



Understanding the Tax Efficiency of Market Neutral Equity Strategies*

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Contrary to common belief, market neutral equity strategies can be very tax efficient. Not only can they have low tax burdens, but they can also yield tax benefits. These tax benefits can be further increased through tax-aware rebalancing: tax-aware market neutral strategies can achieve large tax benefits that are also sustainable over time. In addition, these tax-aware strategies have a tendency to realize higher tax benefits in bull markets, precisely when long-biased investors are most likely to gain from them. Importantly, in our sample, tax-aware market neutral strategies achieve these tax benefits with only a small degradation in pre-tax returns. Based on this, we conclude that tax-aware market neutral equity strategies can be an important tool in the toolbox of a taxable investor from both the tax and pre-tax perspectives.

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Introduction

The conventional wisdom is that the tax burden of an investment strategy increases with its turnover, as high-turnover strategies exhibit a higher propensity to realize capital gains. Short selling in particular is often perceived to be tax-inefficient since realized capital gains on short positions are generally taxed at a higher short-term capital gains tax rate, regardless of the holding period. In our study, we find that, contrary to popular perception, actively managed investment strategies that take advantage of short selling can not only have low tax burdens, but can even result in significant tax benefits if executed with an eye toward tax awareness.¹

In this paper, we first show the tax efficiency of strategies which employ short selling and explain the mechanics underpinning the tax efficiency.² We then demonstrate, through historical strategy simulations, how introducing tax awareness into market neutral strategies can further increase after-tax returns. We show that the tax benefits of tax-aware market neutral equity strategies are persistent and sustainable over time. We then discuss the impact of liquidation taxes and conclude with practical applications of tax-aware strategies.

Principles of Tax-Aware Investing

What matters is not how much you make but how much you keep, and taxes can be a significant drag on what investors get to keep. Some common ways for individual investors to reduce their tax burdens include deferring the realization of capital gains and accelerating the realization of capital losses.

Deferring capital gains is beneficial for several reasons. Long-term capital gains are taxed at a lower rate than short-term capital gains. Further deferral of realization of long-term capital gains to a future period allows investors to benefit from the time value of money with potentially more capital available for reinvestment. Importantly, the taxation of capital gains can be completely avoided when assets with unrealized gains receive a step-up of the cost basis at death or are gifted to a charity.

On the other hand, it is advantageous to accelerate the realization of capital losses since these losses can be used to offset current or future capital gains in the overall portfolio. Realizing short-term losses is particularly beneficial because they first offset higher taxed short-term capital gains. As an example, under the assumption of a 43.4% short-term capital gains tax rate, by realizing a \$100 short-term capital loss an investor with large short-term capital gains tax liabilities can achieve a tax benefit of \$43.4.³

A tax-aware approach to investing recognizes that realizing gains results in tax costs and realizing losses results in tax benefits and puts these tax costs and benefits on an equal footing with pre-tax alpha. Since the after-tax return of an investment strategy is the sum of its pre-tax return and its associated tax liabilities or benefits, we can view tax-aware strategies as those that seek attractive after-tax returns. Such strategies can thus be particularly well adapted to the needs of taxable investors in taxable accounts.

Simulation Methodology

We simulate tax-agnostic and tax-aware versions of quantitative market neutral strategies, over a

¹ The idea that combining long and short positions enhances tax efficiency has been previously discussed by Means (2002), Farr (2004), Gallmeyer et al. (2006), and Berkin and Luck (2010).

² Tax treatment depends in part on the investment vehicle used and the instruments traded. Throughout this paper we consider cash equities and taxable separately managed accounts of individual investors. The same tax treatment would not apply to, for instance, 40 Act Registered Investment Companies.

³ The 43.4% tax rate is the maximum individual federal tax rate (39.6%) plus net investment income tax (3.8%).



period of 31 years from 1985 to 2015. Both versions use the same model, but the tax-agnostic strategy does not employ tax-aware rebalancing and thus represents the baseline case. The quantitative strategies combine value and momentum style factors with equal weights. Appendix A provides further details on methodology and tax rate assumptions.⁴

The tax-aware strategy seeks to reduce tax liabilities from capital gains and increase tax benefits from capital losses by systematically accelerating the realization of capital losses and deferring the realization of capital gains. This is achieved through an optimization that balances the expected pre-tax benefits of liquidating unattractive positions against the tax liabilities or benefits associated with those liquidations.⁵

Understanding the Tax Efficiency of Market Neutral Equity Strategies

Tax-Agnostic versus Tax-Aware Strategy Performance

Exhibit 1 shows performance and turnover statistics for the simulated tax-agnostic and tax-aware strategies, each at a 4% volatility target.⁶

The most striking result in Exhibit 1 is that the tax-agnostic strategy, instead of realizing a tax liability, realizes an annual tax benefit of 0.3%, despite its high annual turnover (670% of NAV, 274% of GNV).⁷ This benefit comes from tax losses

realized by the market neutral strategy that can be used to offset gains realized by other strategies in the investor's portfolio.

Exhibit 1 | Performance of a Hypothetical Value-Momentum Market Neutral Strategy, 1985-2015

| | Tax-Agnostic | Tax-Aware |
|--|--------------|--------------|
| Annual Return | | |
| Pre-Tax | 5.5% | 4.3% |
| Tax Benefit (Liability) | 0.3% | 6.1% |
| After-Tax | 5.8% | 10.4% |
| Annual Volatility | | |
| Pre-Tax | 4.8% | 4.6% |
| After-Tax | 4.7% | 5.6% |
| Annual Sharpe Ratio | | |
| Pre-Tax | 1.1 | 0.9 |
| After-Tax | 1.2 | 1.9 |
| Turnover and Gross Notional Value | | |
| Annual Turnover, % of NAV | 670% | 504% |
| Annual Turnover, % of GNV | 274% | 158% |
| Gross Notional, % of NAV | 246% | 321% |

Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Returns are gross of fees and transaction costs and excess of cash (Merrill Lynch T-Bill Index). Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

In our analysis, tax-aware rebalancing of the market neutral strategy increases the tax benefits from 0.3% to 6.1% per year. Pre-tax return decreases by about 1% as the weights of the tax-aware strategy deviate somewhat from those of the tax-agnostic strategy.⁸ However, this reduction in pre-tax return is outweighed by the increase in tax benefits. As a result, tax awareness increases the after-tax return from 5.8% to 10.4% and the after-tax Sharpe ratio from 1.2 to 1.9 (see the bold numbers in Exhibit 1). Exhibit 1 reveals that tax awareness also reduces the turnover of the strategy.⁹ What explains this surprising tax efficiency of market neutral strategies?

4 The main conclusions about the tax benefits of short selling and tax awareness are not affected qualitatively if we use strategies with different factor specifications. However, in general, systematic strategies that use optimization in portfolio construction and are rebalanced with an approximately monthly frequency are better candidates for tax-aware rebalancing.

5 The optimizer might "sacrifice" some of the pre-tax alpha in order to increase the after-tax alpha. It is important to note though that in our context "sacrifice" does not mean giving up virtually certain pre-tax performance in order to achieve a tax benefit. It is a probabilistic statement relying on numerous assumptions such as accuracy of the expected return and risk predictions and the ability of the investor to utilize realized loss offsets optimally.

6 Turnover is defined as the average of all the purchases and sales and is normalized by either the net asset value (NAV) or the gross notional value (GNV). This definition of the turnover follows the definition commonly used by mutual funds, which is calculated by dividing the lesser of purchases or sales of securities by the monthly average of the value of the portfolio securities (<https://www.sec.gov/about/forms/formn-sar.pdf>).

7 At a target volatility of 4%, the tax-agnostic strategy is 123% long and 123% short, adding up to the GNV of 246%.

8 Given that the weights of the tax-aware strategy will deviate from those of the tax-agnostic strategy, long horizon investors might be concerned that tax-aware rebalancing might lead to a progressive divergence over time of the returns of the tax-agnostic and tax-aware strategies. However, we observe a high return correlation of 0.9 between the tax-agnostic and tax-aware strategies even at the end of our thirty year sample period, where the correlation is calculated over a 36-month rolling window.

9 Another effect of tax awareness is that the exposures shift away from value and toward momentum, as previously observed by Israel and Moskowitz (2012). This is because deferring the realization of capital gains results in holding on to recent winners, and accelerating the realization of capital losses results in selling recent losers, which is to some extent similar to how a momentum signal is constructed.

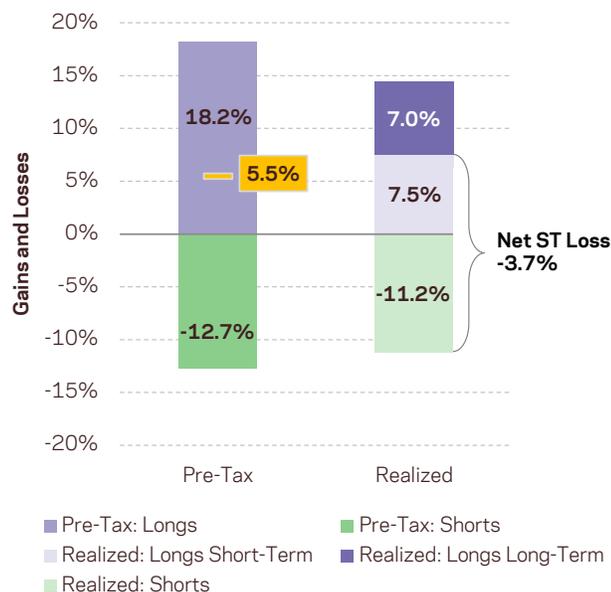


Inherent Tax Efficiency of Market Neutral Equity Strategies

On average, equity markets go up — e.g., the Russell 1000 index had an average annual return of 12.6% during our sample period. As a consequence, long positions tend to appreciate, while short positions tend to lose value.¹⁰

Moreover, under current law, all gains and losses realized on short positions, irrespective of the positions’ holding period, are treated as short-term gains and losses.¹¹ This amplifies the tax benefits resulting from losses on the shorts: As short-term losses first offset short-term gains which are taxed at a higher rate, they can be particularly beneficial. We illustrate this via a numerical example in Exhibit 2.

Exhibit 2 | Hypothetical Annual Pre-Tax Returns and Realized Gains and Losses of the Tax-Agnostic Strategy, 1985-2015



Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Returns are gross of fees and transaction costs and excess of cash (Merrill Lynch T-Bill Index). Sharpe ratio equals excess return over cash divided by the standard deviation of excess returns. Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

Exhibit 2 shows that the tax-agnostic strategy has a pre-tax gain of 18.2% on the longs and a pre-tax loss of -12.7% on the shorts resulting in a pre-tax strategy return of 5.5%. Due to the high turnover of the tax-agnostic strategy, a large proportion of the gains and losses are realized. In this simulation, the long leg realizes a 14.5% gain, roughly 80% of the total gains on the longs, consisting of a 7.5% short-term gain and a 7.0% long-term gain. Similarly, the short leg, realizes a -11.2% loss, roughly 88% of the -12.7% total loss, all of which is characterized as short-term. The short-term losses on the shorts of the tax-agnostic strategy more than offset its short-term gains on the longs to result in a net short-term loss of -3.7%. Note that the long-term gain on the longs remains at 7.0% since there are no offsetting long-term losses.

Multiplying the long-term gain and short-term loss by the respective tax rates of 23.8% and 43.4% yields a tax cost of 0.05%. Subtracting this cost from a 0.37% tax benefit arising from dividends results in the 0.32% tax benefit reported in Exhibit 1.¹²

How Tax Awareness Boosts Tax Efficiency

In addition to the fact that short positions on average lose value due to stock market appreciation, the ability to sell short increases the opportunity set for loss harvesting, especially in bull markets. Whether in a bull market or in a bear market, the long and short sides of the portfolio will typically move in opposite directions. When one side is realizing gains, the other is realizing losses. This is what makes market neutral strategies particularly well-suited for obtaining tax benefits through tax-aware management.

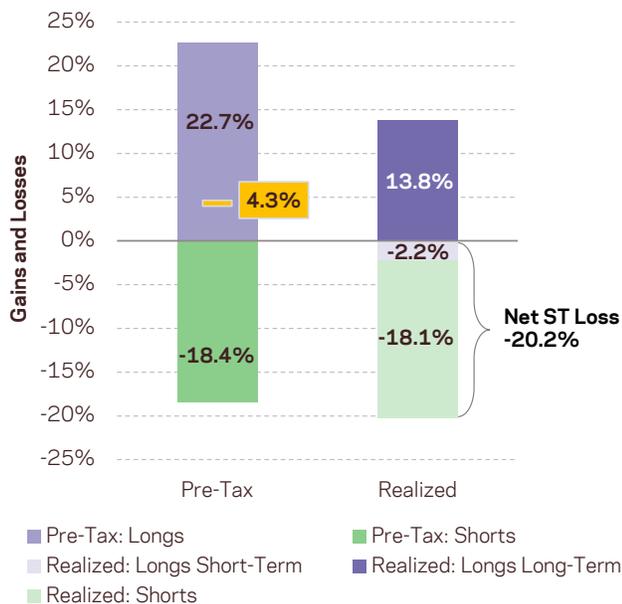
Exhibit 3 shows how tax-aware rebalancing changes the pattern of realization of capital

¹⁰ This is true even though the strategy seeks to produce positive returns whether the market is rising or falling, the aim of the strategy is to have the longs outperform the shorts.
¹¹ See the appendix for further details on our tax accounting and tax rate assumptions. These are derived from the Internal Revenue Code and the Code of Federal Regulations as of 2016.
¹² We explain in Appendix A that we assume that dividends on the longs are treated as qualified dividend income taxed at 23.8% and the in-lieu dividends on the shorts are treated as ordinary expense providing an offset against ordinary investment income taxed at 43.4%. This difference in tax rates applied to dividends on long and short positions results in a tax benefit.



gains and losses as compared to Exhibit 2. The difference in the pre-tax gains and pre-tax losses is now somewhat smaller yielding a pre-tax strategy return of 4.3%. The tax-aware strategy defers the realization of capital gains on the longs resulting in a short-term realized loss of -2.2% and a long-term realized gain of 13.8%. Together these two numbers add up to a net realized gain of 11.6%, which constitutes only 52% realization of the 22.7% total gain on the longs. In comparison, the tax-agnostic strategy realizes as much as 80% of the gain on the longs, as we saw in Exhibit 2. The tax-aware strategy also accelerates the realization of capital losses so that 98% of the losses on the shorts are realized, compared to 88% for the tax-agnostic strategy.

Exhibit 3 | Hypothetical Annual Pre-Tax Returns and Realized Gains and Losses of the Tax-Aware Strategy, 1985-2015



Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Returns are gross of fees and transaction costs and excess of cash (Merrill Lynch T-Bill Index). Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

As seen in Exhibit 3, when short-term losses on the longs and on the shorts are aggregated, the total realized short-term loss is -20.2% while the realized long-term gain is 13.8%. Multiplying the total long-term gains and short-term losses of the tax-aware strategy by the respective tax rates of 23.8% and 43.4% yields a tax benefit of 5.5%. With the additional 0.6% tax benefit coming from dividends — qualified dividend income on the longs and ordinary expense on the shorts — the total tax benefit is 6.1% as is shown in Exhibit 1.

To summarize, in our simulated strategy analysis, the incremental tax efficiency of tax-aware market neutral strategies over their tax-agnostic counterparts results from a reduction in net short-term gains realized by long positions and an increase in net short-term losses realized by short positions.

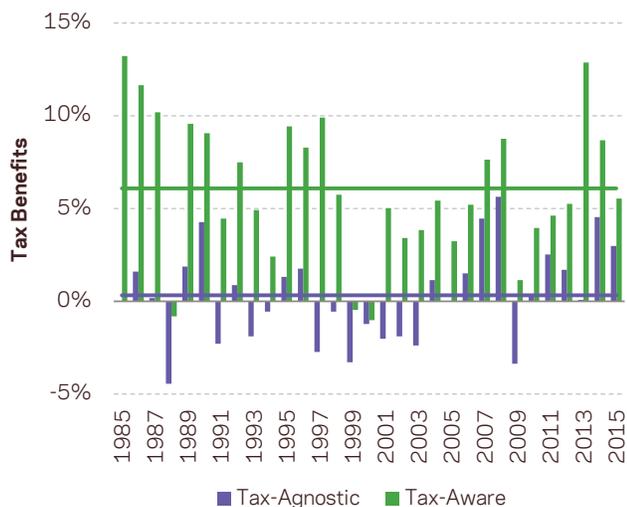
Benefits of Tax-Aware Market Neutral Equity Strategies over Time

Level of Tax Benefits

Exhibit 4 shows the annual tax benefits of the tax-agnostic and tax-aware market neutral strategies. While on average the tax-agnostic strategy gives rise to a tax benefit, in any given year it can result in either a tax liability or a tax benefit. In comparison, the tax-aware strategy results in a meaningful tax benefit in most years. Importantly, the tax benefits of the tax-aware market neutral strategy do not, in our analysis, seem to deplete over time. What makes the potential tax benefits of the tax-aware market neutral strategy so sustainable? The next section sheds light on this puzzle.



Exhibit 4 | Year-by-year Hypothetical Tax Benefits of Market Neutral Strategies, 1985-2015



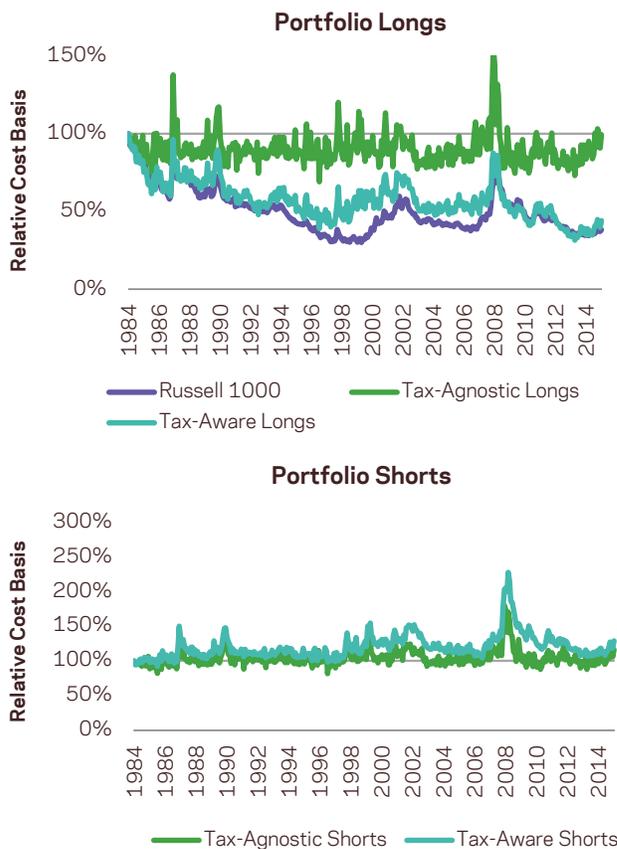
Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Returns are gross of fees and transaction costs and excess of cash (Merrill Lynch T-Bill Index). Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

Long-Run Sustainability of Tax Benefits

It is a common presumption that deferral of capital gains eventually causes portfolio lock-up - a situation where the unrealized gains are so large that any rebalancing of the portfolio results in significant tax costs that outweigh the expected economic gains from trading. Thus, as the tax-aware strategy systematically defers the realization of gains, its ability to continually yield tax benefits across three decades, as shown in Exhibit 4, seems counterintuitive. However, a more careful inspection of unrealized gains helps solve this mystery.

The appreciation of stocks due to the positive equity premium causes a buildup of unrealized gains in long positions. Shorts, on the other hand, tend to incur losses thus creating a steady supply of loss-harvesting opportunities. We measure the buildup in unrealized gains using relative cost basis — the ratio of the positions’ cost basis to their market value. Exhibit 5 plots the evolution of the relative cost bases of long and short portfolio positions.

Exhibit 5 | Cost Basis of Hypothetical Portfolio Positions Relative to Net Asset Value, 1985-2015



Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

The top chart shows how, for a passive low turnover index, like the Russell 1000, the relative cost basis decreases over time. In contrast, for the tax-agnostic market neutral strategy, the relative cost basis of the longs remains close to 100%, due to its higher turnover and more frequent realization of gains. In the case of the tax-aware strategy, as it defers the realization of gains on the longs, the relative cost basis of its long positions declines over time, but to a lesser extent than that of the passive index due to the strategy’s naturally higher turnover.

The bottom chart in Exhibit 5 shows the relative cost basis for the shorts in the market neutral



strategies. It remains close to 100% as both the tax-agnostic and tax-aware strategies seek to continuously realize losses on the shorts. By constantly refreshing the cost basis of the short positions, i.e. keeping it close to 100% of the positions' value, market neutral strategies make loss realization potentially sustainable in the long run.

Timing of Tax Benefits

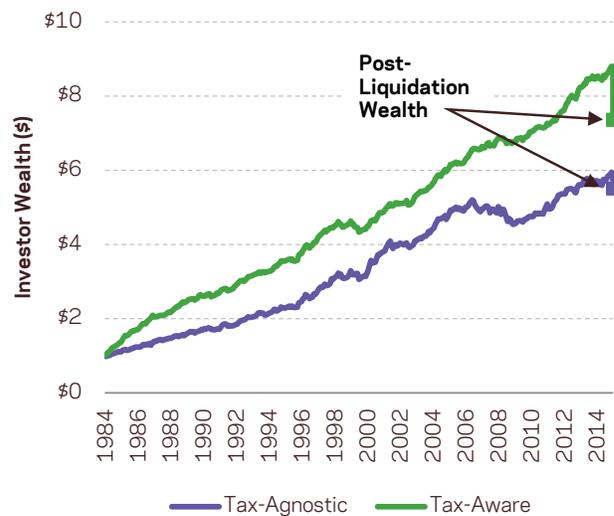
Long-only loss-harvesting strategies tend to realize higher tax benefits in bear markets due to declining stock prices. Contrary to that, the tax-aware market neutral strategy tends to realize losses in bull markets exactly when they are needed the most – when the market performance is strong and many other long-biased investments are likely to be at a gain. Since shorts, on average, realize losses in up markets and gains in down markets, the tax-aware strategy, which gives rise to tax benefits mostly by realizing losses on the shorts, tends to achieve higher benefits in up markets. In the simulation herein, the correlation between the Russell 1000 index return and the tax-aware strategy tax benefits is 0.2, compared to a correlation of -0.3 between the Russell 1000 index return and the tax benefits of the tax-agnostic strategy.

The Effect of Liquidation Tax

One consequence of deferring the realization of capital gains is that the unrealized capital gains, and thus the liquidation tax liability, tend to increase over time. Exhibit 6 shows the effect of liquidation tax on the investor's wealth for the tax-agnostic and tax-aware strategies.¹³ The tax-aware market neutral strategy has a higher liquidation tax liability. However, for a taxable investor, even after accounting for the liquidation tax, the tax-aware strategy is more advantageous than its

tax-agnostic counterpart as it results in a higher after-tax post-liquidation wealth. This is due to the substantially higher tax benefits of the tax-aware strategy that the investor gets to reinvest for many years.¹⁴ We note that the assumption of fully taxable liquidation in the last period is fairly conservative as, under the current law, a tax-aware investor has ways to reduce or entirely avoid liquidation taxes, for example, by donating the appreciated shares to a qualified charity, or holding them until death when the cost basis of the shares is stepped-up to their market value.

Exhibit 6 | Hypothetical Effect of Liquidation Tax on Investor's Wealth, 1985-2015



Source: AQR. Data as of December 31, 2015. Please see the Appendix for an explanation of the hypothetical data. The universe is a large-cap U.S. stock universe. Returns are gross of fees and transaction costs. Not representative of an actual portfolio that AQR currently manages. Hypothetical data has inherent limitations, some of which are disclosed herein.

Practical Uses of Tax-Aware Market Neutral Equity Strategies

There are three immediate applications of the potential tax and pre-tax benefits realized by tax-aware market neutral strategies. First, the tax-aware strategy may help the investor offset gains realized by other less tax-efficient managers in her

¹³ Investor wealth is the sum of strategy NAV and the reinvested tax savings arising from the tax benefits.

¹⁴ This assumes a reinvestment rate of after-tax U.S. dollar 3-month LIBOR.



portfolio and act as the principal source of overall portfolio tax efficiency.¹⁵ The strategy effectively expands the opportunity set of potential managers as it enables the investor to consider managers who might otherwise have been too tax-inefficient to include.

The second application is reducing the risk of a concentrated and highly appreciated position in a tax-efficient manner. An investor might hold a highly concentrated portfolio that she would like to diversify but is unable to do so due to a high tax burden of large unrealized gains. A tax-aware market neutral strategy can realize tax losses to offset the gains realized during the transition period.¹⁶

The third application is that even without the tax benefit of offsetting short-term gains from other investments, the tax-aware strategy may yield attractive after-tax returns that are uncorrelated to equity markets. To generate the same after-tax return, a strategy with tax liabilities would need to generate higher pre-tax returns to overcome the tax drag, which can be substantial.

Conclusions

In this study we show that, counter to popular belief, market neutral equity strategies can be very tax-efficient because short positions give rise to considerable opportunities for realizing short-term losses.

Adding tax-aware portfolio construction can further improve after-tax returns of market neutral strategies, and may even realize tax benefits similar in magnitude to pre-tax alpha. Moreover, tax benefits of the tax-aware market neutral strategy can persist in the long run. Importantly, these tax benefits are positively correlated with market returns because short positions tend to

realize losses exactly at the time when investors need tax offsets the most, that is, when markets are up and other investments in their portfolios are likely to be at a gain.

Tax-aware market neutral strategies have important practical applications such as potentially making a multi-manager investment portfolio more tax-efficient, helping an investor diversify concentrated low-cost-basis positions, and providing a source of attractive diversifying after-tax returns.

¹⁵ The approach to portfolio allocation where a tax-aware passive core is used to offset capital gains realized by the trading of satellite managers was proposed by Brunel (2001), Rogers (2001), Stein (2001) and Quisenberry (2003).

¹⁶ Farr (2004), Rogers (2006), and Wilcox et al. (2006) suggest that a strategy implementing leverage and shorting can be an effective means for diversifying a concentrated portfolio.



Appendix

Details of Methodology

This section describes the methodology we use in the simulation in the main body. All the results in the paper are reported gross of management fees, transaction costs, and financing costs.¹⁷

A. Alpha Model

The portfolio construction process begins with a quantitative alpha model that yields stock-level alphas. The model is built over a US large-cap universe similar to the universe of Russell 1000 constituents, and combines value and momentum style factors with equal weights. Value is measured by the most frequently used academic measure of equity value: the book-to-market ratio. Following Asness and Frazzini (2013) we scale the book value of a firm with the most recent market capitalization of the firm. Momentum is measured by total return over the preceding 12 months, excluding the most recent month.

B. Portfolio Construction

The strategies are rebalanced monthly over the period from January 1985 to December 2015 and target 4% risk. The portfolio is dollar-neutral and the portfolio beta versus the Russell 1000 index is constrained to be between +0.02 and -0.02. To create tax-aware strategies, the optimizer incorporates tax implications into the portfolio construction process.

C. Tax Accounting and Tax Rate Assumptions

Since the effects of tax lot accounting are not central to our conclusions and have been analyzed elsewhere, we use the highest-in first-out, or FIFO, tax lot accounting method throughout the paper. The tax rates we use correspond to the tax rates for a U.S. individual in the top federal marginal income tax bracket in 2016: 23.8% on long-term and 43.4% on short-term capital gains.¹⁸ Gains on short positions are almost always taxed as short-term capital gains, regardless of the holding period of the short position. All dividends paid on long positions are assumed to be qualified and therefore taxed at a 23.8% rate. This assumption is consistent with strategies using relatively long holding periods, as does the combined value-momentum strategy we study in this paper. All in-lieu dividends paid on short-positions are treated as an interest expense offsetting ordinary investment income taxed at 43.4%. This difference in tax rates applied to dividends on long and short positions creates a tax benefit. The tax rates are assumed to remain constant throughout the simulation period.

We assume that realized losses can be used immediately to offset capital gains of the same character elsewhere in the investor's portfolio. This means that an investor realizing a \$100 short-term capital loss will achieve a tax benefit of \$43.4 in the current year. Thus, these results are relevant for investors who realize sufficient short-term and long-term capital gains from other investment sources. Sialm and Sosner (2017) show how changing this assumption affects the tax outcomes for investors.

¹⁷ Sialm and Sosner (2017) find that introducing such costs does not change the main conclusions.

¹⁸ Note that many states impose additional taxes on capital income, which are not included in these rates.



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Biographies

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Nathan is a Managing Director within AQR's Global Stock Selection group and a Head of Tax Managed Research. In this role, he focuses on developing new and enhancing existing offerings for taxable investors, including private wealth, corporate accounts and taxable pension plans. Between 2012 and 2015, Nathan was a Director at Barclays Capital. Prior to Barclays, Nathan served for six years as a researcher in AQR's Global Stock Selection group. Nathan began his financial industry career at MSCI Barra as a member of the Equity Research Group. Prior to joining MSCI Barra, while in graduate school at Harvard University, he worked in research capacities at Harvard Business School and State Street Bank's Global Trading and Research Group. Nathan earned a B.A. and M.A. in economics from Tel Aviv University and a Ph.D. in economics from Harvard University.

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Ted is a Managing Director and Head of Tax Advantaged Solutions. In this role, he is responsible for positioning AQR's offerings to taxable investors and driving growth with this investor segment. Ted also serves as AQR's Chief Strategy Officer, working with other senior managers to identify, evaluate and assist in executing new opportunities to expand the business, improve clients' experience and strengthen the firm's competitive positioning. Prior to AQR, he was a member of the Executive Committee and held a variety of positions at S.A.C. Capital Advisors and its successor, Point72 Advisors, including Global Head of Strategy, Co-Head of Equities and Head of its Aperio Investments unit. He began his career as a consultant at Bain & Company. Ted earned an A.B. in astronomy and astrophysics, graduating summa cum laude and a Ph.D. in astronomy, both from Harvard University, as well as an M.B.A. from the University of Chicago.

Swati Chandra

Vice President, Portfolio Solutions Group

Swati is a member of AQR's Portfolio Solutions Group, where she writes white papers, conducts investment research and engages clients on portfolio construction, risk allocation and capturing alternative sources of returns. Prior to this, Swati was a researcher in AQR's global macro group researching signals for AQR's asset allocation strategies. Before joining AQR, she spent six years in the quantitative research and portfolio management team at ING Investment Management, focusing on stock selection strategies. Swati received her B.Eng. from Gujarat University in India and her M.B.A. from the University of Chicago.



Notes



Notes



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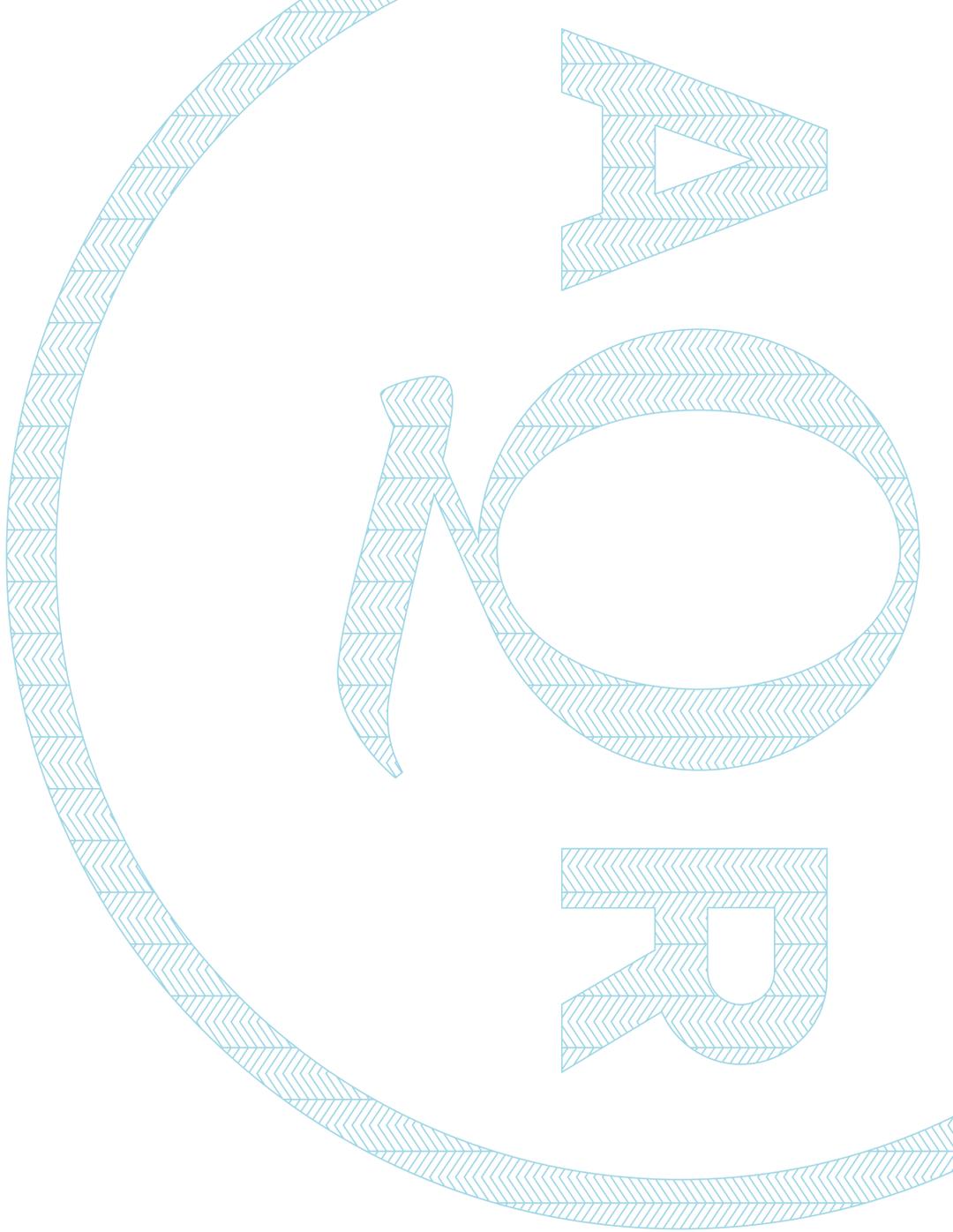
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