for such strategies.[7]

Our main findings for the set of strategies considered in this article are as follows. First, dividend avoidance generally reduces implementation efficiency, thus lowering expected pre-tax returns by as much as 50 bps for an average strategy. Moreover, when we further

[2] See Rogers (2001); Arnott, Berkin, and Ye (2001a) and (2001b); Chincarini and Kim (2001); and Berkin and Ye (2003). Sialm and Starks (2012) also pointed out that a fund manager concerned about tax efficiency might, among other things, avoid dividend-paying stocks.

[3] See Horvitz and Wilcox (2003) and Kim, Dougherty, and Klein (2011).

[4] See Susco (2003), Gordon (2004), Kim et al. (2011), and Bouchey, Santodomingo, and Sireklove (2015).

[5] The reference to "dogs" comes from the subtitle of the book, "Slash Your Tax Bill and Be a Tax Alpha Dog."

[6] The attractiveness of quantitative multi-style strategies is illustrated in Israel, Jiang, and Ross (2018); such strategies benefit from reduced exposure to unintended risks, controlled volatility, and integration of multi-style views into portfolio construction. Fitzgibbons et al. (2017) demonstrated the benefits of integrated style investing.

[7] Israel and Moskowitz (2012) provided a detailed analysis of the tax efficiency of strategies employing sorting and truncation for portfolio formation. They considered both capital gains and dividend optimization, and concluded that minimizing capital gains exposure increases after-tax returns without incurring large tracking error or style drifts relative to the original alpha strategy, whereas dividend yield minimization results in a significant tracking error with respect to the original alpha strategy.

group strategies by their naturally occurring dividend yield levels into low-, medium-, and high-yield tertiles, we find that the reduction in implementation efficiency is particularly pronounced for an average high-yield strategy; the loss of expected pre-tax return can be as high as 70 bps, compared to a 35 bp loss for an average low-yield strategy.[8] Second, dividend avoidance detracts from the ability to manage capital gains. For example, for an average capital-gains-aware strategy, as dividend aversion increases and the dividend yield decreases by 160 bps, long-term and short-term capital gains each increase by about 50 bps, such that, under realistic tax rate assumptions, the reduction in dividend tax costs is nearly offset by the increase in capital gains tax costs.[9]

It is important to note that in this study we focus on US individual investors investing in taxable accounts. For this category of investors, our results hold for a variety of investment vehicles such as separately managed accounts, hedge funds, and mutual funds. We also consider tax rates similar to the higher-income bracket of US Federal rates as of 2019. Although taxation principles might be different for other types of investors and tax rates might change from our assumed levels, analysis tools developed in this article can be applied to those other tax situations, albeit possibly leading to different conclusions.[10]

The next section shows why in theory dividend avoidance might not be as beneficial as it might seem. The following sections present the strategy simulation methodology and show empirical results, first for an average strategy and then by dividend yield category—low-, medium-, and high-yield. In the simulations we vary the level of dividend aversion and measure the resulting changes in expected after-tax returns. The last section concludes.

AN OSTENSIBLE REASON FOR AVOIDING DIVIDENDS

The Argument for Avoiding Dividends

At first glance, dividends result in a tax burden for a taxable investor. To see why, let's decompose a stock's pre-tax total return into capital gain and dividend yield:

$$r_t = \frac{P_t + D_t - P_{t-1}}{P_{t-1}} = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{D_t}{P_{t-1}},$$

where P_t and D_t are a stock's price per share and dividend per share, respectively. Assuming for simplicity of exposition that $r_t > 0$, let's define dividend yield as a fraction of total return as

$$\delta_t = \frac{1}{r_t}\left(\frac{D_t}{P_{t-1}}\right).$$

Then capital gain as a fraction of total return is

$$1 - \delta_t = \frac{1}{r_t}\left(\frac{P_t - P_{t-1}}{P_{t-1}}\right),$$

and the total return can be decomposed as follows

$$r_t = r_t[(1 - \delta_t) + \delta_t].$$

Whereas investors must pay taxes on the dividend portion of the total return in the year the dividend income is received, in principle, they have the ability to postpone taxes on the capital gain portion of the total return by avoiding selling the stock.[11] Assume that all the capital gain is deferred. Although deferred capital gain adds to unrealized gains, the present value of the

[8] As will become clear below, this degradation in expected pre-tax returns is *not* a result of lower dividend yield exposure. In fact, although on theoretical grounds dividend yield should be predictive of future returns, Fama and French (1993) showed that the cross-sectional relationship between dividend yield and expected stock returns is fully captured by three equity factors: market, RM-RF, size, SMB, and value (defined using only book-to-market), HML.

[9] In additional experiments not reported in this article, we found similar effects for passive strategies with a loss-harvesting overlay constructed using the methodology described in Sosner, Krasner, and Pyne (2019).

[10] For example, US-domiciled corporations, under certain circumstances, might receive a dividend received deduction (DRD) on dividends paid by US corporate issuers. The DRD might make dividend income more desirable than capital gains for US corporate investors. On the other hand, a US tax-exempt institution investing through an offshore blocker will be subject to a 30% dividend withholding tax on US-source dividend income but will not be taxed on capital gains.

[11] Note that under Section 1259 of the Internal Revenue Code, hedging an appreciated stock position by entering into a short sale of the same or substantially identical property or into an offsetting derivative contract, such as a swap, futures, or forward, with respect to the same or substantially identical property, may be treated as a "constructive sale," which results in the same gain recognition as if the appreciated position were sold outright. As a result, such hedging should also be postponed if the investor seeks to postpone capital gain taxes on appreciated stocks.

expected tax rate on unrealized gains might be meaningfully lower than the tax rate applicable to dividend income (see, for example, Poterba 1999). Using t_E and t_D to denote the applicable tax rates for unrealized gains and dividends, respectively, we can express a stock's after-tax return as follows:

$$\begin{aligned} r_{AT,t} &= \frac{(P_t - P_{t-1})(1-t_E)}{P_{t-1}} + \frac{D_t(1-t_D)}{P_{t-1}} \\ &= r_t[(1-\delta_t)(1-t_E) + \delta_t(1-t_D)]. \end{aligned}$$

This further simplifies to:

$$r_{AT,t} = r_t[(1-t_E) - \delta_t(t_D - t_E)]. \tag{1}$$

Taken at face value, this decomposition of after-tax return for a single stock shows that *holding the stock's pre-tax return constant*, as long as the tax rate on dividend income exceeds the effective tax rate on unrealized gains (i.e., $t_D > t_E$), after-tax returns increase as the fraction of return coming from dividend yield, δ_t, decreases. Moreover, if one were to ignore the cost of liquidation tax by effectively setting t_E to zero, Equation 1 could be reduced to a simple formula that shows the penalty imposed by dividend income even more starkly:

$$r_{AT,t} = r_t[1 - \delta_t t_D]. \tag{1'}$$

Such considerations might serve as the motivating factor for avoiding stocks for which a high portion of the total return comes from dividend yield.

Problems with the Argument for Avoiding Dividends

There are two problems with the framework discussed in the prior section. First, it relies on a far-fetched assumption that high-dividend stocks can be replaced with low-dividend stocks without affecting the pre-tax return of the investment. However, if investors demand a constant level of *after-tax* returns, an increase in the dividend yield portion of the total return should lead to a lower price and a higher pre-tax return of the stock as compensation for a higher tax burden. In theory, the effect of dividend yield on pre-tax and after-tax returns of a stock will depend on the tax rate of the marginal investor. However, empirical studies have not been able to conclusively establish this link partially due to numerous non-tax determinants of returns such as risk and transaction costs, partially due to the complexity of firms' decisions pertaining to capital structure and distributions to shareholders, and partially due to the variation in the marginal investor's tax rate across the universe of publicly traded equities.[12]

Second, Equation 1 is derived under the assumption that all capital gains are deferred into the future, and Equation 1′ further assumes that those unrealized capital gains are never taxed. A more realistic assumption is that a fraction γ_t of capital gains is realized in the current period, thus leading to the decomposition of total capital gains into two terms:

$$1 - \delta_t = (1-\delta_t)\gamma_t + (1-\delta_t)(1-\gamma_t),$$

where the first quantity is taxed at a *realized* capital gains rate t_G and the second at the effective rate applicable to *unrealized* gains t_E as introduced above.

This can be shown to be equivalent to replacing t_E in Equation 1 with a weighted capital gains tax rate $\gamma_t t_G + (1-\gamma_t)t_E$, in which case Equation 1 becomes

$$\begin{aligned} r_{AT,t} &= r_t[(1-\gamma_t t_G - (1-\gamma_t)t_E) \\ &\quad - \delta_t(t_D - \gamma_t t_G - (1-\gamma_t)t_E)] \\ &= r_t[(1-t_E) - \gamma_t(t_G - t_E) \\ &\quad - \delta_t(t_D - t_E) + \delta_t\gamma_t(t_G - t_E)]. \end{aligned} \tag{2}$$

[12] The lack of empirical support to the dividend tax burden hypothesis was pointed out by Miller and Scholes (1982). Their results showed that yield-related tax effects are both statistically and economically insignificant once information effects of dividends are controlled for. Similarly, Fama and French (1993) found that the cross-sectional relationship between dividend yield and expected returns is fully captured by their three-factor model, leaving no additional predictive ability for dividend yield. Gentry, Kemsley, and Mayer (2003) provided a more recent brief overview of inconclusive empirical literature on the topic. Gentry, Kemsley, and Mayer found indirect evidence of tax costs of dividends in a sample of equity real estate investment trusts where methodological problems are alleviated by the fact that the value of the firm's assets is easier to estimate, capital structure tends to be simple, and management has very little discretion over dividend payouts. More recently, Guenther and Sansing (2010) developed an equilibrium model which shows that for a given stock the effect of dividend yield on expected return depends on the relative aggregate risk tolerance of all taxable investors (as compared to all tax-exempt investors) for the specific risk factor exposures of that stock. The authors also provided empirical support for their theoretical model. The complex interaction between dividend yield and investors' aggregate relative risk preferences proposed in Guenther and Sansing might explain why past evidence on the relationship between dividend tax burden and stock returns has been inconclusive.

The tax rate t_G applicable to the realized gains can be the long-term capital gains rate, the short-term capital gains rate, or a combination of the two, depending on the holding periods of the tax lots comprising the stock position. In any event the realized capital gains tax rate t_G is significantly higher than t_E, such that $t_G - t_E > 0$. Furthermore, if we set t_E to equal zero, as we did in Equation 1′, Equation 2 becomes

$$r_{AT,t} = r_t[1 - \gamma_t t_G - \delta_t t_D + \delta_t \gamma_t t_G]. \tag{2′}$$

The last term in the square brackets in Equations 2 and 2′, $\delta_t\gamma_t(t_G - t_E)$ and $\delta_t\gamma_t t_G$, respectively, leads to an important observation: As the fraction of realized gains, γ_t, increases and/or the holding period of an average realized tax lot decreases (in turn leading to an increase in t_G), dividend income becomes relatively less punitive from a tax perspective. Specifically, holding the pre-tax return constant, for positions comprised mostly of tax lots with holding periods between 61 days and 365 days, dividend income might in fact be attractive, because for such positions dividends qualify for low-tax-rate qualified treatment whereas capital gains are taxed at the high short-term capital gains rate.[13]

We conclude this section with three observations. First, Equation 1 shows that when the present value of expected liquidation tax on unrealized gains is properly accounted for, dividend income becomes less punitive. Although dividend yield accelerates tax liabilities to the current period, it reduces future tax liabilities. Second, Equations 2 and 2′ show that taking into account the current period realization of capital gains also makes dividends less punitive. When a significant portion of capital gains is realized and is realized as short-term, qualified dividend income taxed at the lower long-term capital gains rate might even become tax advantageous. Finally, concentrating the investment portfolio in stocks with low dividend yields might alter the characteristics of the stocks in the portfolio in such a way that the pre-tax return is reduced. In fact, tax savings from low dividend yield exposure might not be sufficient to offset the degradation in expected pre-tax returns.

Consistent with these considerations, our study evaluates how varying dividend yield exposure affects the strategies' pattern of recognition of capital gains and the expected pre-tax returns.

STRATEGY SIMULATION METHODOLOGY

We model a standard approach to quantitative factor investing—maximizing exposure to expected returns subject to a tracking error target, long-only constraint, and other constraints and penalties.[14] Our strategies are simulated using approximately the Russell 1000 index constituent universe over a 33-year period from 1985 to 2017, rebalancing monthly based on value-momentum-quality factor models. We provide a brief overview of the strategy simulation methodology in this section and delegate further details to Appendix A.

Alpha Model

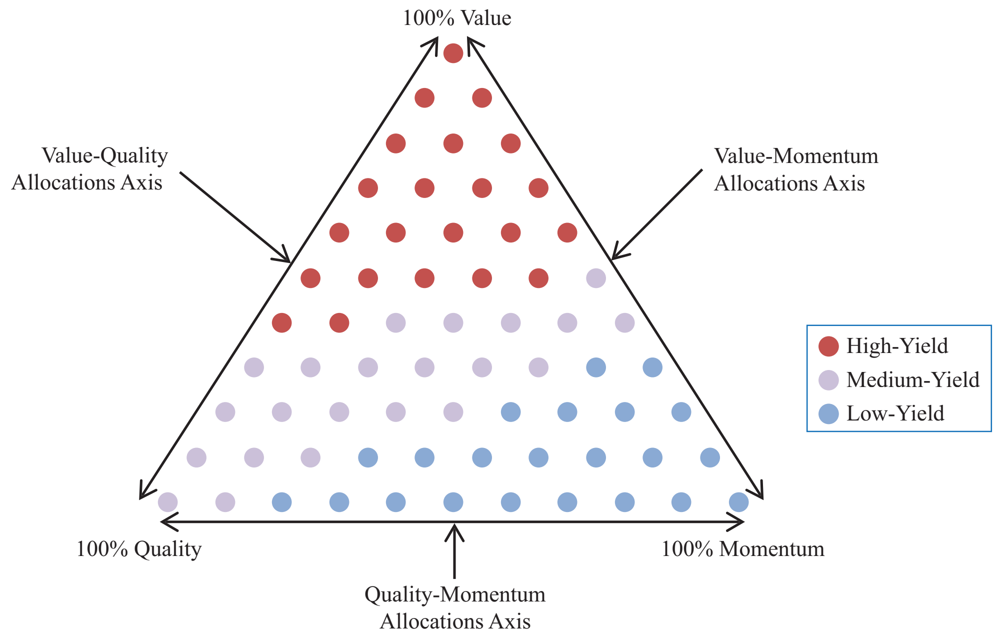
Value, momentum, and quality factors capture a significant portion of the variation in cross-sectional stock returns and are low-to-negatively correlated with each other, allowing us to study the effects of dividend yield and capital gains management on groups of very different stocks.[15] These factors also have different natural exposure to dividend yield, with value having the highest and momentum having the lowest dividend yield. In order to generalize our results we consider not only the individual factor portfolios but also their various combinations, ranging from a 100% risk allocation to each factor to approximately equal risk allocations among factors. We vary factor risk weights by 10% increments, giving us 66 combinations of risk allocations. We then separate those 66 factor models into three 22-factor groups of low-, medium-, and high-yield models. Exhibit 1 shows how these groups are distributed across the risk allocation spectrum. As expected, models with a higher allocation to value tend to have a relatively high dividend yield,

[13] The fact that dividend yield might in fact be attractive from a tax perspective can be easily seen from Equations 2 and 2′. If all the gains are realized, $\gamma_t = 1$, and realized short term, $t_G \geq t_D$, then both equations reduce to $r_{AT,t} = r_t[(1 - t_G) - \delta_t(t_D - t_G)]$. Since $(t_D - t_G) \leq 0$, as the fraction of the total return coming from dividend yield δ_t increases, holding the pre-tax return constant, the after-tax return increases rather than decreases.

[14] These types of long-only strategies are modeled in Sialm and Sosner (2018) and Sosner, Krasner, and Pyne (2019). Sialm and Sosner (2018) explained that dividends in long–short factor-based strategies might lead to different and potentially advantageous tax results. As a result, we focus on traditional long–only strategies where dividends are likely to be punitive from the tax perspective.

[15] See Asness et al. (2015). These authors used a value-momentum-defensive model. We subset the Asness et al. defensive theme to just its quality component, which borrows alpha signals from Asness, Frazzini, and Pedersen (2018).

EXHIBIT 1
Yield Categories of Different Risk Allocations to Factors



and models with a higher allocation to momentum tend to have a relatively low dividend yield.

Portfolio Construction

Using these alpha models, we construct long-only portfolios that target a tracking error of 5% and a beta of 1.0 with respect to the Russell 1000 benchmark. For each strategy we create two versions—capital-gains-agnostic and capital-gains-aware. Our portfolio construction methodology closely follows Sialm and Sosner (2018) with one modification: For dividend-yield-aware strategies, similar to Israel and Moskowitz (2012), we introduce dividend aversion into the optimization objective function as a linear term represented by a product of the portfolio's dividend yield and a dividend yield aversion coefficient. For stock-level dividend yield data we use MSCI Barra predicted dividend yield. A portfolio's dividend yield is computed as the weighted average yield of the portfolio's stock holdings.

Our main focus is on the effects of changing dividend aversion, and we do not observe large changes in turnover along the dividend aversion frontier. As a result, in our reported results we ignore transaction costs and report changes in gross-of-costs expected returns and taxes.[16]

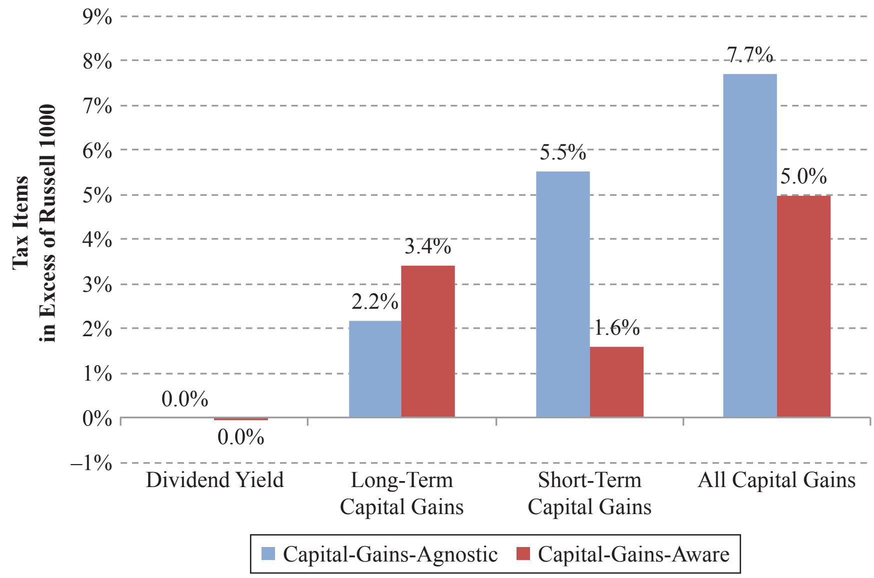
Tax Rates

We assume that the tax rate on dividends and long-term capital gains is 20% and the tax rate on short-term capital gains is 35%. These tax rates are broadly consistent with the level of US federal tax rates for higher-income brackets as of the time of this writing. Note that all the dividend income is assumed to be qualified dividend income taxed at the lower long-term capital gains rate. This assumption is appropriate for value-momentum-quality factor-based strategies modeled here because they tend to hold most positions for longer than 61 days, which is the period required for dividend income to be treated as qualifying for the low tax rate.

[16] Although the turnover is relatively stable along the dividend aversion frontier, similar to Israel and Moskowitz (2012) and Sialm and Sosner (2018), we observe a large decrease in turnover when capital gains awareness is introduced. We also find that this decrease in turnover is achieved without any meaningful degradation in the level of gross-of-costs expected return.

Exhibit 2

Comparison of Tax Items of Capital-Gains-Agnostic and Capital-Gains-Aware Strategies



BASE CASE OF NO DIVIDEND AVERSION

Before we begin varying the levels of dividend aversion we establish the base case of no dividend aversion (i.e., dividend yield aversion coefficient equal to zero). Exhibit 2 compares the tax items—dividends and long-term and short-term capital gains—for an average capital-gains-agnostic strategy and an average capital-gains-aware strategy. All the values in Exhibit 2 are shown in excess of the Russell 1000 benchmark. An average capital-gains-agnostic strategy has a dividend yield similar to the benchmark but realizes significantly higher capital gains than the benchmark, in particular in the highly-taxed short-term capital gains category. Capital gains awareness does not change the level of dividend yield but substantially reduces the level of realized capital gains. Whereas low-taxed long-term capital gains show a small increase relative to the capital-gains-agnostic strategy, punitive short-term capital gains are drastically reduced.

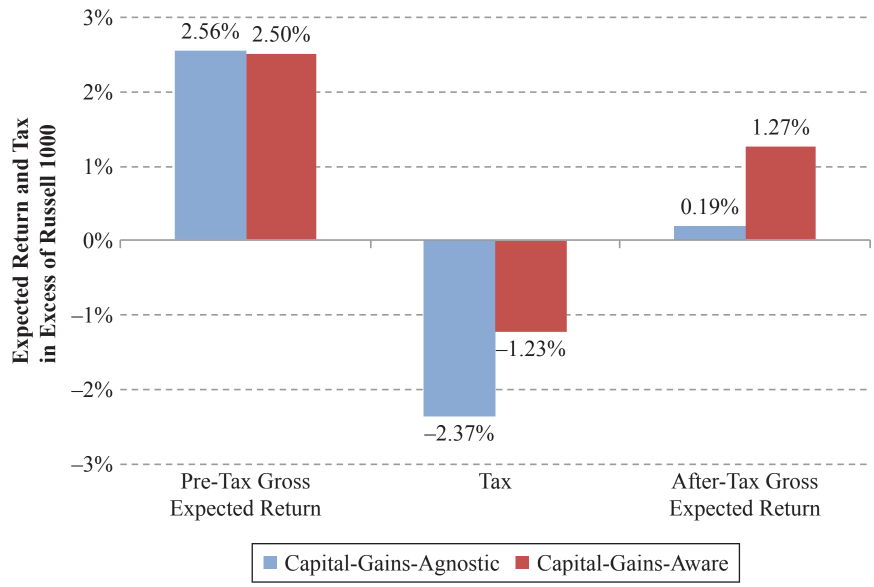
Exhibit 3 shows pre-tax gross-of-costs expected returns, tax liabilities, and after-tax gross-of-costs expected returns. Similar to Exhibit 2, all of the values are shown in excess of the Russell 1000 benchmark. Capital gains awareness has a minimal impact on expected pre-tax excess returns (see Appendix B for the methodology for computing the expected pre-tax returns). However, it results in a significant reduction in tax liabilities. The tax items shown in Exhibit 2 multiplied by their respective tax rates amount to 2.37% tax liability in excess of the benchmark for an average capital-gains-agnostic strategy and 1.23% tax liability for an average capital-gains-aware strategy, a tax saving of 114 bps. As a consequence of these significant tax savings, capital gains awareness improves the expected after-tax excess returns by more than 100 bps, from 19 bps for an average capital-gains-agnostic strategy to 127 bps for an average capital-gains-aware strategy.

IMPACT OF DIVIDEND AVERSION

Dividend Aversion and Taxable Items

We can now introduce dividend aversion. Exhibit 4, Panel A, shows the change in dividend yield and realized capital gains as the dividend yield aversion coefficient increases from 0 (no aversion) to 1 for an average capital-gains-agnostic strategy. At the aversion coefficient of 1, the average factor strategy portfolio's dividend yield declines by 1.6%. Given that the Russell 1000 index had a dividend yield of 2.4% over our 1985–2017 sample period, 1.6% is a very substantial reduction in the level of dividend yield.

EXHIBIT 3
Expected Returns and Taxes of Capital-Gains-Agnostic and Capital-Gains-Aware Strategies

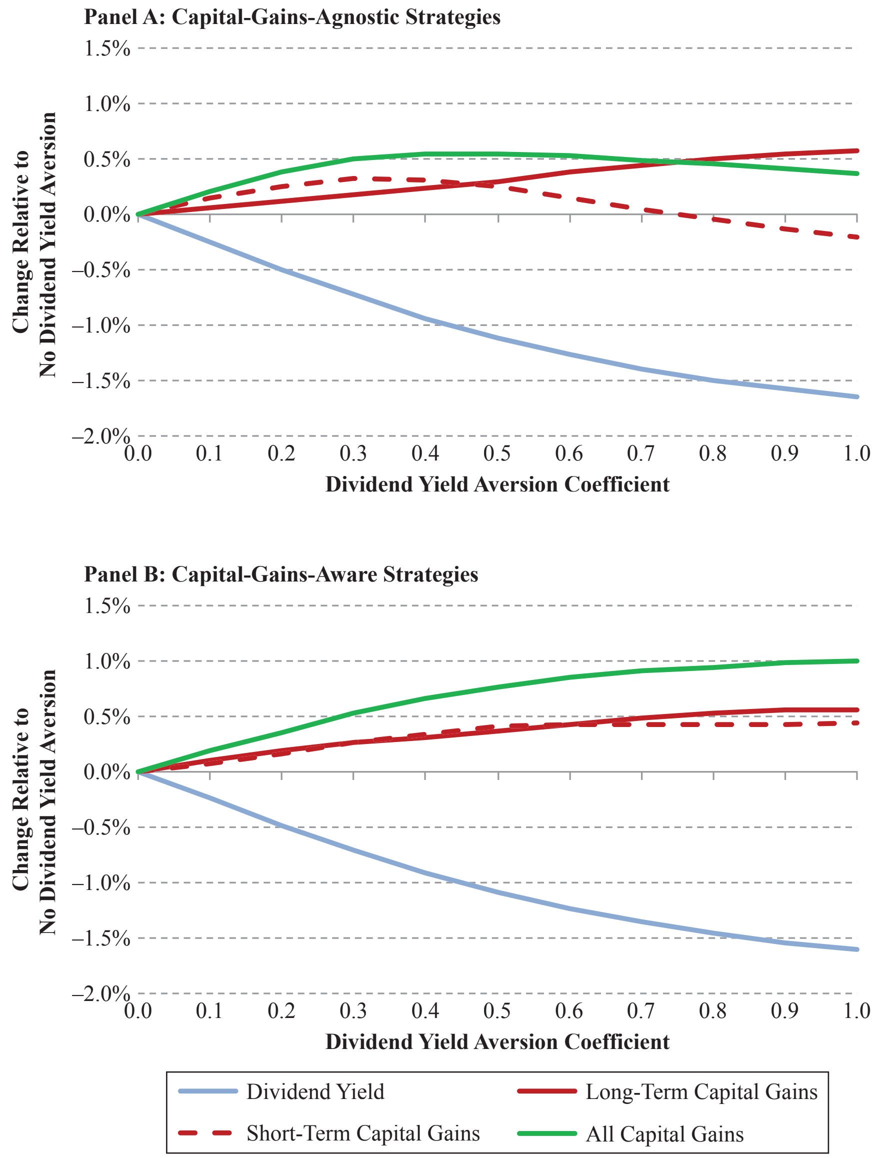


Reduction in the dividend yield of a strategy might have two opposite effects on realized capital gains. On one hand, holding the level of total return constant, a lower dividend yield mechanically implies higher capital gains. On the other hand, dividend aversion results in deviation from the pre-tax optimal portfolio, potentially leading to a reduction in the strategy's pre-tax returns and thus its capital gains. Which one of the two effects dominates is an empirical question. Exhibit 4, Panel A, shows that for an average capital-gains-agnostic strategy the former effect dominates for lower levels of dividend aversion, while the latter effect dominates for higher levels of dividend aversion. The total realized gains peak at the aversion coefficient of 0.5 and then decline slightly but remain at the level above no dividend aversion.[17] Exhibit 4, Panel A, also shows that the pattern of long-term realized gains is different from the pattern of short-term realized gains along the dividend aversion frontier. Realized long-term capital gains increase monotonically while realized short-term capital gains first increase and then decrease.

For an average capital-gains-aware strategy, there is an additional third effect of dividend aversion. As the dividend aversion increases, the dividend yield penalty clashes progressively more with the capital gains penalty in the strategy portfolio's objective function, thus reducing the effectiveness of capital gains management. As we show in the previous subsection, capital gains management results in a large decrease in realization of highly taxed short-term capital gains and thus leads to a very meaningful reduction in tax costs. In the base-scenario shown in Exhibit 2, the level of realized short-term capital gains for an average capital-gains-agnostic strategy is 5.5% of the NAV compared to just 1.6% for an average capital-gains-aware strategy. However, this ability of capital-gains-aware strategies to reduce short-term capital gains realization deteriorates with the increase in

[17] For capital gains calculation, we assume that the investor realizes no other capital gains or losses in the relevant periods. Thus, we first net long-term gains with long-term losses, and short-term gains with short-term losses. If both net amounts are gains, they are reported as taxable gains in their respective categories as long-term and short-term. If both net amounts are losses, they are carried forward in their respective categories. If one is a gain and the other is a loss, then capital gains and losses are netted across categories. If the total net amount is a gain, it is reported as a taxable gain in its respective category. If the total net amount is a loss, it is carried forward in its respective category. For example, if net long-term gain (say \$20) exceeds net short-term loss (say \$18), the net amount (of \$2) is reported as a long-term gain taxable in the current year, whereas if net long-term gain (say \$20) is less than net short-term loss (say \$25), the net amount (of \$5) is a short-term loss carryforward. All the losses that are carried forward are netted with gains of the same category, long-term or short-term, in the next calendar year, after which the netting process is repeated for the following year.

Exhibit 4
Effect of Dividend Aversion on Dividend Yield and Realized Capital Gains



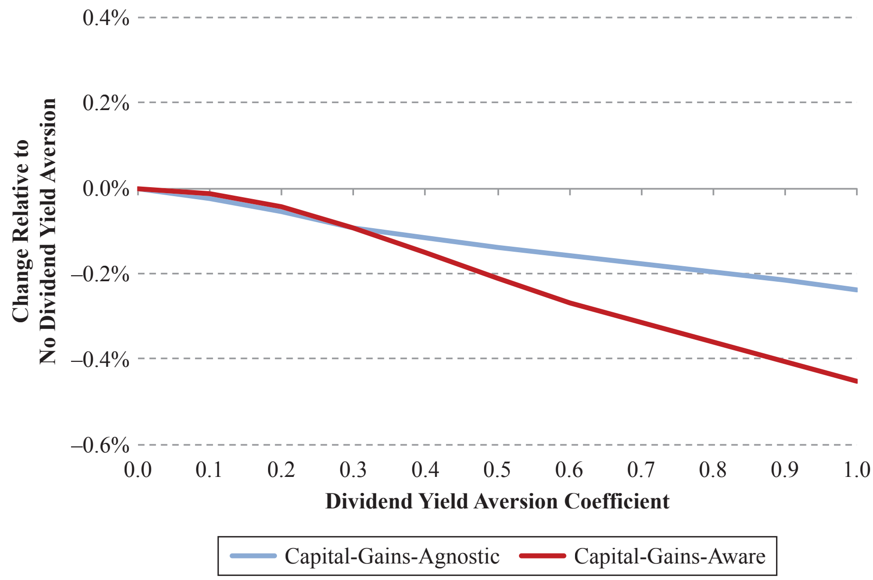
dividend aversion. Exhibit 4, Panel B, shows that for an average capital-gains-aware strategy, the conflict between dividend aversion and capital gains aversion dominates the reduction in capital gains due to the degradation in pre-tax returns at all levels of dividend aversion we tested.

Dividend Aversion and Expected After-Tax Returns

We now can estimate how dividend aversion affects the after-tax return of an average strategy. Exhibit 5 shows the change in expected after-tax returns of an average strategy as the dividend yield aversion coefficient increases from 0 to 1. Expected after-tax returns decline monotonically for both capital-gains-agnostic and capital-gains-aware strategies, indicating that reduction in dividend yield exposure is punitive for after-tax returns. Importantly, we showed in Exhibit 3 that in the base case of no dividend aversion an average capital-gains-aware strategy outperforms an average capital-gains-agnostic strategy on an after-tax basis by more than 100 bps. The former has an after-tax return of 127 bps while

EXHIBIT 5

Effect of Dividend Aversion on Expected After-Tax Return



the latter has an after-tax return of just 19 bps. Relative to these base-case levels of after-tax return, at the dividend yield aversion coefficient of 1, the 24 bp return loss for an average capital-gains-agnostic strategy shown in Exhibit 5 takes the expected after-tax excess return into the negative territory, while the 45 bp loss for an average capital-gains-aware strategy implies giving up a third of the base-case expected after-tax excess return.

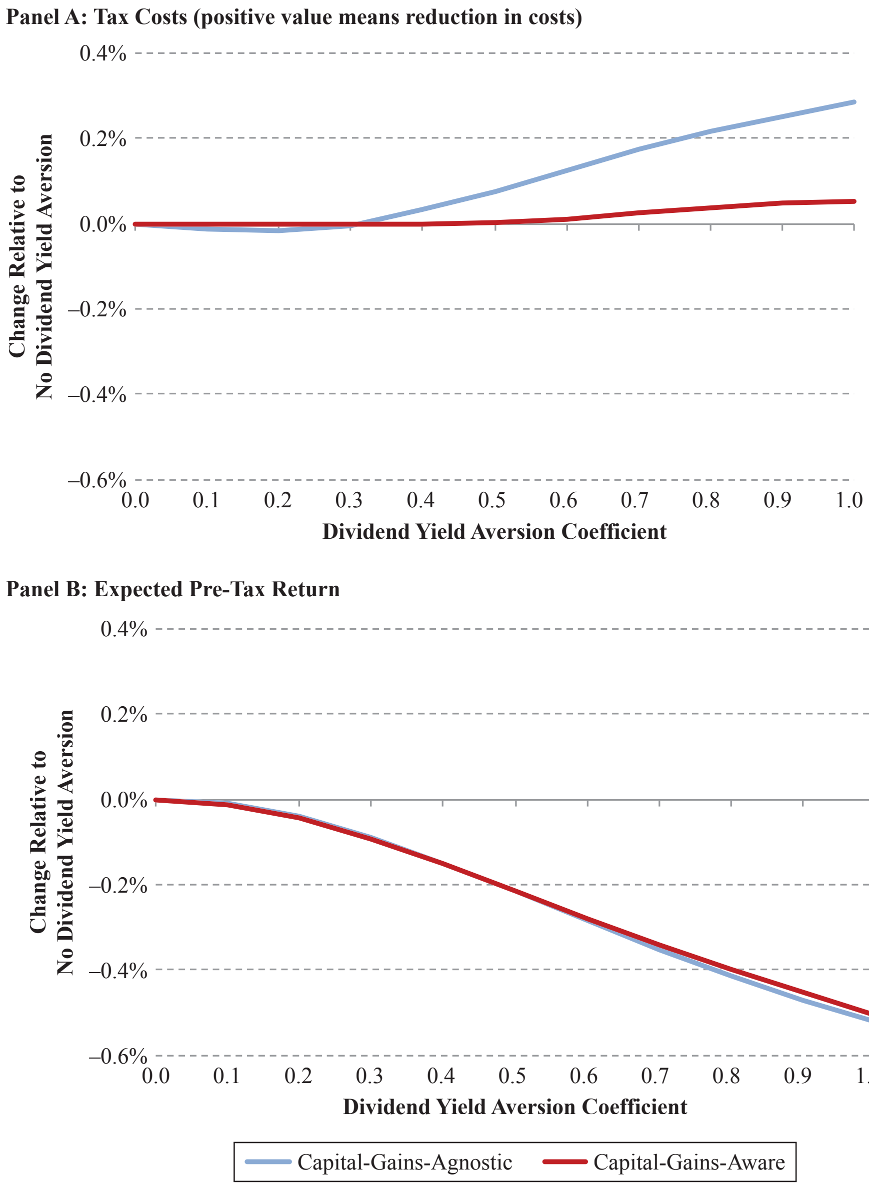
We can attribute the degradation of after-tax returns to changes in pre-tax returns and taxes. Exhibit 6, Panel A, shows the change in taxes of an average strategy as the dividend yield aversion coefficient increases from 0 to 1. Under our tax rate assumptions, an average capital-gains-agnostic strategy has some tax cost reduction from dividend yield management, whereas an average capital-gains-aware strategy has virtually none. At the dividend yield aversion coefficient of 1, dividend awareness decreases the tax cost of an average capital-gains-agnostic strategy by 28 bps from its base-case level of 2.37% shown in Exhibit 3. However, for the capital-gains-aware strategy, dividend awareness conflicts with capital gains awareness, and the overall tax cost is reduced by a mere 5 bps from its base-case level of 1.23% in Exhibit 3. In Exhibit 3 we showed that capital gains management results in tax cost savings of 114 bps. By comparison, dividend yield management at the dividend yield aversion coefficient of 1 only yields tax costs savings of 28 bps. Based on these results, for US taxable individual investors, capital gains awareness is a much more effective tax management tool than dividend awareness.

Conceptually, this is not surprising because both time-series variation and cross-sectional dispersion are much higher for capital gains than for dividend yields, thus creating significantly greater optionality for capital gains management. Moreover, for capital gains, the investor controls the timing and the level of realized gain or loss, whereas for dividend yield, both the timing and the level are controlled by the firm issuing the stock, further reducing the optionality afforded by dividend yield management compared to capital gains management. Our empirical results are interesting because they quantify these conceptual considerations.

The amount of tax savings does not however tell the full story. In pursuit of lower tax costs investors will likely need to deviate from their investment thesis, which in turn would result in lower expected pre-tax returns. Exhibit 6, Panel B, shows the change in expected pre-tax returns of an average strategy as the dividend yield aversion coefficient increases from 0 to 1. At the dividend yield aversion coefficient of 1, the expected pre-tax return of an average strategy decreases by 50 bps. The decrease in pre-tax return is virtually

Exhibit 6

Effect of Dividend Aversion on Tax Costs and Expected Pre-Tax Return



identical for an average capital-gains-agnostic and an average capital-gains-aware strategy.

In the base-case scenario of no dividend aversion shown in Exhibit 3, the expected pre-tax active return in excess of the Russell 1000 benchmark was 2.56% for an average capital-gains-agnostic strategy and 2.50% for an average capital-gains-aware strategy. That is, capital gains awareness, while meaningfully reducing tax costs, had a minimal effect on expected pre-tax returns.[18] In contrast, dividend aversion results in a meaningful loss of expected pre-tax returns. This degradation in expected pre-tax returns is particularly disadvantageous for capital-gains-aware strategies, which, as we show in Exhibit 6, Panel A, do not benefit from a reduction in tax costs.

[18] This result is consistent with Sialm and Sosner (2018), who show the same result for a similarly constructed strategy.

To summarize, for an average factor-based long-only strategy we replicated the evidence in the prior literature that showed capital gains awareness can meaningfully enhance after-tax returns for a US taxable individual investor. On the other hand, we struggle to find evidence that reducing dividend yield exposure improves after-tax returns for factor-based strategies with some level of pre-tax alpha.

Our reader could argue that the reason we didn't see a benefit of dividend yield exposure management is that we were looking in the wrong place: Rather than averaging across all the factor-based strategies—low-, medium-, and high-yield—we should have focused on high-dividend-yield strategies, such as value, where the benefit of dividend yield awareness might arguably be the highest. To address such concerns, in the next section we provide a more granular analysis by separating our strategies into naturally low-, medium-, and high-yield categories. As a preview, this analysis leads to the same conclusion that a benefit of managing dividend yield exposure for factor-based long-only strategies is hard to demonstrate, in particular for high-yield strategies.

ANALYSIS BY LOW-, MEDIUM-, AND HIGH-YIELD STRATEGY CATEGORIES

Base Case of No Dividend Aversion by Yield Category

We begin our analysis of dividend yield categories with the base case of no dividend aversion. The levels of dividend yield in excess of the Russell 1000 benchmark are shown in Exhibit 7. As expected, models with a higher allocation to value tend to have a relatively high dividend yield and models with a higher allocation to momentum tend to have a relatively low dividend yield. There is a difference of close to 120 bps between the yield of an average high-yield and an average low-yield strategy. This difference is quite sizable compared to the 2.4% average yield of the Russell 1000 index during our sample period. Capital gains awareness has no significant effect on the levels of dividend yield.

In Exhibit 8 we consider the *differences* between capital-gains-agnostic and capital-gains-aware strategies by yield category in the base case of no dividend aversion. The results show that there is little variation across yield categories: Capital gains awareness reduces expected pre-tax returns by 5 bps to 6 bps, helps save between 112 bps and 118 bps on tax costs, and as a consequence improves expected after-tax returns by 105 bps to 112 bps.

Dividend Aversion and Changes in Dividend Yield by Yield Category

Exhibit 9 shows the change in dividend yield as the dividend yield aversion coefficient increases from 0 to 1. The increase in dividend aversion has the largest impact on high-yield strategies. Exhibit 7 showed that the excess (to the Russell 1000) yield of the average low-, medium-, and high-yield capital-gains-agnostic strategies were –50, –12, and 66 bps, respectively. At the dividend yield aversion coefficient of 1, the strategies experience a reduction in dividend yield of approximately 110, 150, and 230 bps, respectively. This results in all three categories having a similar excess dividend yield of about –160 bps at the dividend yield aversion coefficient of 1. With the Russell 1000 index dividend yield of 2.4%, this constitutes a two-thirds reduction relative to the benchmark. Capital-gains-agnostic and aware strategies show virtually identical results for the dividend yield reduction. It is worth noting that strategies starting with very disparate levels of dividend yield in Exhibit 7 end up with very similar levels of dividend yield at high values of the dividend aversion coefficient.

Dividend Aversion and Expected After-Tax Returns by Yield Category

Do the meaningful decreases in dividend yield exposure observed in Exhibit 9 translate into increased expected after-tax returns? Exhibit 10 shows the change in expected after-tax returns as the dividend yield aversion coefficient increases from 0 to 1. For all three yield categories, increasing the dividend yield aversion coefficient results in degradation of expected after-tax returns. In fact, high-yield strategies that show the largest dividend yield reductions in Exhibit 9 suffer the greatest loss of expected after-tax return. Moreover, the after-tax return advantages of capital-gains-aware strategies of 105 bps to 112 bps shown in Exhibit 8 are partially eroded by increasing the dividend aversion, because the degradation in expected after-tax returns is greater for capital-gains-aware strategies. In Exhibit 8, for example,

Exhibit 7
Excess Dividend Yield by Yield Category

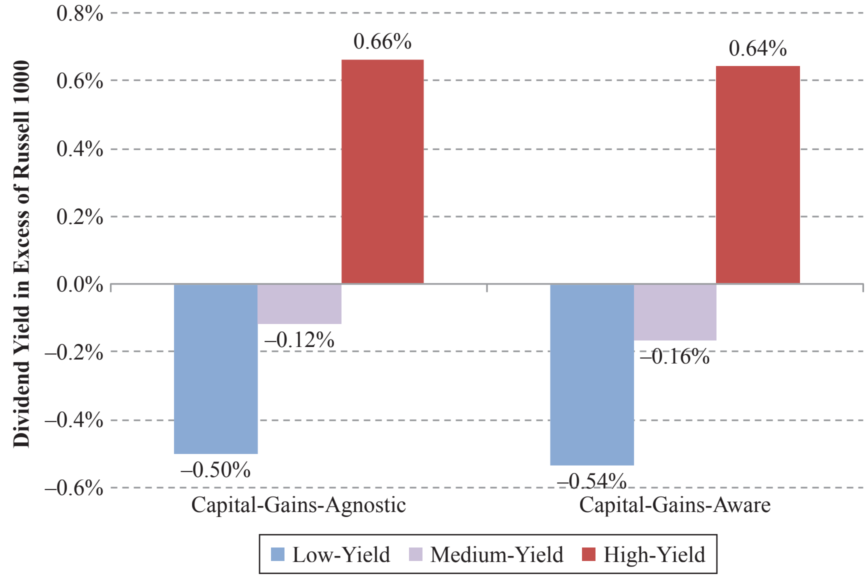
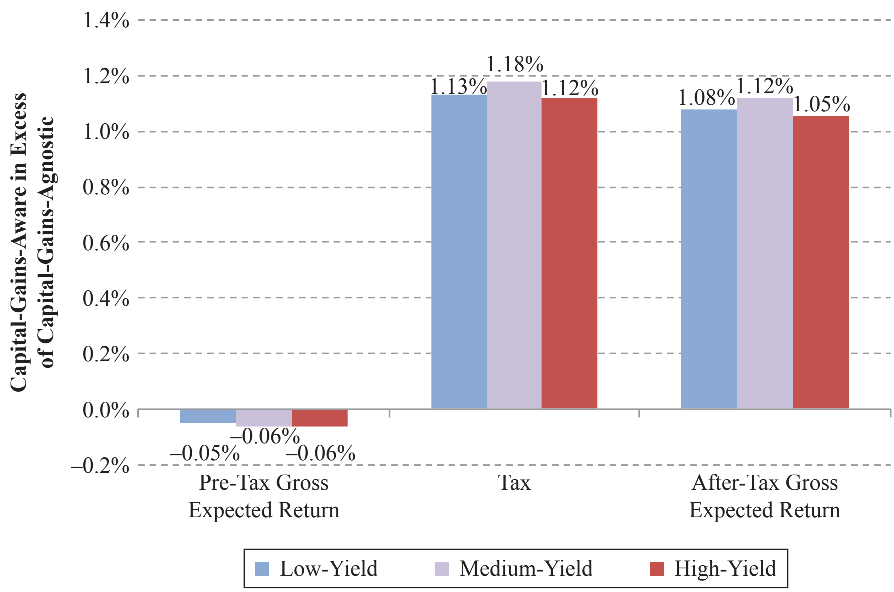


Exhibit 8
Capital-Gains-Aware versus Capital-Gains-Agnostic Strategies by Yield Category



on an after-tax gross-of-costs basis, at the dividend yield aversion coefficient of 0, an average high-yield capital-gains-aware strategy outperformed an average high-yield capital-gains-agnostic strategy by 105 bps. However, in Exhibit 10, at the dividend yield aversion coefficient of 1, an average capital-gains-agnostic strategy experiences a 32 bp reduction in expected after-tax return while an average capital-gains-aware strategy's expected after-tax return is reduced by 62 bps. This reduces the initial 105 bp advantage of an average capital-gains-aware

Exhibit 9

Effect of Dividend Aversion on Dividend Yield by Yield Category

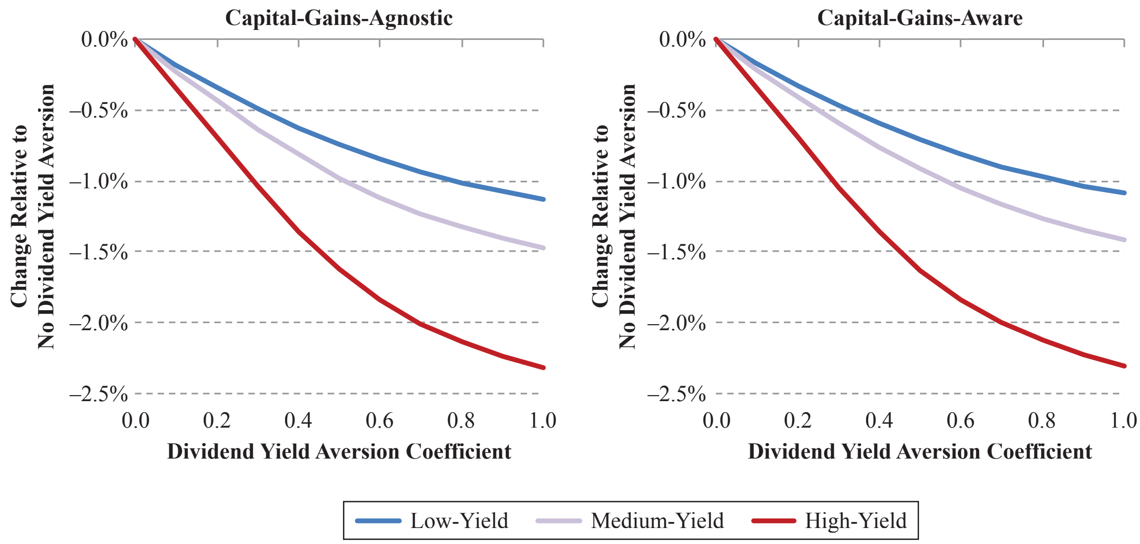
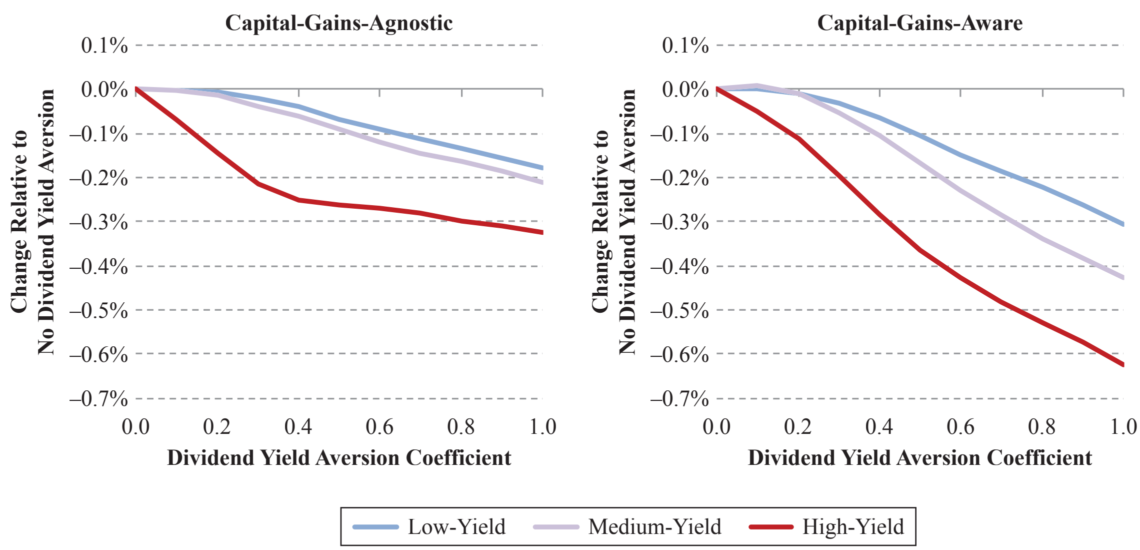


Exhibit 10

Effect of Dividend Aversion on Expected After-Tax Returns by Yield Category

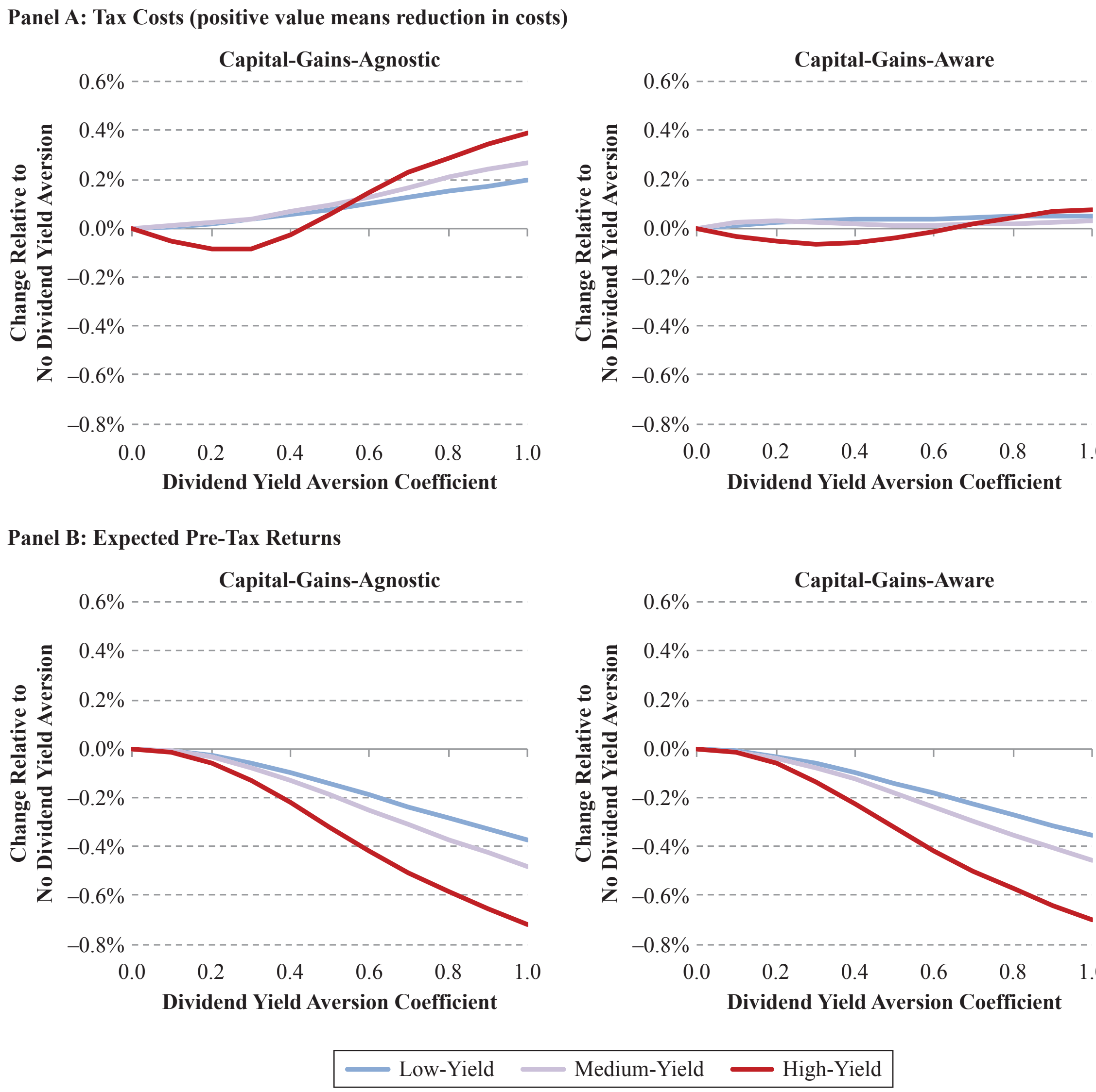


strategy to 75 bps. Based on the results in Exhibit 10, we conclude that dividend awareness interferes with capital gains awareness and reduces the effectiveness of capital gains management.

What causes this loss of expected after-tax returns shown in Exhibit 10? Exhibit 11 decomposes the change in expected after-tax returns into that due to tax costs and that due to expected pre-tax returns. Exhibit 11, Panel A, shows that all the capital-gains-agnostic strategies benefit from reduction in tax costs at high levels of dividend aversion. Note that this reduction in tax costs, ranging from 20 to 40 bps, at the dividend yield aversion coefficient of 1 is much lower than the reduction in tax costs due to capital gains awareness,

Exhibit 11

Effect of Dividend Aversion on Tax Costs and Expected Pre-Tax Return by Yield Category



amounting to more than 110 bps shown in Exhibit 8. Results for capital-gains-aware strategies are substantially muted due to the fact that dividend aversion interferes with the strategies' ability to manage the realization of capital gains. As a result, for these strategies, savings from reduced dividend yield are largely offset by higher taxes on realized capital gains.

Exhibit 11, Panel B, reveals the main culprit for the loss in expected after-tax returns. Increase in dividend aversion causes deviations from the pre-tax optimal strategy, which in turn leads to loss of expected pre-tax returns. Such deviations are more punitive for strategies that have naturally higher dividend yields. This loss of expected pre-tax return is similar for capital-gains-agnostic and capital-gains-aware strategies.

To summarize, our results by dividend yield category support our main conclusion that from the perspective of a US taxable individual investor, managing dividend yield exposure is unlikely to be beneficial for quantitative factor-based long-only strategies. Moreover, expected after-tax returns of high-yield strategies, where one would hope for a bigger benefit from dividend exposure management, in fact suffer the most from reduction in dividend yield exposure.

CONCLUSION

While the tax benefits of capital gains management are well documented in the literature, a consensus on the tax benefits of managing dividend yield exposure seems to be lacking. In this study we focus on dividend yield management for a particular popular type of investment strategies—quantitative factor-based long-only strategies. Rather than limiting ourselves to a particular factor, such as value or momentum, we simulate 66 strategies with varying combinations of risk allocations to value, momentum, and quality factors by changing the risk weights by 10% increments. For each of the 66 strategies we simulate a dividend aversion frontier for both capital-gains-agnostic and capital-gains-aware versions. We summarize the results in two ways, first by averaging across all the 66 strategies and then by separating the strategies into three equally sized groups of 22 strategies based on the level of dividend yield.

Our main conclusions are as follows. First, as expected, using dividend aversion in strategy portfolio construction helps reduce dividend yield exposure by a significant amount. Dividend yield is reduced the most for naturally high-yield strategies that make a large allocation to the value factor. Second, dividend aversion causes large reductions in expected pre-tax strategy returns. This reduction is particularly pronounced for high-yield strategies. Third, dividend aversion results in an increased realization of capital gains that partially—and in some cases fully—offsets the tax benefit of lower dividend yields. The increase in both long-term and short-term capital gains realization is particularly pronounced for capital-gains-aware strategies. For such strategies dividend yield awareness interferes with capital gains awareness. Finally, for reasonable expectations of manager alpha, the tax benefits of lower dividend yields are not enough to compensate for the associated increase in capital gains taxes and decrease in expected pre-tax returns. As a result, dividend avoidance results in a reduction in expected after-tax returns.

We would like to point out that our results are specific to a particular class of strategies (quantitative long-only equity strategies) and a particular type of investors (US individuals investing in taxable accounts); thus it is conceivable that in other situations investors might benefit from dividend yield exposure management. Nevertheless, we believe that our results present a valuable addition to the body of literature studying the benefits of various tax management techniques.

APPENDIX A

EMPIRICAL METHODOLOGY

Alpha Model

We constructed the factor-based model portfolios $\tilde{\boldsymbol{v}}_k$ as follows. We turned raw factor scores into industry-relative ranks.[19] We de-meaned these ranks within each industry (by subtracting the average rank within an industry) and standardized them (by dividing by the standard deviation of the ranks within an industry) to create an industry-neutral portfolio. These long–short portfolio weights for the three factors are denoted by $\boldsymbol{v}_{VAL}$ for value, $\boldsymbol{v}_{MOM}$ for momentum and $\boldsymbol{v}_{QUAL}$ for quality. This ranks-based factor portfolio formation method is borrowed from Asness et al. (2015) and Sialm and Sosner (2018).

We then normalized the value, momentum, and quality portfolios by their respective volatility forecasts:

$$\tilde{\boldsymbol{v}}_{VAL} = \frac{1}{\sigma_{VAL}} \boldsymbol{v}_{VAL},\ \tilde{\boldsymbol{v}}_{MOM} = \frac{1}{\sigma_{MOM}} \boldsymbol{v}_{MOM},\ \tilde{\boldsymbol{v}}_{QUAL} = \frac{1}{\sigma_{QUAL}} \boldsymbol{v}_{QUAL}.$$

We computed the volatility forecasts using the MSCI Barra USE3L risk model (see Barra 1998 for details).

We then constructed a given model portfolio k as a weighted average of the value, momentum, and quality portfolios:

$$\boldsymbol{v}_k = \theta_{VAL,k}\tilde{\boldsymbol{v}}_{VAL} + \theta_{MOM,k}\tilde{\boldsymbol{v}}_{MOM} + (1 - \theta_{VAL,k} - \theta_{MOM,k})\,\tilde{\boldsymbol{v}}_{QUAL}.$$

Then we normalized the model by its predicted volatility:

$$\tilde{\boldsymbol{v}}_k = \frac{1}{\sigma_k} \boldsymbol{v}_k.$$

[19] For the industry classification, we use the industry levels of the Global Industry Classification Standard (GICS), developed by MSCI and Standard & Poor's. The GICS classification has four levels—sector, industry group, industry, and subindustry—with sector the most aggregated and subindustry the most granular. Historically, the number of GICS industries has varied from 59 before 1999 to 70 in 2017.

We computed the model volatility σ_k in the same way as the value, momentum, and quality factor volatilities.

Following the methodology of Jones, Lim, and Zangari (2007), at every month-end we convert the model portfolio $\tilde{\boldsymbol{v}}_k$ into a vector of stock-level alphas by multiplying it by the stock-level covariance matrix $\boldsymbol{\Sigma}$ (from MSCI Barra's USE3L risk model):

$$\alpha_k = \Sigma \tilde{\boldsymbol{v}}_k.$$

The alpha forecasts used in the optimization rely on only the information available at the time of portfolio construction.

Portfolio Construction

The optimization problem for our strategies is defined as follows:

$$\max_{w_1 \ldots w_N} \sum_i w_i \alpha_{k,i} - \gamma_G T_G - \gamma_D \sum_i (b_i + w_i)\gamma_i$$

$$s.t.$$

$$\sum_i \sum_j w_i w_j \sigma_{ij} \le TE^2$$

$$\sum_i b_i + w_i = 1$$

$$0.98 \le \sum_i (b_i + w_i)\beta_i \le 1.02$$

where w_i and $\alpha_{k,i}$ correspond to the active portfolio weight and the alpha of security i, b_i is the benchmark weight of security i, γ_G is the capital gains aversion coefficient (equal 0 for capital-gains-agnostic optimizations and 0.1 for capital-gains-aware optimizations, as in Sialm and Sosner 2018), T_G is the tax cost of realized capital gains resulting from rebalancing the portfolio, γ_D is the dividend yield aversion coefficient that we vary between 0 and 1, y_i is MSCI Barra predicted dividend yield of stock i, σ_{ij} is the covariance between the returns of securities i and j derived from MSCI Barra's risk model, TE is the target tracking error of 5% annually, and β_i corresponds to the beta of security i with respect to the Russell 1000 index predicted by the MSCI Barra risk model.

The tax cost of capital gains is defined as follows:

$$T_G = t_{LT} g_{LT} + t_{ST} g_{ST},$$

where t_{LT}, t_{ST} are the long-term and short-term capital gain tax rates, respectively, and g_{LT}, g_{ST} are the net long-term and short-term capital gains computed from individual tax lots, respectively. The tax burden, T_G, is expressed as a proportion of the strategy's net asset value. Several studies have documented that the choice of accounting method for tax lot selection has a nontrivial effect on after-tax returns (Dickson, Shoven, and Sialm 2000, Berkin and Ye 2003, and Israel and Moskowitz 2012). Because the effects of tax lot accounting are not central to our conclusions and have been analyzed elsewhere, we use the HIFO (highest in, first out) tax lot accounting method throughout this article.

Appendix B

IMPLEMENTATION EFFICIENCY AND MANAGER EXPECTED RETURNS

Measuring the impact of optimization penalties and constraints on realized strategy returns can be unreliable and prone to biases. For example, a given penalty can shift a strategy's exposure away from a particular risk factor toward another factor. If the former factor happened to outperform the latter over the strategy's simulation period, it might look like the optimization penalty had a punitive effect. And vice versa, if the former factor were to underperform the latter, we might conclude that the optimization penalty had a benefit.

A proper estimation and validation of the interaction of optimization settings with realized returns is a highly complex topic and well outside the scope of this article. As a result, although realized returns of our simulations support our conclusions, we choose to focus not on realized returns but on a metric that directly measures the impact of penalties: expected returns derived on the basis of portfolio implementation efficiency from the manager's perspective.

Our starting point is the manager's view on individual stocks based on their fundamental characteristics, in our case value, momentum, and quality. From the manager's vantage point, this view precisely reflects all the information he or she has about stocks and thus represents the ideal set of portfolio weights. The manager expects the ideal view portfolio to have an information ratio that is high enough to enhance passive benchmark returns after accounting for all costs, penalties, and constraints. If not, the manager would've chosen to hold a passive benchmark.

Due to constraints, such as the long-only constraint, or penalties, such as taxes, the manager must deviate from the ideal view portfolio. How much would such deviations impact the manager's expected returns? In this section we summarize the theoretical framework originally developed in Clarke, de Silva, and Thorley (2006) and Grinold (2006) that will help us answer this question. In particular, this framework will guide our assessment of degradation in strategies' expected pre-tax returns as a consequence of reducing dividend yield exposure. In this Appendix we summarize the main ideas of the framework and refer interested readers to the source articles for derivations and additional commentary.

Ideal View Portfolio Return, Volatility, and Information Ratio

Let $\bar{\boldsymbol{r}}$ and $\boldsymbol{C}$ stand for the manager's vector of stock-level expected returns and stock-level forecast covariance matrix. Let $\boldsymbol{v}$ be the vector of weights of the ideal view portfolio Q that most accurately reflects the manager's expected stock returns $\bar{\boldsymbol{r}}$. The manager expects the return of the view portfolio to be

$$\bar{r}_Q = \boldsymbol{v}^T \bar{\boldsymbol{r}},$$

its volatility to be

$$\sigma_Q = \sqrt{\boldsymbol{v}^T \boldsymbol{C} \boldsymbol{v}},$$

and its information ratio to be

$$IR_Q = \frac{\bar{r}_Q}{\sigma_Q}.$$

Investment Portfolio Return, Volatility, and Information Ratio

The manager who implements his or her ideal view portfolio under constraints and penalties constructs an investment portfolio P defined by a vector of stock-level active weights $\boldsymbol{w}$. The manager expects that portfolio P will realize an active gross return

$$\bar{r}_{P,gross} = \boldsymbol{w}^T \bar{\boldsymbol{r}},$$

an active risk (or tracking error)

$$\sigma_{P,gross} = \sqrt{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{w}},$$

and a gross information ratio

$$IR_{P,gross} = \frac{\bar{r}_P}{\sigma_P}. \tag{B-1}$$

Implementation Efficiency and Investment Portfolio Return

Given a mean-variance optimization problem and the forecast covariance matrix of stock returns $\boldsymbol{C}$, the manager's expected returns are proportional to the view portfolio:

$$\bar{\boldsymbol{r}} \propto \boldsymbol{C}\boldsymbol{v}.$$

Based on this result, it can be further shown that

$$IR_{P,gross} = \frac{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{v}}{\sqrt{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{w}}\sqrt{\boldsymbol{v}^T \boldsymbol{C} \boldsymbol{v}}} IR_Q. \tag{B-2}$$

The view portfolio Q reflects exactly the manager's return forecasts and thus has the highest expected information ratio before tax. The multiplier $\frac{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{v}}{\sqrt{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{w}}\sqrt{\boldsymbol{v}^T \boldsymbol{C} \boldsymbol{v}}}$ is the expected correlation between returns of the investment portfolio P and the view portfolio Q; it is commonly referred to in the literature as the *transfer coefficient*. The transfer coefficient measures how close the returns of the actual investment portfolio are expected to be to the returns of the ideal view portfolio, and thus serves as a measure of implementation efficiency of stock-level return forecasts.

We define

$$\theta_P \equiv \frac{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{v}}{\sqrt{\boldsymbol{w}^T \boldsymbol{C} \boldsymbol{w}}\sqrt{\boldsymbol{v}^T \boldsymbol{C} \boldsymbol{v}}}$$

and rewrite Equation B-2 as

$$IR_{P,gross} = \theta_P \times IR_Q. \tag{B-3}$$

By combining Equations B-3 and B-1, we can express the gross expected active return of portfolio P as a product of its tracking error, its transfer coefficient, and the view portfolio's information ratio:

$$\bar{r}_{P,gross} = \sigma_{P,gross} \times \theta_P \times IR_Q.$$

Finally, by adjusting the expected gross return by transaction costs τ_P we obtain the expression for the net-of-costs expected active return of portfolio P:

$$\bar{r}_{P,net} = \sigma_{P,gross} \times \theta_P \times IR_Q - \tau_P. \tag{B-4}$$

Comparison of Investment Portfolios with Different Dividend Yield Exposure

Equation B-4 allows us to compare the expected returns of two portfolios, P and P'. Assuming that both portfolios target—and achieve—the same level of tracking error σ_{gross}, the difference in net-of-costs active returns is

$$\bar{r}_{P,net} - \bar{r}_{P',net} = \sigma_{gross} \times (\theta_P - \theta_{P'}) \times IR_Q - (\tau_P - \tau_{P'}). \tag{B-5}$$

We find that in our simulations the target tracking error is almost always achieved; therefore, the assumption that both portfolios P and P' have the same tracking error is generally satisfied. In addition, as we also discuss in the main text, dividend aversion has little effect on transaction costs. As a result, in our specific case, it is reasonable to simplify Equation B-5 to

$$\overline{r}_{P,net} - \overline{r}_{P',net} \approx \overline{r}_{P,gross} - \overline{r}_{P',gross} = \sigma_{gross} \times (\theta_P - \theta_{P'}) \times IR_Q. \quad \text{(B-6)}$$

In other words, the difference in portfolio net active returns can be approximated by the difference in portfolio gross active returns, which in turn reduces to the difference in portfolio transfer coefficients multiplied by the tracking error and the view portfolio information ratio. We use the latter metric throughout the article for assessing the impact of tax management on pre-tax returns.

Note that under a reasonable assumption that portfolio-level transaction costs are relatively stable over time, transaction costs have very little effect on the tracking error, allowing us to rewrite Equation B-6 as

$$IR_{P,net} - IR_{P',net} \approx IR_{P,gross} - IR_{P',gross} = (\theta_P - \theta_{P'}) \times IR_Q.$$ [20]

This shows that, similar to the difference in portfolio returns, the difference in portfolio information ratios is driven by the difference in portfolio transfer coefficients.

Application of the Methodology to Our Study

We use Equation B-6 to measure the difference in expected returns. Note that, as discussed above, these expected returns capture the manager's ability to implement his or her stock-level views and are unaffected by the performance of specific risk factors over the strategy simulation period.

We simulated returns for 66 sets of value-momentum-quality allocations reflecting 66 different managers. Technically, this implies 66 different ideal view portfolios and thus potentially 66 different view portfolio information ratios. However, there is no reason to assume that our simulated managers would have different subjective view information ratios. Although post-factum one could argue that more balanced allocations to value, momentum, and quality outperformed more concentrated allocations (such as, for example, 100% to only one factor), ex ante, the managers who chose more concentrated allocations did so based on their beliefs that these would be the best performing allocation going forward; otherwise they would have chosen a different allocation. We thus assume that the manager's subjective information ratio for each of the 66 factor allocations is 0.8. Note that is not the information ratio of the investment portfolio, which would be the information ratio of the view multiplied by the transfer coefficient. Given that for our simulated strategies the average transfer coefficient (where the average is taken across all monthly portfolio rebalances and across all the 66 factor allocations) is about 0.6, the 0.8 information ratio of the view translates into a gross-of-costs-and-fees information ratio of about 0.5.

For example, if the transfer coefficient were 0.630 and 0.505 in the base case of no dividend aversion and in the case of dividend aversion coefficient of 1, respectively, this would imply a drop of 50 bps along the dividend aversion frontier (according to Equation B-6: 5% × 0.125 × 0.8 = 0.5%). This is approximately the level of the expected return loss we see in Exhibit 6, Panel B, in the main text for both an average capital-gains-agnostic and an average capital-gains-aware strategy.

[20] In other words, if transaction cost volatility is low and thus $\sigma_{net} \approx \sigma_{gross}$, we can replace σ_{gross} with σ_{net} on the right-hand side of Equation B-6. Dividing both sides of the resulting equation by σ_{net} yields the difference in information ratios on the left-hand side.

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