



# Factors & Financial Planning

June 12, 2017

## SUMMARY

- In asset management research, we often assume an investor has an infinite horizon, no spending requirements, and no tax consequences.
- While this may be appropriate for some institutions, it is rarely appropriate for individual investors, leaving financial advisors to fill the gaps.
- Many factor (“smart-beta”) products focus on their potential for excess (risk-adjusted) returns. The return is not riskless, however, and in the context of portfolio construction, this needs to be accounted for.
- We ask the question: “should our relative allocation to different factor products differ based upon our risk tolerance?”

## About Newfound Research

Founded in August 2008, Newfound Research is a quantitative asset management firm based in Boston, MA.

Investing at the intersection of quantitative and behavioral finance, Newfound Research is dedicated to helping investors achieve their long-term goals with research-driven, quantitatively-managed portfolios, while simultaneously acknowledging that the quality of the journey is just as important as the destination.

We work exclusively with financial advisors and institutions to help them manage the wealth of their clients through our suite of investment portfolios and mutual funds.

Newfound was awarded 2016 ETF Strategist of the Year by ETF.com<sup>1</sup>.

## Portfolios Focused on Risk Management

Our strategies reflect our view that investing is not easy. Emotional decisions can derail even the best laid plan. Therefore, we believe that the optimal investment plan is, first and foremost, one that investors can stick with. Research shows that investors feel the pain of losses more than they feel the joy of gains. This is reflected in a deep desire to protect the capital that they have worked hard to accumulate. Accordingly, we seek to improve risk-adjusted returns and investor experience by prioritizing downside risk management and seeking to avoid large losses.

Our suite of offerings includes global large-cap, U.S. large-cap, U.S. small-cap, multi-asset income, and target yield bond portfolios. Due to their explicit focus on downside risk management, the portfolios are often categorized as tactical, flexible, or unconstrained.

Our portfolios are available as separately managed accounts, through model manager platforms, and as mutual funds<sup>2</sup>.

## Outsource Your Asset Allocation

For investors looking to outsource their asset allocation and manager selection decisions, we offer our QuBe (“Quantitative Behavioral”) portfolio series, a suite of strategically managed, behavior aware, hybrid active/passive portfolios offered with zero overlay fee<sup>3</sup>.

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<sup>1</sup> An ETF Strategist is a firm that builds portfolios primarily using exchange-traded funds.

<sup>2</sup> See <http://www.thinknewfoundfunds.com>

<sup>3</sup> See <http://www.thinknewfound.com/qube-managed-portfolios>

There is a divide between asset management and financial planning. In the world of asset management, we often know very little about who is actually invested in our strategies and their unique situations and circumstances. Rather, we are left developing generic portfolios that often assume investors have infinite horizons, no spending requirements, and no tax constraints. Our research looks to maximize Sharpe and Information ratios (excess risk-adjusted return relative to benchmark tracking error).

Financial advisors and planners are left with the job of connecting the dots: bringing circumstance and product together to create a comprehensive client portfolio. Time is spent trying to understand liquidity needs, tolerance for risk, and the capacity for risk.

In normative financial market theory, these should come together nicely. Asset managers can simply maximize Sharpe ratios and financial advisors can increase or decrease the risk of these portfolios by introducing cash or leverage.

Except that doesn't happen. Our experience is that investors loathe to sit on cash due to perceived opportunity cost (despite the fact that a barbelled portfolio of cash plus high risk assets may offer a higher expected return at the same risk level as a fully invested portfolio of low-risk assets). And leverage? Forget about it.

Which brings us to factor investing. Research and empirical evidence suggest that combining factors can increase an equity sleeve's Information ratio. Recent multi-factor pieces have focused on whether mixed or integrated approaches offer the best Sharpe and Information ratios.

What is lost in the discussion is whether the same "optimal" multi-factor portfolio is necessarily appropriate across the entire spectrum of client risk profiles. In other words, can we just replace our U.S. Equity exposure with the same multi-factor portfolio in both our most conservative and most aggressive risk profiles?

## Data

In standard factor research, a long/short portfolio is constructed by creating a portfolio of long positions with a desired factor characteristic (e.g. cheap stocks or positively trending stocks) and a portfolio of short positions that have undesirable characteristics (e.g. expensive stocks or negatively trending stocks). These portfolios are rebalanced to equal-weight each month to create a "self-financing" – or "dollar-neutral" – portfolio.

The problem with this approach is that in practice, investors exhibit an aversion to short-selling. In the marketplace we tend to see long-only portfolios that are "tilted": they overweight securities found in the long leg of the factor and underweight those in the short leg. How much they can underweight, however, is limited by the position size of that security. So the ability to fully implement the factor, as academically defined, is diluted.

As we are trying to explicitly address the gap between asset management and financial planning, we want to focus on implementable results. Therefore, the long/short portfolios we will construct in this study will be long a long-only factor index and short the market. As we'll see later, this will allow us to "net out" positions and create a portfolio that can be implemented for investors with no shorting.

For this study, we will use data from the Kenneth French Data Library and MSCI. For the long-only factor exposures, we use the following MSCI Indices:

- Value: MSCI USA Enhanced Value
- Size: MSCI USA Size Tilt
- Momentum: MSCI USA Momentum
- Quality: MSCI USA Quality
- Low Volatility: MSCI USA Minimum Volatility

For each factor, we create a long/short portfolio by going long the corresponding long-only index and short the market. Each leg is held in equal weight and rebalanced monthly.

As defined, this long/short index will, in effect, capture the relative performance between the long-only index and the market.

Since we are discussing portfolio construction, we will need expected return, volatility, and correlation assumptions.

For stocks and bonds, we use expected return and volatility assumptions from J.P. Morgan's 2017 Capital Market Assumptions, subtracting out the return of cash.

For our constructed factor long/shorts, we use the historical annualized return and volatility figures to proxy our forward looking return assumptions.

So far, these returns represent gross asset-class or index returns. Particularly with the factors, we want to subtract out some cost associated with the funds we would likely implement with as well as transaction costs that likely be incurred in running the strategy. For fees, we'll use fees from ETFs that manage to the corresponding MSCI indices. For transaction costs, we use monthly transaction cost estimates from Frazzini, Israel, and Moskowitz (2014)<sup>4</sup> for the Size, Value, and Momentum factors. Specifically, we use the "Total Trading Costs" outlined in Table VIII. We assume Low Volatility and Quality have identical costs as Value.

This gives us the following expected returns and volatility profiles:

	<b>Expected Return</b>	<b>Volatility</b>
Bond	1.06%	3.50%
Equity	5.25%	14.75%
Value	1.04%	6.54%
Quality	0.76%	5.53%
Size	0.03%	3.39%
Momentum	1.94%	7.69%

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<sup>4</sup> Frazzini, Andrea and Israel, Ronen and Moskowitz, Tobias J., Trading Costs of Asset Pricing Anomalies (December 5, 2012). Fama-Miller Working Paper; Chicago Booth Research Paper No. 14-05. Available at SSRN: <https://ssrn.com/abstract=2294498>

Low Volatility                      -1.14%                      6.86%

To estimate correlations between stocks, bonds, and the long/short factors, we use sample correlation over the full period of available data, where we proxy Equities with the returns of the SPDR S&P 500 ETF (“SPY”) and Bonds with the iShares U.S. Core Bond ETF (“AGG”).

	Bond	Equity	Value	Quality	Size	Momentum	Volatility
Bond	1.00	0.05	-0.04	-0.03	0.14	0.01	0.21
Equity	0.05	1.00	0.03	-0.31	-0.06	-0.15	-0.61
Value	-0.04	0.03	1.00	0.04	0.65	-0.18	0.23
Quality	-0.03	-0.31	0.04	1.00	0.24	0.31	0.49
Size	0.14	-0.06	0.65	0.24	1.00	-0.03	0.52
Momentum	0.01	-0.15	-0.18	0.31	-0.03	1.00	0.25
Volatility	0.21	-0.61	0.23	0.49	0.52	0.25	1.00

Some interesting things to note:

- After fees and estimated transaction costs, Size offers little to no premium and Low Volatility offers a *negative* premium. The latter is not surprising, as the Low Volatility portfolio likely has a beta much less than 1, meaning that the long/short has negative exposure to the equity risk premium. This could be corrected by employing a beta neutral, instead of dollar neutral, construction.
- All five long/short factors offer near-zero to negative correlations to equities, meaning that layering on the long/shorts should provide beneficial diversification.
- Of the five factors, Value and Momentum offer the most diversification to one another.

## Methodology

We will build a number of portfolios using a simulation-based optimization. This means for that each portfolio built, we will run five hundred unique simulations, optimize our results on those simulated returns, and then average the results together to arrive at our final portfolio.

We will build six portfolios representing six different risk levels. Each portfolio will strive to have the same expected maximum drawdown<sup>5</sup> as its corresponding stock/bond mix. For example, for our “0/100” portfolio, we will seek to maximize expected return subject to our expected maximum drawdown being less than that of the 0/100 portfolio.

<sup>5</sup> See <http://alumnus.caltech.edu/~amir/mdd-risk.pdf>

Specifically, for a given target stock/bond mix:

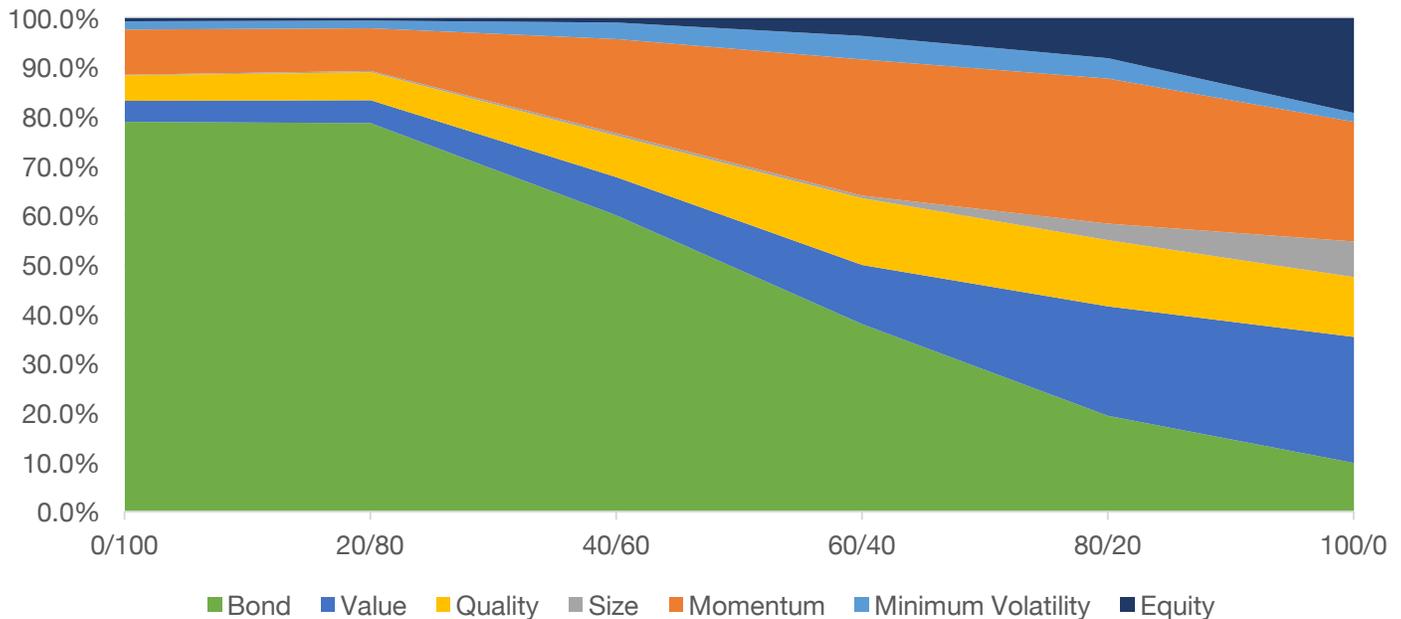
1. Use our expected returns, volatilities, and correlations and simulate out 10-years of hypothetical returns for our assets.
2. Using those simulated returns, compute sample annualized returns and covariances.
3. Compute expected maximum drawdown of the target stock/bond mix using the sample annualized returns and covariances.
4. Compute the portfolio that maximizes expected return, given our sample annualized returns and covariances, subject to,
  - a. Having an expected drawdown *less than or equal* to the expected drawdown calculated in step #3.
  - b. The weight of stocks and bonds must sum to 100%.
  - c. No shorting and no positions exceeding 100%.
  - d. The sum of all long/short positions can only equal the size of the stock position so that the net stock exposure is purely the long factor indices in the most extreme case.

## Results

As we mentioned above, the choice of defining our long/short factors as long-only indices minus market returns allows us to aggregate results. In these results below, we've long/shorts and turned them into long-only exposures by reducing an equivalent amount of passive equity exposure.

Without further ado...

	<b>0/100</b>	<b>20/80</b>	<b>40/60</b>	<b>60/40</b>	<b>80/20</b>	<b>100/0</b>
Total Bond	78.9%	78.7%	60.0%	37.9%	19.3%	9.8%
Total Equity	21.1%	21.3%	40.0%	62.1%	80.7%	90.2%
<i>Value</i>	4.3%	4.5%	7.7%	12.0%	22.2%	25.5%
<i>Quality</i>	5.1%	5.7%	8.3%	13.5%	13.5%	12.1%
<i>Size</i>	0.1%	0.2%	0.5%	0.5%	3.3%	7.3%
<i>Momentum</i>	9.1%	8.7%	19.1%	27.6%	29.4%	24.2%
<i>Low Volatility</i>	1.7%	1.4%	3.3%	4.7%	4.1%	1.8%
<i>Passive Equity</i>	0.7%	0.6%	1.0%	3.7%	8.2%	19.3%



*Data: MSCI, CSI, J.P. Morgan, Kenneth French. Calculations by Newfound Research.*

#### What do we see?

- Both the 0/100 and 20/80 models have similar bond positions. This is due to the fact that 0/100 and 20/80 stock/bond portfolios have very similar expected max drawdowns. This arises from the fact that the two portfolios have similar volatility levels (the benefits of diversification!) while the introduction of equities increases the expected return in the latter.
- From the 20/80 to the 80/20, bonds stay in line with the strategic model. Despite the fact that the long/shorts introduce significant volatility on their own, they are diversified enough from both the strategic assets, as well as one another, that a step-up in bond exposure is not necessary.
- That is, until the 100/0 profile. In the pursuit of maximizing returns, Value and Momentum are given significant relative overweights compared to the other factors. While these are the two factors that had the greatest diversification from one another, the residual risk they add to the portfolio required the introduction of bonds. The interesting takeaway is that the optimizer believes that a multi-factor 90/10 can actually outperform a passive 100/0 on an absolute basis while maintaining the same risk profile.
- Also interesting to note is that in the 80/20 and 100/0 profiles, there is a significant residual exposure to Passive Equities (meaning equity exposure with no factor tilt). Diversification between passive and active equity strategies is just another form of the strategy diversification that we are trying to achieve by using a multi-factor

approach.

- Momentum is, by far and away, the “premier anomaly.” Despite having the highest transaction costs, it is the largest factor allocation in each of the risk profiles.
- Low Volatility plays a very small role. In less risky portfolios – where people typically advocate for Low Volatility approaches – Quality and Value are used to offset the increased risk introduced by Momentum.
- In more aggressive portfolios, Value and Momentum appear to be the best pairing, though Low Volatility and Quality remain involved as potential hedges.
- Size plays little-to-no role throughout. This does not come as much of a surprise, given the assault on the legitimacy of this premium in the last several years. That said, the results could have been meaningfully different had we taken a Size/Value or Size/Quality tilt, which still appears robust.

We cannot stress enough that these results are highly dependent upon the inputs. In this case, we are explicitly making the assumption that past returns *are* indicative of future returns for the factors (this is a common assumption with factor research). While we believe our simulation-based approach can help account for a degree of estimation error in the inputs, garbage in will still lead to garbage out. If you fundamentally disagree with our return assumptions, then you should fundamentally disagree with our results.

## No Premium, No Allocation?

As factor premia are a hotly debated topic, let’s also ask the following question: if we assume *zero* associated premium, would we bother allocating to factors at all?

To answer this question, we re-compute the expected factor returns as simply the residual beta times the expected excess return for equities minus implementation costs. This means a factor like Low Volatility still has a negative expected return – as the long/short still has a beta of -0.3 – but now so does Momentum, since it has a near-zero beta but high associated implementation costs.

	<b>Expected Return</b>	<b>Volatility</b>
Bond	1.06%	3.50%
Equity	5.25%	14.75%
Value	0.45%	6.54%
Quality	-0.65%	5.53%
Size	0.02%	3.39%
Momentum	-0.63%	7.69%

Low Volatility                      -1.68%                      6.86%

Assuming zero associated premium, would we still allocate? The answer is a resounding, “yes.”

	<b>0/100</b>	<b>20/80</b>	<b>40/60</b>	<b>60/40</b>	<b>80/20</b>	<b>100/0</b>
Total Bond	81.4%	80.5%	63.7%	41.4%	23.8%	13.8%
Total Equity	18.6%	19.5%	36.3%	58.6%	76.2%	86.2%
<i>Value</i>	5.0%	5.6%	9.4%	14.7%	20.9%	31.0%
<i>Quality</i>	3.6%	4.1%	6.2%	10.3%	10.5%	7.6%
<i>Size</i>	0.9%	0.9%	2.5%	5.1%	5.5%	7.0%
<i>Momentum</i>	4.5%	3.7%	7.7%	12.6%	15.8%	17.9%
<i>Low Volatility</i>	2.1%	2.2%	4.2%	7.0%	7.8%	4.4%
<i>Passive Equity</i>	2.5%	3.0%	6.2%	8.9%	15.8%	18.3%

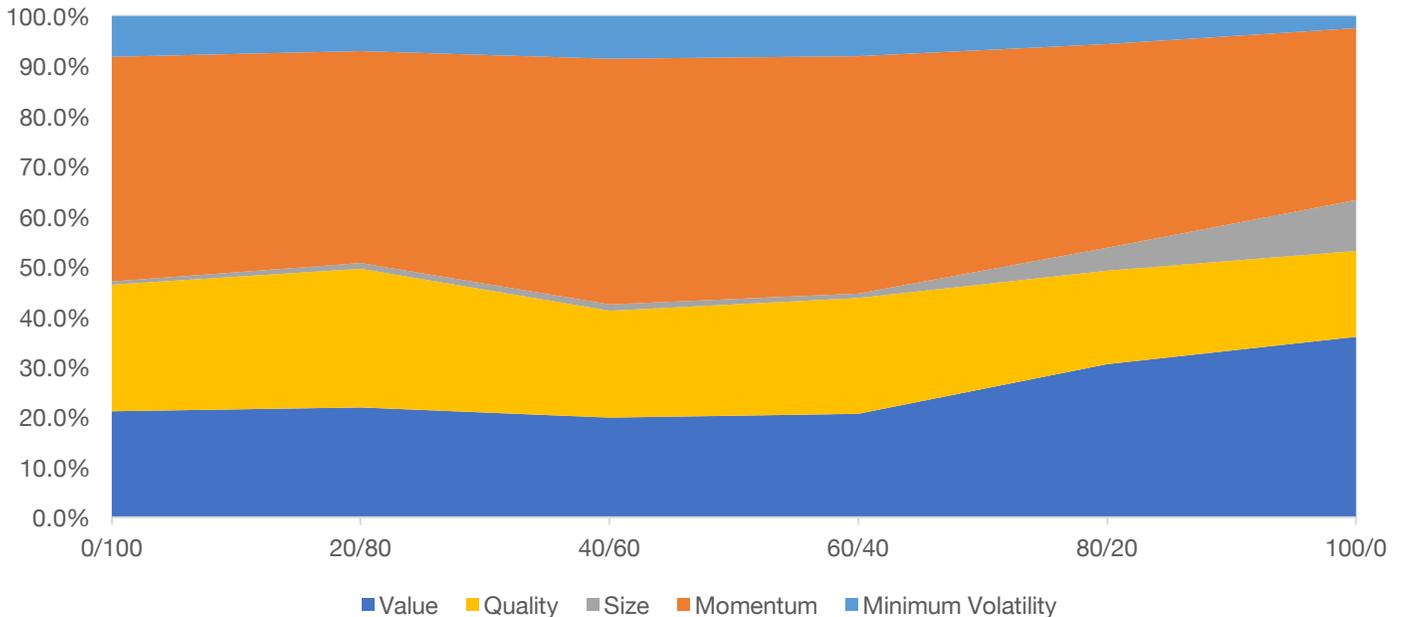
We see many of the same trends. However, now that Momentum has a negative expected return, it’s relative proportional share of the factor portfolio is reduced. However, given its beneficial diversification properties with respect to Passive Equity and Value, it still remains a large piece of more aggressive portfolios. Similarly, we see a reduction in the allocation towards Quality.

Assuming zero excess strategy premiums, it appears that Value reigns king due to its low slight positive market beta, low correlation to equities and bonds, and significantly lower implementation costs than other strategies.

## Conclusion

We find in this exercise that the mix of factors employed in a portfolio should vary depending on investor objective and assumptions about forward factor returns. If we assume forward premia are likely to be similar to those realized in the past, more risk-averse investors may benefit from a 50/25/25 tilt split towards Momentum/Value/Quality, while a more aggressive investor may prefer a 40/40/20 split of Momentum/Value/Quality.

We can see that these splits are fairly constant by isolating just the recommended relative factor exposure.



*Data: MSCI, CSI, J.P. Morgan, Kenneth French. Calculations by Newfound Research.*

Based upon this data, it would appear that the answer to our original question is “no”: we should not use the same mix across our risk spectrum. At higher risk levels, we should move towards an even split of Value and Momentum while at lower risk levels we should use Quality as a risk hedge.

On the other hand, the relative proportional changes are not so drastic that, based upon this data, we could likely just use a 50/25/25 Momentum/Value/Quality split across the entire spectrum and not end up being far from optimal ex-post.

Perhaps the most interesting takeaway is in the extreme portfolios: active risk from factors may allow us to take *more* risk in our 0/100, but force us to take *less* risk in our 100/0. It seems active risk can cut both ways.

*Corey Hoffstein & Justin Sibears*



## About Newfound Research

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