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Why Factor Tilts Make Sense and Implementation Differences Matter

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It is hard to read, watch, or listen to financial media today without finding references to factor tilts, smart beta, scientific beta, and style or factor investing. We refer to all of these as factor tilts because there is no agreement on common definitions for these terms and it is not the label but the strategy design that matters, e.g., choice of factors and how factors are translated into portfolio weights. Significant assets have flowed into strategies under this theme in pursuit of simple, transparent, systematic sources of return beyond traditional market-cap weighted indexes. Through a factor lens, each security has an array of exposures that explain its risk and return. Altering factor weights from those in a market-cap weighted portfolio—a "tilt"—can solve for two significant drawbacks of a market-cap weighted approach to portfolio construction: concentration and undesirable factor exposures. Tilting toward rewarded factors while diversifying away unrewarded risks may offer better risk-adjusted returns than a market-cap weighted index, and tilts offer opportunities to tailor portfolios to meet specific risk and return objectives.

Although the term "factor tilt" is relatively new, the concept of factors is familiar to many investors. From the most well-known market factor of all, beta, which was described in the capital asset pricing model (CAPM) (Lintner 1965; Mossin 1966; Sharpe 1964; Treynor 1961) to the value and size factors vetted in the seminal paper by Fama and French (1993), factors have become a common means of describing a strategy's exposures. The Fama-French three-factor model paved the way for Morningstar's style box: a nine-square grid based on size (large, mid, and small) and fundamental style (value, blend, and growth) introduced in 1992 and still featured prominently in portfolio construction today.

We adopt a broad definition that captures both "what" and "how" aspects of factor tilt strategies: the aim to capture persistent risk premiums associated with well-researched stock attributes, and the use of transparent, systematic, and rule-based implementation with large liquidity and capacity. These strategies are usually long-only, without derivatives or leverage, and they often deviate from a market-cap weighting scheme. Our goal is to explain why factor tilts make sense and to highlight important portfolio construction details.

FACTOR TILT LANDSCAPE

In the past few years, factor tilt strategies have brought in billions of dollars due to the popularization of factor investing and the tremendous growth of the exchange-traded fund (ETF) industry in general. The ETF industry is a good gauge of the evolution of factor tilt strategies for two reasons: (1) ETF data is readily available and not subject to the reporting delays that are typical for mutual funds, and (2) the ETF industry has its root in passive indexing, and

Table 1

U.S. LISTED EQUITY ETFS

Index Weight	AUM (Millions)	AUM (%)	# of Funds	Three-Year Net Flow ($millions)
Dividend	$94,910	3.3%	61	($5,171)
Equal	$77,248	2.7%	132	$18,957
Fundamentals	$42,921	1.5%	81	$14,484
Market Cap (Growth/Value)	$325,176	11.3%	39	$70,225
Multi-Factor	$124,057	4.3%	242	$50,398
Proprietary	$15,185	0.5%	122	$7,255
Market Cap (passive index)	$2,165,013	75.2%	639	$544,686
Others	$34,730	1.2%	100	$10,602
Total	$2,879,241	100.0%	1,416	$711,436

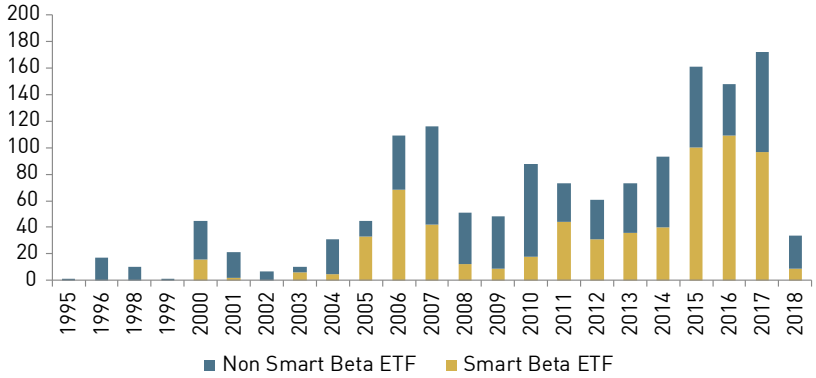
Source: Internal calculation based on data from Bloomberg as of March 16, 2018. Categories other than "Market Cap" (passive index) and "Others" are considered smart beta.

almost all products track a published index. The index construction is typically transparent and rule-based, which is consistent with our definition of a factor tilt strategy.

We rely on index weight and fund name to identify factor tilt ETFs. If "index weight" is Dividend, Equal Weight, Fundamentals, Multi-Factor, or Proprietary, or if "index weight" is Market Cap and fund name has "Value" or "Growth" in it, a fund is considered a factor tilt fund. Of the more than 1,400 equity ETFs listed in the United States, 50 percent of funds and 25 percent of ETF assets under management are now in the factor tilt category, and more than 20 percent of ETF net inflow over the past three years was into factor tilts (see table 1). In addition, over the past five years, more than 60 percent of the new ETFs that were launched were factor tilt funds (see figure 1). Given the growth in factor investing and the hundreds of strategies to choose from, it is important to have a solid understanding of what factor investing is trying to capture and how to compare strategies.

Figure 1

U.S. LISTED EQUITY ETFS LAUNCHED



Source: Internal calculation based on data from Bloomberg as of March 16, 2018. Categories other than "Market Cap" (passive index) and "Others" are considered smart beta.

Table 2

FAMA-FRENCH FIVE-FACTOR PLUS MOMENTUM

(A): Annualized Return and Risk: July 1963-January 2018

	Size	Value	Profitability	Investment	Momentum
Annualized Return	2.9%	4.1%	3.0%	3.4%	8.0%
Annualized Risk	10.5%	9.7%	7.7%	6.9%	14.5%
Sharpe Ratio (SR)	0.28	0.42	0.39	0.49	0.55
Max Drawdown	-29%	-32%	-28%	-15%	-83%

(B): Factor correlation: July 1963-January 2018

	Value	Profitability	Investment	Momentum	
Size	-0.07	-0.35	-0.10	-0.03	
Value		0.07	0.70	-0.18	
Profitability			-0.03	0.11	
Investment				-0.02	

Source: Internal calculation based on data from Fama-French's research library at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

FACTORS

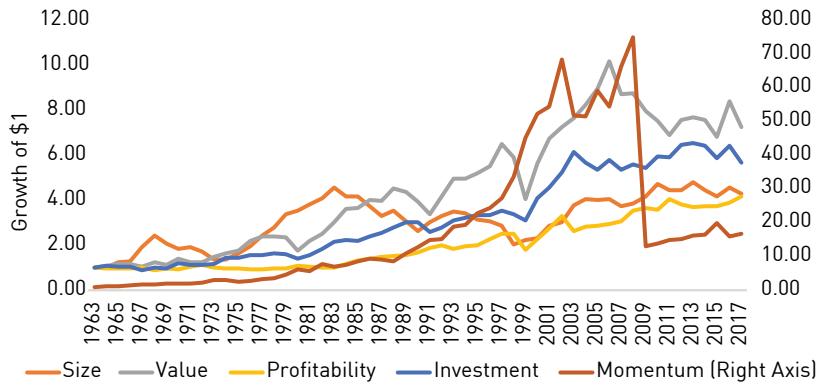
A factor can be any characteristic that explains the risk and return of a group of securities. The most compelling factors are those with plausible explanations, those with explanatory power that is significant and expected to persist, and those that offer a premium relative to a market-cap weighted alternative. Fundamental and technical equity factors have received the most attention and will be our focus. Fundamental active managers were responsible for some of the earliest work on value and growth factors. Benjamin Graham and David Dodd are credited with establishing the discipline of value investing. Their influential work, *Security Analysis* (Graham and Dodd 1934), suggested that buying equities at a discount to their intrinsic value would provide a margin of safety and suggested screening stocks on low price-to-book value and low price-to-earnings ratios as a means to preserve capital. T. Rowe Price is often cited as the father of growth investing. Price's eponymous firm, founded in 1937, has built its investment process around a focus on earnings growth with a long investment horizon. Academic factor research also dates back many decades. Ross (1976) popularized the term "factor" in his work on arbitrage pricing theory. Ross (1976) challenged assumptions made in CAPM and laid out the idea that multiple factors explain the risk and return of securities without specifying an exhaustive list of what those factors might be. This opened the door for empirical studies on the efficacy of various factors.

Jegadeesh and Titman (1993) and Carhart (1997) found evidence of return premium associated with a momentum factor, and an abundance of research suggests momentum exists in many asset classes and markets (Asness et al. 2013). Banz (1981) first identified size as a factor found in small-cap stocks that carry a premium. Novy-Marx (2013) made one of the first cases for profitability as a factor. Novy-Marx measured profitability as a ratio of a firm's gross profit (revenue minus cost of goods) to its assets, and found this factor had an ability similar to the ratio of book value to market value to explain the variability of equity returns as well as a return premium. This profitability factor also has been referred to as quality.

A standard way to evaluate a factor's risk premium is to construct a portfolio that

Figure 2

FACTOR CUMULATIVE RETURN—JULY 1963–JANUARY 2018



Source: Internal calculation based on data from Fama-French's research library at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

is long the top X percent, such as top quintile, of factor-ranked stocks and short the bottom X percent, such as bottom quintile by factor rank. The long-short portfolio removes systematic risk and highlights the return from the factor in focus. We examine the latest five-factor model from Fama and French in table 2 and figure 2.

Using 55 years of backtest, Fama and French (2015) showed that size, value, profitability, and investment factors have generated positive risk premiums and Sharpe ratios ranging from 0.28 for size to 0.49 for investment. The two newer factors, profitability and investment, perform comparably to value. Value and investment have a high correlation of 0.7, which Fama and French (2015) pointed out makes value redundant if the goal is to measure portfolio abnormal return using their factor model. However, if used to measure portfolio tilts toward these factors, inclusion of all five factors may be optimal. Lo and Patel (2008) detail results in both a long-only and 130/30 format for portfolios constructed with 10 factors.

Consistent with findings from earlier research, momentum generates the highest risk premium (note it uses the right axis in figure 2) and is the most volatile factor. It had a massive drawdown in 2009, with seven months of negative returns and a full-year drawdown of 82 percent. Research has shown that momentum tends to perform well in "normal" environments, but it does not work well at inflection points such as sharp rebounds or corrections. Past literature has suggested using market sentiment or VIX (or both) to predict the turning point or forecasting momentum mean return and variance to dynamically adjust momentum (Daniel and Moskowitz 2016). In practice, it is challenging to time the turning point. Portfolio managers need to understand the economic drivers of factors and be cognizant of their performance cycles.

Fama and French took more than 20 years to move from their three-factor model (1993) to their five-factor model (2015). But today people talk about libraries with hundreds of factors. Given the power of computers and the availability of data, it has become relatively easy for anyone with programming skills to mine data and engineer factors. These statistically mined factors have beautiful backtest results, otherwise they would not be presented, but out-of-sample performance is arguably the only true test. Harvey and Liu (2018) suggest that traditional statistics, such as *t*-statistics and *p*-values, used to evaluate the significance of trading strategies are no longer valid if hundreds or even thousands of backtests are conducted. Backtests built on data without theory should be held to a higher standard, for example by discounting resulting risk-adjusted returns by as much as 50 percent. Instead, we recommend investing in factors that have proven to generate consistent risk premiums over time and across markets and have a solid economic foundation.

PORTFOLIO CONSTRUCTION

Most discussions about factor investing stop at the point when a factor risk premium is documented. However, theoretical factor portfolios may not be directly investable. They do not control for risk (such as industry risk), transaction costs (fixed and market impact of buying and selling securities), and taxes (short-term or long-term capital-gain taxes from turnover), which are practical considerations for investors. There are broadly two ways to implement factor insights: long-short and long-only. A long-short portfolio can extract a purer form of a factor premium because it removes market beta and maximizes the spread between top- and bottom-ranked stocks. It serves the needs of certain institutional investors or sophisticated individual investors. Long-only factor tilt strategies include market beta and may have relatively low tracking error to market-cap weighted indexes. We focus on long-only investing because most mutual funds and ETFs are long-only and individual investors may be more comfortable with long-only portfolios.

Albert Einstein said, "Everything should be made as simple as possible, but not simpler." This applies to factor investing as well. Factor tilt strategies aim to follow a transparent and rule-based approach, but craftsmanship matters. Portfolio managers need to make many choices: investment universe, risk target, portfolio weights, combining multi-factors, etc. Every decision influences portfolio returns and risk. In table 1, the multi-factor group alone, including both single- and multi-factor products, has 242 ETFs, and the majority of them track a version of a factor index. It is important for investors to look under the hood and understand different methodologies.

Table 3

INDEX COMPARISON

	Eligible Universe	Value Definition	Portfolio Construction	Weighting Schema
MSCI USA Enhanced Value Index	MSCI USA	Forward price to earnings, enterprise value to operating cash flow, price to book	Calculate individual variable Z-score; take the average of three Z-scores as composite score; derive sector relative Z-score from the composite value score	Proportional to market cap X final value score
Russell 1000 Value Index	Russell 1000	Price to book, I/B/E/S medium-term growth forecast, sales per share five-year historical growth	Calculate individual variable Z-score; weigh the three scores by 2:1:1 to compute the composite value score	Proportional to market cap X composite value score
S&P 500 Value Index	S&P 500	Price to book, price to earnings, price to sales	Calculate individual variable Z-score; take the average of three Z-scores as composite value score	Proportional to market cap X composite value score
Russell RAFI U.S. Large Company Index	Russell 1000	Sales, cash flow, book value, dividends	Break the link between prices and portfolio weights; use fundamental measures of company size to weigh securities	Fundamental weighting

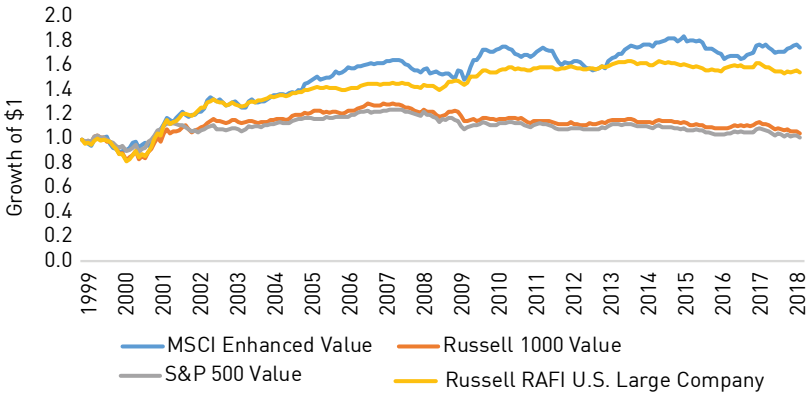
Note: Refer to each index provider's website for a more complete description of index methodology.

INDEX CONSTRUCTION

We use four well-known U.S. large-cap value indexes to illustrate the impact of portfolio construction: MSCI USA Enhanced Value Index, Russell 1000 Value Index, S&P 500 Value Index, and Russell RAFI U.S. Large Company Index. They are not necessarily the best—and they are certainly not the only—value indexes, but billions of assets track these indexes. The detailed index methodology is publicly available and table 3 summarizes it briefly.

Figure 3

CUMULATIVE EXCESS RETURN OF VALUE INDEX VS. PARENT INDEX



Source: Internal calculation, data is from Bloomberg, February 1999 - January 2018

Figure 3 shows the cumulative excess return of each index relative to its market-cap weighted parent index. Different parent indexes are used to capture the impact of different universes. MSCI USA Enhanced Value outperforms its parent MSCI USA index by 3.1 percent per annum with tracking error (TE) of 6 percent, and Russell RAFI U.S. Large Company outperforms Russell 1000 by 2.4 percent per annum with TE of 5.3 percent. Russell 1000 Value and S&P 500 Value have almost no outperformance over their respective parent indexes with TE close to 5 percent. If an investor invested in one of these four indexes to tilt toward the value factor, the investor would have had a very different experience after 20 years depending on the index selected. Non-market-cap weighted MSCI USA Enhanced Value and RAFI indexes outperformed the two market-cap weighted value indexes, which is consistent with the criticism that market-cap weighted indexes overweight overvalued securities.

Factor exposure and risk analysis is a useful tool for looking under the hood of different factor tilt strategies. A long-only factor tilt portfolio likely has exposure to factors other than the intended factor tilt. A more accurate way to measure exposure is to use holdings and an equity risk model. Alternatively, we use the Fama-French five-factor model plus momentum to run return-based analysis. Figure 4 shows the exposures from a full sample regression of index returns over factor returns.

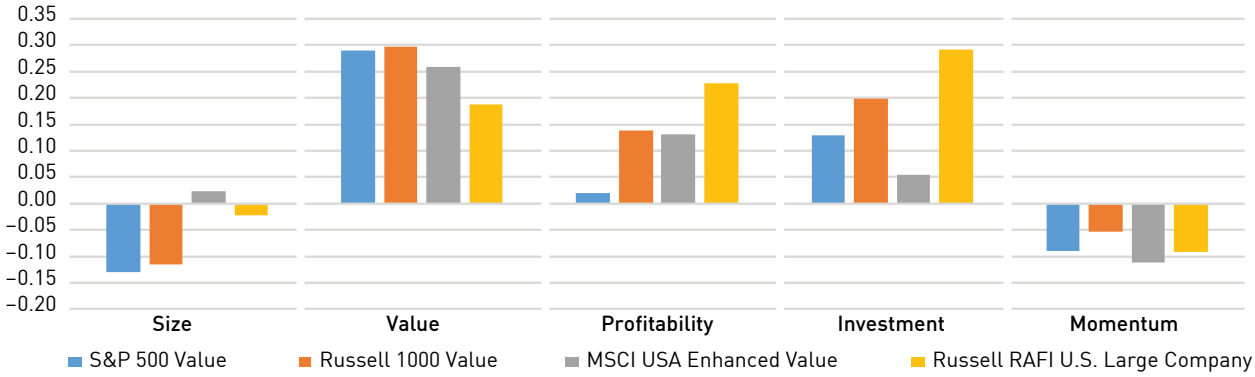
All four indexes have strong exposure to value, which is the desired factor tilt. They also all have positive exposure to profitability and investment, though RAFI stands out with especially high exposure to those factors. All four indexes have negative exposure to momentum, which makes sense because value and momentum are negatively correlated. S&P 500 value and Russell 1000 value indexes have more bias toward large-cap securities than the other two. It is important to look beyond the branding of a factor tilt strategy to appreciate the impact of difference in implementation. A careful review of portfolio construction, factor exposure, performance attribution, and risk decomposition can illuminate how implementation differences might yield different risks and returns.

INTEGRATING VS. MIXING FACTORS

Although evidence indicates that factors outperform the market over long periods and there are economic rationales for why many factors might persist, each factor has gone through periodic bouts

Figure 4

FACTOR EXPOSURE TO FAMA-FRENCH FIVE FACTORS AND MOMENTUM



Source: Internal calculation, factor return is from Fama-French website, index return is from Bloomberg, February 1999–January 2018

of underperformance. The periodic underperformance of individual factors may extend beyond a client's investment horizon and can present a significant drawdown risk. Hence, investors should consider combining factors for diversification. Here we discuss two common choices for building multi-factor portfolios: integrating versus mixing.

Mixing factors refers to first building single-factor portfolios, i.e., define the investment universe, decide on security weights based on individual factors, and then combine the weights from single-factor portfolios. Integrating factors refers to the practice of integrating stock rankings of different factors into one composite ranking, which is then used to derive portfolio weights.

A mean-variance representation of building a factor tilt portfolio is shown in equation 1:

$$\text{Maximize } \{ h'^{*}E(r) - \lambda * h' * COV * h - TCAF * h'^{*}TC(\Delta h) - Taxes \} \quad (1)$$

h: vector of portfolio weights

h'; the transpose of vector of portfolio weight

Δh: vector of trading list as a result of portfolio rebalance

$E(r)$: vector of expected return

Λ: risk aversion parameter, a scalar

COV: variance-covariance matrix of securities

$TCAF$: transaction cost amortization factor, a scalar

$TC(\Delta h)$: vector of expected transaction cost on the trading list

$Taxes$: federal and states taxes due for realized capital gains

The first term $h'^{*}E(r)$ represents expected return, the second term $\lambda * h' * COV * h$ represents penalty on expected risk, the third term $TCAF * h'^{*}TC(\Delta h)$ represents expected transaction cost on trading, and the final term $Taxes$ represents taxes due as a result of realized gains or potential savings from tax loss harvesting.

There are different ways to transform security rankings to portfolio holdings. One approach commonly used in quantitative portfolio construction is to translate rankings to expected returns and use optimization to solve for holding weights. Grinold and Kahn (2000) proposes the following linear transformation:

$$E(r_i) = IC * Volatility_i * Z_i \quad (2)$$

$E(r_i)$ is the expected return for security I, IC is information coefficient, $Volatility_i$ is the expected volatility for stock i, and Z_i is the standardized Z-score for each security. For a single-factor portfolio, Z_i is based on the ranking from one factor. For a multi-factor portfolio, Z_i would be a composite of different factor rankings, such as the average of a momentum factor Z-score and a value factor Z-score.

In the case of mixing, h will be the average holding from stand-alone optimizations that consider one factor at a time. Each optimization will overweight securities with the highest ranking in a particular factor as much as possible while meeting constraints. As a result, the mixing portfolio is likely to have polarized positions that rank high in individual factors and miss securities that are not ranked the highest in a particular factor but have overall good exposure to a few factors. In the case of negatively correlated factors, polarized positions could even offset each other. From an optimization theory point of view, a mixing approach is inferior to the integration approach because it sees only the local optimal, not the global optimal. In the case of integrating, the portfolio will balance the views from different factors and consider risk, transaction cost, and taxes holistically. Fitzgibbons et al. (2015) simulated value and momentum strategies assuming a −0.6 correlation between the two factors. They found that an integration approach adds 1 percent per annum excess return and a 40-percent improvement in information ratio over a mixing approach. The benefit comes from higher exposure to factors, and the benefit is larger when blending factors that are more

Table 4

MULTI-FACTOR AND SINGLE-FACTOR INDEX RISK AND RETURN

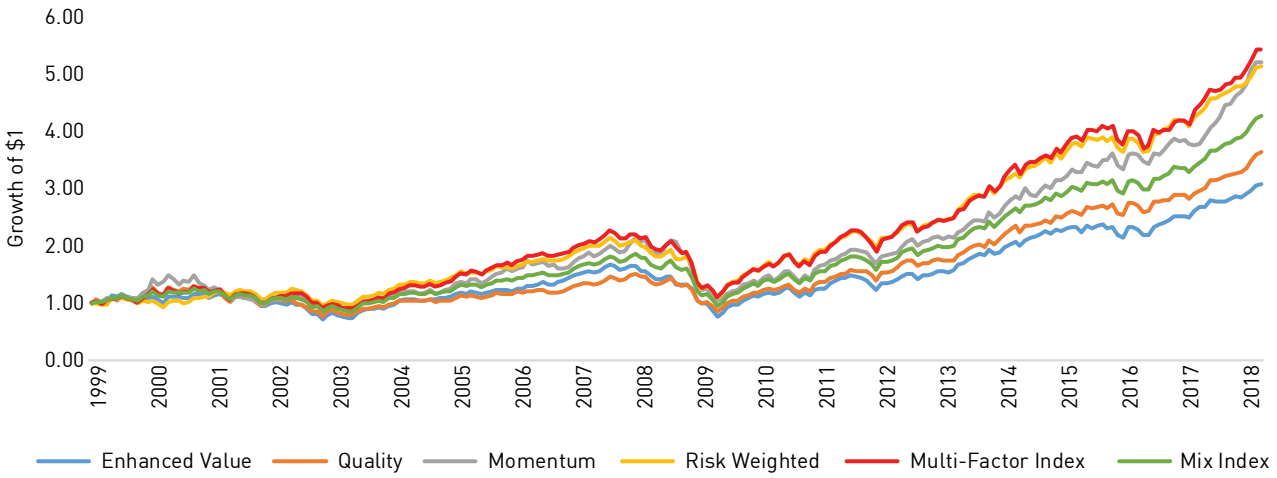
	Enhanced Value	Quality	Momentum	Risk Weighted	Multi-Factor Index	Mixed Index
Annualized Return	6.30%	7.25%	9.50%	9.19%	9.51%	8.18%
Annualized Risk	14.62%	13.76%	15.39%	13.35%	14.80%	13.43%
Sharpe Ratio	0.43	0.53	0.62	0.69	0.64	0.61

Source: Internal calculation. Data is from MSCI, February 1999–January 2018

Figure 5

INTEGRATING VS. MIXING CUMULATIVE PERFORMANCE

FEBRUARY 1999–JANUARY 2018



Source: Internal calculation, factor return is from Fama-French website, index return is from Bloomberg, February 1999–January 2018

negatively correlated. An integration approach also was found to reduce one-sided turnover by 10 percent.

Using MSCI indexes to illustrate the impact of integration and mixing, table 4 and figure 5 compare MSCI USA Diversified Multiple-Factor Index (integrated) versus mixing four stand-alone factor indexes (MSCI USA Enhanced Value, MSCI USA Sector Neutral Quality Index, MSCI USA Momentum Index, and MSCI USA Risk Weighted Index). The MSCI USA Diversified Multiple-Factor Index equal-weights factor exposure for the four target factors—momentum, low size, value, and quality—and uses the composite score to determine each security's weight. The multi-factor index outperforms the average of the four single-factor indexes (hereafter referred to as the mixed index) by 1.3 percent per annum. The performance of the mixed index is in the middle of the rank among the four single-factor indexes because it is a simple average of the four. The multi-factor index has similar return to the momentum index and outperforms the other three single-factor indexes because it synthesizes the merits of individual factors and achieves more desirable factor exposures over time. Sharpe ratio is close between the multi-factor index and the mixed index as the former takes on more risk than the latter.

TRANSACTION COST

A practical consideration in managing factor tilt strategies is transaction cost. Whenever there is turnover, the portfolio will incur transaction costs, including commissions, exchange fees, stamp duty, and market impact. Market impact is a hidden cost that most investors underappreciate; it is due to the demand for liquidity and is usually a function of trade size, stock volatility, and liquidity (average daily volume, bid-ask spread). Trades with larger size, in less liquid and more-volatile securities tend to have higher market impact. U.S. large-cap equities are among the most-liquid stocks in the world, and one-way cost is typically in the low single-digit basis points during normal times. When a lot of trades driven by the same factors might take place at the same time (i.e., market close on an index rebalance day), the cost could be higher. Moreover, cost ramps up quickly when trading small-cap and international equities and fixed income securities, such as corporate bonds.

When investors evaluate factor tilt strategies, it is important to look at rebalance methodology, because of the link between rebalancing and turnover and transaction costs. For the four value indexes discussed earlier, Russell RAFI U.S. Large Company Index has the lowest turnover, 11 percent per annum, and rebalances once a year. Russell 1000 Value Index has double the turnover and rebalances once a year. MSCI USA Enhanced Value rebalances twice a year and has a turnover of about 15 percent.

S&P 500 Value Index rebalances annually and has a turnover of about 15-percent. Momentum strategies inherently have much higher turnover. MSCI USA Momentum Index rebalances twice a year and has more than 100-percent turnover. MSCI USA NeutralQuality Index had 46-percent turnover in 2017 similar to turnover of the MSCI USA Diversified Multiple-Factor Index.

The choice of rebalance frequency hinges on the tradeoff between the benefit of incorporating more current information and the transaction cost associated with rebalancing. For example, companies usually release updated fundamental data on a quarterly basis, but prices change daily and valuation ratios change accordingly; also as companies follow different fiscal calendar years, there are new updates every month. As a result, there could be a benefit from rebalancing a fundamentally driven factor monthly. Price momentum is a different story, because price trends change all the time and more frequent rebalancing, such as daily or weekly, may be beneficial. Ultimately, portfolio managers should balance risk, return, transaction cost, and taxes in totality when designing investment strategies.

TAX MANAGEMENT

As Benjamin Franklin said in 1789, "In this world nothing can be said to be certain, except death and taxes." A major reason that backtested performance and fund factsheet results may not equate to investors' experience is the cost of taxes. Lots of research has shown that taxes have a profound impact on portfolio performance. U.S. active mutual fund investors in top tax brackets could lose 1–2 percent in taxes each year (Peterson et al. 2002; Longmeier and Wotherspoon 2006).

In the context of factor investing, factor tilt portfolios may have higher turnover than their market-cap weighted parent indexes and thus greater exposure to capital gains taxes. Therefore, taxable investors seeking to harvest factor premiums should consider employing active tax management. Bergstresser and Pontiff (2013) pointed out that small-cap and value strategies tend to have higher capital gain realization than large-cap or growth strategies as value strategies sell securities that have appreciated to the point that they no longer represent good value, and small-cap strategies sell positions that have successfully outgrown the small-cap universe. In both cases, these strategies require selling appreciated positions and realizing gains. Momentum strategies may be tax efficient in holding on to winners that are running, but they also tend to have short horizons that may result in short-term gain realization. Systematic tax-loss harvesting offers the potential to realize losses that may be used to offset the gains associated with factor tilts.

Given the differences among factors in turnover, gain realization, and performance cycles, tax management should be an integral part of strategy design as shown in equation 1—and not an afterthought. Portfolio managers should proactively seek opportunities to harvest losses. For example, when selecting the substitute security after selling a security at a loss, portfolio managers could select a security with a close match in factor exposure and an optimal tax lot to defer gain realization, particularly short-term gains. Some gain realization is necessary to capture factor premiums, but striking an appropriate balance between the pursuit of factor premiums and the avoidance of tax cost can improve after-tax results.

CONCLUSION

Factor tilt strategies have taken a strong hold in the investment community because of their long-standing economic foundation and consistent risk premium over time. A factor tilt approach sits between passive and active investing. It leverages the transparency and rules-based approach of passive indexing and captures investment insights, such as value, momentum, growth, and profitability, from active management. Investors might reasonably demand outperformance from active management to compensate for fees in excess of both passive and systematic factor strategy fees. Closet indexers and active managers that hug factors are at risk of being replaced by a more cost-effective factor tilt approach.

Many design decisions go into building a successful factor tilt portfolio. Portfolio construction matters. A well-thought-out investment process manifests itself in defining factors, translating factors to weights, choosing rebalance frequency, and managing risk, transaction costs, and taxes. Finally, factors have performance cycles, and as a result, integrating factors in a holistic manner could achieve smoother performance and a better long-term risk and return trade-off.

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REFERENCES

Asness, C., T. Moskowitz, and L. H. Pedersen. 2013. Value and Momentum Everywhere. *Journal of Finance* 68, no. 3 (June): 929–985.

Banz, R. W. 1981. The Relationship between Return and Market Value of Common Stocks. *Journal of Financial Economics* 9, no. 1 (March): 3–18.

Bergstresser, D., and J. Pontiff. 2013. Investment Taxation and Portfolio Performance. *Journal of Public Economics* 97, issue C: 245–257.

Carhart, M. 1997. On Persistence in Mutual Fund Performance. *Journal of Finance* 51, no. 1 (March): 57–82.

Daniel, K., and T. Moskowitz. 2016. Momentum Crashes. *Journal of Financial Economics* 122, no. 2 (November): 221–247.

Fama, E., and K. French. 1993. Common Risk Factors in the Returns on Stocks and

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Bonds. *Journal of Financial Economics* 33, no. 1 (February): 3–56.

———. 2015. A Five-Factor Asset Pricing Model. *Journal of Financial Economics* 116, no. 1 (April): 1–22.

Fitzgibbons, S., J. Friedman, L. Pomorski, and L. Serban. 2015. Long Only Style Investing: Don't Just Mix, Integrate. *Journal of Investing* 26, no. 4 (winter): 153–164.

Graham, B., and D. Dodd. 1934. *Security Analysis.* New York: The McGraw-Hill Companies, Inc.

Grinold, Richard C., and Ronald N. Kahn. 2000. *Active Portfolio Management.* New York: McGraw-Hill.

Harvey, C., and Y. Liu. 2018. Lucky Factors (January 15). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2528780.

Jegadeesh, N., and S. Titman. 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance* 48, no. 1 (March): 65–91.

Lintner, J. 1965. The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *Review of Economics and Statistics* 47, no. 1 (February): 13–37.

Lo, A. W., and P. N. Patel. 2008. 130/30: The New Long-Only. *Journal of Portfolio Management* 34, no. 2 (winter): 12–38.

Longmeier, G., and G. Wotherspoon. 2006. The Value of Tax Efficient Investments: An Analysis of After-Tax Mutual Fund and Index Returns. *Journal of Wealth Management* 9, no. 2 (fall): 46–53.

Mossin, J. 1966. Equilibrium in a Capital Asset Market. *Econometrica* 34, no. 4 (October): 768–783.

Novy-Marx, R. 2013. The Other Side of Value: The Gross Profitability Premium. *Journal of Financial Economics* 108, no. 1: 1–28.

Peterson, J. D., P. A. Pietranico, M. W. Riepe, and F. Xu. 2002. Explaining After-Tax Mutual Fund Performance. *Financial Analysts Journal* 58, no. 1 (January/February): 75–86.

Ross, S. 1976. The Arbitrage Theory of Capital Market Pricing. *Journal of Economic Theory* 13, no. 3 (December): 341–360.

Sharpe, W. 1964. Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance* 19, no 3 (September): 425–442.

Treynor, J. 1961. Market Value, Time, and Risk (unpublished manuscript). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2600356.

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