



**SOCIETY OF
ACTUARIES®**

Article from

Risks and Rewards

August 2018

Issue 72

Risks & Rewards



SOCIETY OF
ACTUARIES

INVESTMENT
SECTION

Strategic Factor Allocation: Case Studies in Applying Factors in Portfolio Design

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SUMMARY

- Portfolios that appear diversified from an asset class perspective may be less diversified than investors think, as their risk is often concentrated in one or more factors.
- We believe that investors can construct better-diversified portfolios that may be more likely to help them meet specific objectives by incorporating factor insights into their asset allocations.
- To do so, investors must understand which factors they own, which factors they want to own and how to adjust portfolios along factor lines.
- We help answer these questions through two case studies: one starts with a blank slate and then builds a targeted factor portfolio; the other considers multiple options for shifting factor allocations in an existing portfolio.

ABOUT FACTORS AND ASSET ALLOCATION

Investment factors are the broad, persistent drivers of return that underlie all asset classes, and we separate them into two groupings: macro and style factors

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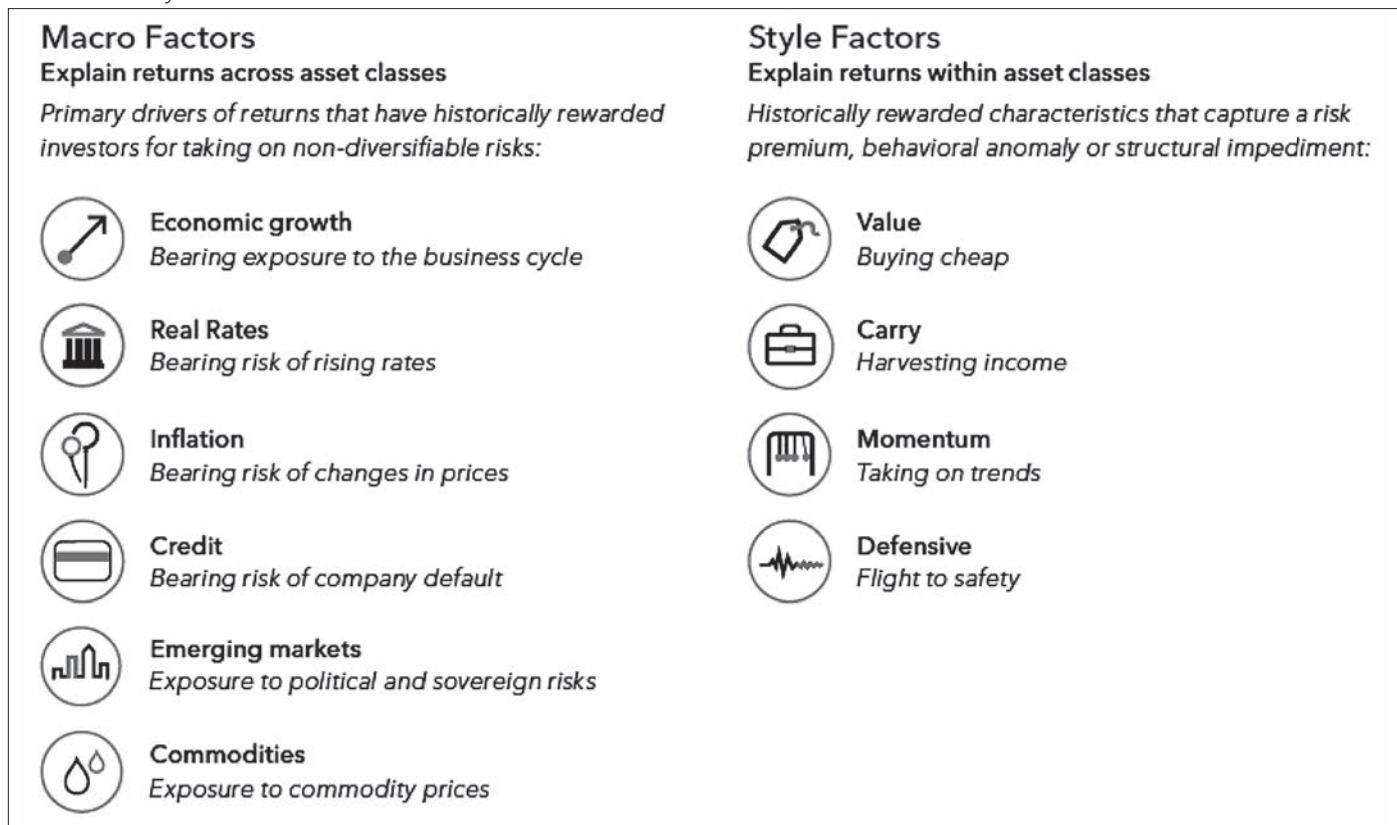
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Figure 1
Macro And Style Factors That Underlie All Asset Classes



(Figure 1). Macro factors—economic growth, real rates, inflation, credit, emerging markets and commodities—explain the majority of returns across asset classes. Style factors—value, carry, momentum and defensive—explain the majority of variation within asset classes. While macro factors describe movements of whole markets, style factors explain relative movements of securities within markets.

The determination of these macro and style factor sets are based on adherence to four key principles:

1. Has the factor created value over long periods of time? We are only interested in those factors that have a demonstrated track record of positive risk-adjusted returns over decades.
2. Is there an underlying economic rationale? To avoid data mining and overfitting, a factor's persistent performance must be attributable to one or more reasons such as rewarded risk, structural impediment or investors' biases.
3. Is it diversifying? We look for factors that exhibit low correlations over time with other sources of return such as the broader market or other factors.

4. Is it scalable? We ideally want to invest in factors that are investable in large volumes in a liquid and cost-efficient manner.

To analyze an asset allocation through a factor lens, we need a way to translate seamlessly between assets and factors. We start by proxying a client's strategic asset allocation with a set of asset class representations. Each asset class consists of hundreds, or even thousands, of underlying securities. Each of these securities can be mapped onto a granular set of risk exposures, like spread, duration and sector for corporate bonds, and industry, valuation ratios, and other balance sheet and earnings variables for stocks.

In total, thousands of risk exposures span all asset classes. Once we create a risk exposure representation of a portfolio, we can map those risk exposures onto the much smaller set of macro factors by using a combination of qualitative (such as economic intuition) and quantitative (such as regression analysis) approaches. Time series of the asset classes and factors are used to quantify the magnitude and direction of those relationships. The result is not just a measure of the total risk of a portfolio but also of how each asset class or factor contributes to that total. Although analyses such as these leverage hundreds of thousands

of data points, state-of-the-art tools and models can perform them in a matter of seconds.

ASSET ALLOCATION THROUGH A FACTOR LENS

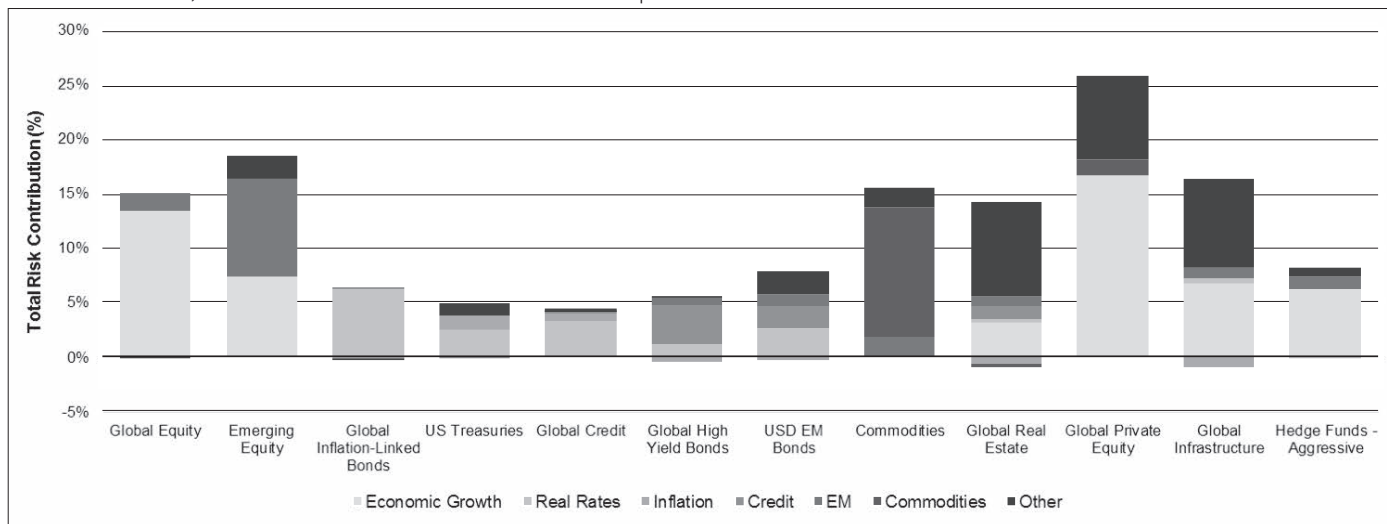
Asset allocation is one of the most important decisions institutional investors have to make. One of the primary goals of the asset allocation process is to construct well-diversified portfolios that are designed to meet risk and return targets in a variety of market and macroeconomic environments. Unfortunately, portfolios that appear diversified from an asset class perspective may be less diversified than investors think, as their risk is often concentrated in one or more macro factors. This became painfully apparent during the global financial crisis of 2008–2009, when many allegedly diversifying assets moved in lockstep. We believe that investors can construct better-diversified portfolios that may be more likely to help them meet their specific objectives by incorporating factor insights into their asset allocation.

Factor investing first involves an understanding that asset classes are merely combinations of factors and, importantly, that many asset classes share similar factor exposures as shown in Figure 2. For example, portfolios with large exposure to equity and private equity are in fact doubling down on economic growth risk rather than diversifying risk away.

The predominance of the economic growth factor across many asset classes has helped that factor to dominate the risk of a variety of institutional investors’ portfolios, as Figure 3 illustrates. Pension and endowment portfolios may have a disproportionate exposure to the growth factor due to their heavy reliance on equities and other growth-sensitive assets. Even insurance company portfolios that are heavily concentrated in fixed income and have relatively small weightings to equities may end up with economic growth as their largest source of macro risk due to the relative riskiness of equities. Although economic growth may be attractive from a risk/return perspective, lack of diversification across macro factors can offset some or all of that benefit during periods when the growth factor is not being rewarded.

By examining their total asset allocation—including alternatives and private assets—through a factor lens, investors can gain new insights into their risk and diversification. Different institutions will, of course, have different objectives when thinking about a desired factor allocation. Some, such as well-funded private endowments or family offices, may have relatively few constraints and can simply seek to maximize long-term returns. Pensions and insurers, on the other hand, will likely need to work with tighter constraints. Pensions have to budget for quarterly benefits payments and may wish to consider liability matching,

Figure 2
Different Assets, Common Risks: Macro Factor Decomposition Of Different Asset Classes



Source: Aladdin Factor Workbench, June, 2017. Global asset classes are all hedged to USD. Risk contribution is the risk decomposition of the portfolio by factor, taking into account the correlations between the factors and the benefits of diversification, using a lookback period of 15 years. “Other” includes risk contributions from style factor exposures and idiosyncratic risks. Asset classes are represented by the following indices: Global equity, MSCI All Country World Index; Emerging equity, MSCI Emerging Markets; Global inflation-linked bonds, BofA ML Global Governments Inflation-Linked Index; U.S. Treasuries, Bloomberg Barclays Government Index; Global credit, Bloomberg Barclays Global Aggregate Corporate Index; Global high yield bonds, Bloomberg Barclays Global High Yield Index; USD EM Bonds, JP Morgan EMBI Global Diversified Index; Commodities, Bloomberg Commodity Index Total Return; Global real estate, BlackRock Proxy; Global private equity, BlackRock Proxy; Global infrastructure, BlackRock Proxy; Hedge funds—aggressive, HFRI Equity Hedge Index.

while insurers need to consider surplus risk and account for uncertain future payouts. Other parameters such as investment horizon (very long for an endowment, shorter for a pension), the willingness to take risk in illiquid assets, and the ability to employ leverage can also play into the allocation decision.

While each institution faces a unique set of circumstances, a factor-based approach to strategic asset allocation may provide benefits to all. By deliberately diversifying across macro factors, institutions may unlock potential sources of return that were previously underrepresented, or not represented at all, in their portfolios, such as credit and emerging markets. Adding an allocation to style factors may bring an additional source of return and diversification. Diversifying across macro and style factors may also help improve risk mitigation, as factors have historically displayed low correlations to each other, even during periods of market stress.¹

To illustrate these ideas, we present two case studies. First, we examine a hypothetical institution’s investment goals and guidelines and, starting with a blank slate, outline three approaches to adopting factor-based allocations to help meet their objectives. Next, we draw on real-world data from our 2017 U.S. Public Pension Peer Survey to create a representative model portfolio, and then examine how institutions looking to reduce their reliance on economic growth can use factor-based allocations to

help improve diversification. Similar analyses can be performed for any type of institutional investor to help meet a particular investment outcome.

CASE STUDY: THE BLANK SLATE

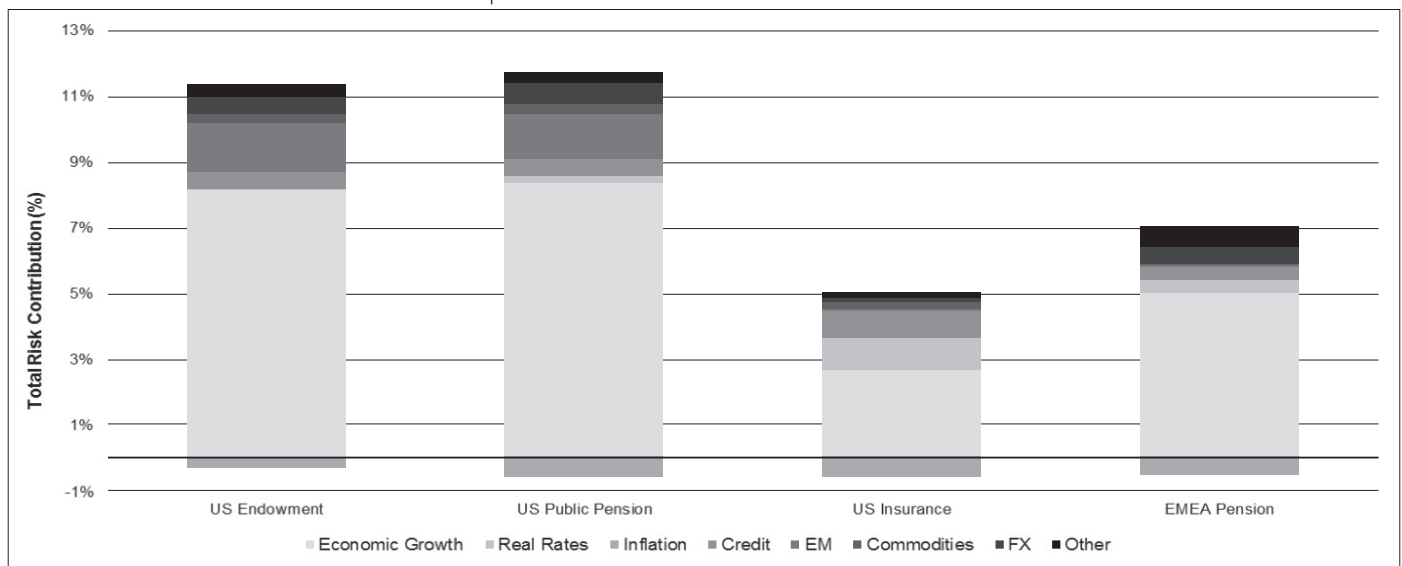
Building a Targeted Factor Allocation From the Ground Up

To illustrate how a factor-based approach to asset allocation may help meet specific objectives, we will examine a hypothetical asset owner, referred to as the ABC Plan. ABC targets a total plan risk of 10 percent and does not target an explicit level of return. The investment committee at ABC is particularly sensitive to extended periods of losses and would like to limit the possibility and magnitude of two-year drawdowns. Given modest *forward-looking asset class returns*, ABC is particularly concerned about maximizing potential returns relative to its risk target. ABC has a strong preference for liquid investments to accommodate annual spending needs.

Portfolio 1: Equal-Weighted Macro Factors

We start by examining an equal risk-weighted combination of the six macro factors. Allocating an equal amount of risk to each factor helps to ensure that the hypothetical portfolio is diversified, with the opportunity to benefit from many independent sources of return. The equal-weighted portfolio has the benefit of being simple and not overly reliant on forward-looking assumptions of risk, return or correlations.

Figure 3
Growth Dominates: Macro Factor Decomposition Of Institutional Portfolios



Source: Aladdin, December 2016. Risk contribution is the risk decomposition of the portfolio by factor, taking into account the correlations between the factors and benefits of diversification, using a lookback period of 15-years. U.S. Endowment portfolio is based on the Nacubo Survey. U.S. Public Pension portfolio is based on the BlackRock Public Pension Peer Survey. U.S. Insurance portfolio is based on BlackRock FIG Study (SNL Data). EMEA Pension portfolio is based on a representative portfolio. "Other" includes risk contributions from style factor exposures and idiosyncratic risks. "FX" is included to show an important source of risk common in institutional portfolios, however we do not consider it a rewarded factor and it is not included in the analysis going forward.

But this simple, equal risk-weighted portfolio does not take into consideration the varying characteristics of each factor and does not meet all of our investor's specific preferences. However, this well-diversified portfolio would have a conservative drawdown profile.

Portfolio 2: Targeted Macro Factors

We can enhance the equal-weighted macro portfolio by taking into consideration the differing characteristics of each factor along with three key considerations for ABC: Sharpe ratio, drawdown mitigation and liquidity.

First, we consider the potential risk-adjusted return of each factor. BlackRock research, supported by economic intuition and historical data, tells us that the economic growth and credit factors have had the highest risk-adjusted returns and are decidedly procyclical. The real rates factor has also historically displayed high risk-adjusted returns, with the persistent decline in global interest rates over the last 30 years driving robust returns in bond markets. However, with interest rates now beginning to rise from record lows in much of the world, we expect more modest returns in the years ahead.

ABC is also highly sensitive to the potential for drawdowns. The real rates and inflation factors are defensive in nature and have historically performed well when investors seek perceived

safe-haven securities like nominal and inflation-adjusted bonds. In contrast, the economic growth, credit and emerging markets factors have exhibited deeper drawdowns in times of market crisis or a slowing global business cycle.

Finally, ABC's preference for liquidity suggests allocating to factors that can be accessed via assets that have generally displayed relatively high liquidity, even during periods of market stress. The following table (Figure 4) ranks each factor according to ABC's criteria and leads us to overweight real rates; to underweight credit, emerging markets and commodities; and to keep neutral weights for economic growth and inflation.

Portfolio 3: Targeted Macro Plus Style Factors

Our hypothetical targeted macro portfolio is well-diversified and allocates to systematic risk premiums in a way that incorporates ABC's goals. ABC might consider trying to boost returns and enhance diversification by incorporating new sources of return, namely style factors, which can be implemented via a long/short, multi-asset strategy.

To illustrate, we add a 20 percent allocation to a hypothetical long/short style factor strategy to our hypothetical targeted macro portfolio. While any individual style factor may be highly cyclical, the addition of style factors is diversifying. The average pairwise correlation between style and macro factors

Figure 4
Consider The Factors: Ranking Of Each Macro Factor When Considering ABC Plan's Criteria

Consideration	Economic growth	Real rates	Inflation	Credit	Emerging markets	Commodities	
Drawdown Mitigation	–	+	+	–	↔	↔	Real rates and inflation can provide a natural hedge during downturns
Return/Risk Ratio	+	↔	–	+	↔	–	Economic and credit factors have had higher expected return/risk ratios
Liquidity in Market Downturns	↔	+	+	↔	↔	↔	Certain asset class representation of the factors have provided more liquidity in times of stress
Conclusion: Overweight/Neutral/ Underweight? (Relative to Equal Risk Weighting)	↔	+	↔	–	–	–	

Source: BlackRock, September 2017. For illustrative purposes only. This information is not indicative of future results and is not a recommendation of an investment strategy or allocation.

is approximately zero, and very low between the style factors themselves as Figure 5 shows.

If we now examine the expected risk and return of each of our three hypothetical factor-based portfolios, we can see the results of incorporating a broader and more targeted approach to factor

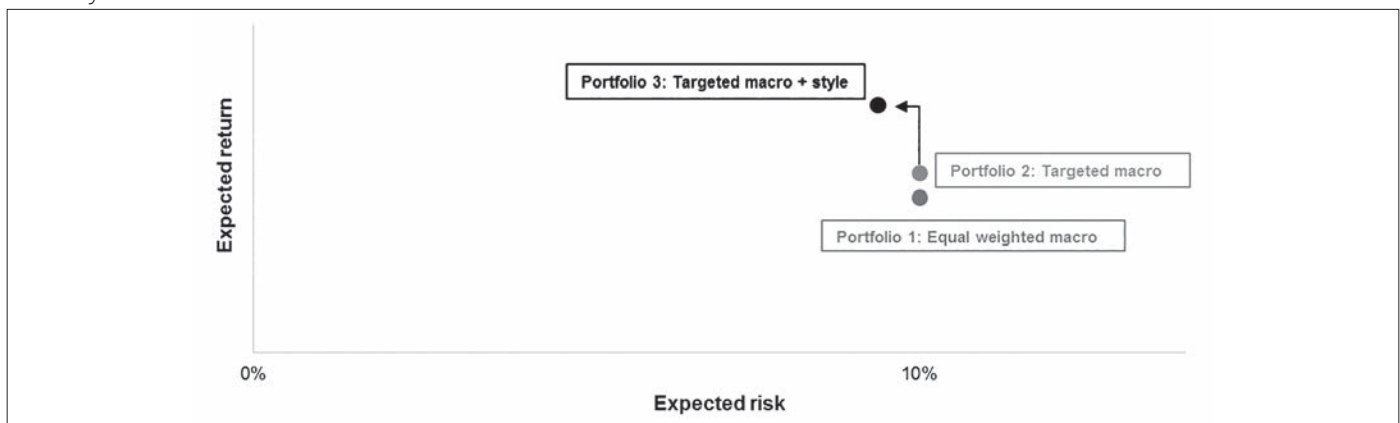
investing in Figure 6. While each of the portfolios is diversified across the most important drivers of return, and each fulfills our hypothetical client’s desire for a 10 percent risk target, moving from the equal-weighted portfolio to the targeted one would modestly improve expected returns, and adding style factors could help improve returns further while reducing risk.

Figure 5
Diversifying Factors: Five-year Correlations Of Macro Factors And Long/Short Style Factors

	Carry	Momentum	Value	Quality	Min Vol	Economic growth	Real rates	Inflation	Credit	Emerging markets	Commodities
Carry	1	-0.2	0.2	-0.1	0.1	0.3	0.3	-0.2	0.2	0.3	0.4
Momentum		1	-0.4	0.1	0.0	-0.3	0.1	0.4	-0.5	-0.6	-0.5
Value			1	0.2	0.2	0.2	-0.1	-0.1	0.2	0.2	0.0
Quality				1	0.2	0.0	-0.1	0.1	-0.1	-0.2	-0.3
Min Vol					1	0.2	0.0	-0.1	0.1	0.0	0.0

Source: BlackRock, June 2017. Correlations are calculated over five years of monthly data. Macro factor returns are adjusted to ex-ante annualized risk level of 10%. Style factor returns are adjusted to ex-ante annualized risk level of 5%. Factor returns are based on underlying exposures to the particular factor premium, based on BlackRock’s models. Exposures include broad index exposures across markets. This analysis is limited to the index universe available to BlackRock in Aladdin. Factor returns are gross of all fees and transaction costs.

Figure 6
Targeted Outcomes: Risk And Return Profiles Of Hypothetical Equal-weighted, Targeted Macro And Targeted Macro Plus Style Portfolios



Source: BlackRock. For illustrative purposes only. The Targeted Macro & Equal-Weighted portfolios are constructed to target 10% risk.

CASE STUDY: THE REAL-WORLD FRAMEWORK

Implementing Factor Shifts in Existing Portfolios

Investors usually are not working from a blank slate. They have well-ingrained asset allocation frameworks and existing portfolios, and it may be unrealistic to make drastic changes to these. Instead, investors may want to make strategic and tactical shifts away from their existing portfolios.

One change that may be worth considering is a targeted reduction in exposure to the economic growth factor. As we highlighted earlier, many institutional investors' portfolios are highly dependent on this factor, making their results quite reliant on the strength of the global economy. This may have been a boon over the last several years, but it leaves portfolios susceptible to a softening in the economy or a spike in geopolitical tensions that leads to adverse market movements.

There are many incremental steps investors can take to help diversify portfolios along factor dimensions. For our example, we use the asset allocation and macro exposures of the average U.S. pension, as determined by BlackRock's 2017 U.S. Public Pension Peer Survey, as the starting portfolio in Figure 7. Our objective is to reduce the relative risk exposure to economic growth by 20 percent and to reallocate that risk among other rewarded factors.

Option 1: TIPS Plus Smart Beta

Shifting a portion of the portfolio from developed equities to inflation-linked debt results in a direct reduction in exposure

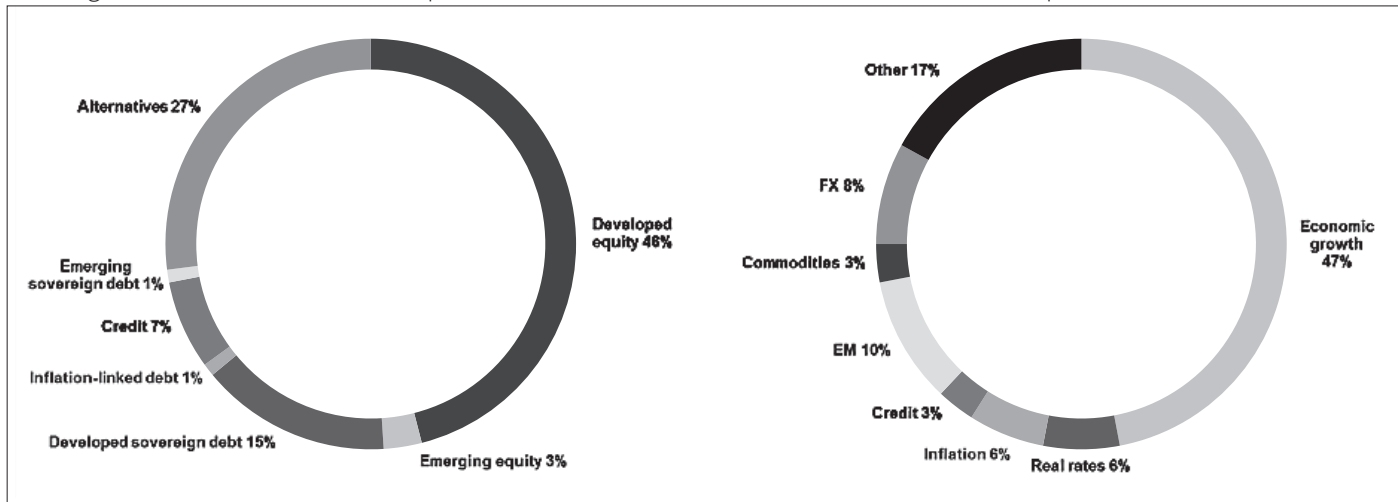
One change that may be worth considering is a targeted reduction in exposure to the economic growth factor.

to the economic growth factor and an increase in exposure to the real rates factor. However, given the significantly lower levels of expected risk and return of TIPS relative to equities, this shift would reduce the total risk and return of the plan. Leverage would be required to maintain the same level of return as the starting portfolio, and leverage is hard to find (and costly) in inflation-linked bond markets where synthetic exposures are not readily available. To offset the reduction in risk and to seek enhanced returns, our approach instead shifts a portion of the plan's cap-weighted equity exposure into a multifactor smart beta strategy that offers exposure to rewarded style factors.

Option 2: Leveraged Nominal Bonds Plus Smart Beta

Another option is to shift from developed equities to nominal developed market bonds. An allocation to nominal bonds would result in an increase in exposure to real rates and inflation, both of which are highly diversifying to economic growth. As with option one, such a shift would also reduce the expected risk and

Figure 7
Starting Point: U.S. Pension Plan Representative Portfolio Asset Allocation And Factor Exposure



Source: BlackRock Public Pension Peer Survey, August 2017.



return of the portfolio. With nominal bonds, however, leverage is readily available via exchange-traded futures, which are highly liquid and relatively inexpensive to trade. In order to diversify risks further and to limit the amount of leverage, our approach here also shifts a portion of the plan's cap-weighted equity exposure into a multi-factor smart beta strategy.

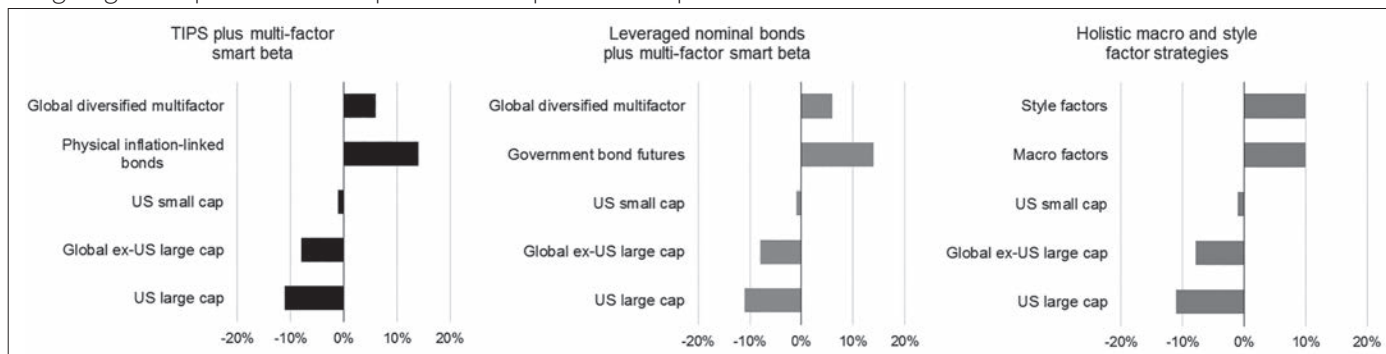
Option 3: Holistic Macro And Factor Strategies

A more holistic approach to factor diversification can be found in strategies that explicitly target balanced exposure to macro or style factors, or both. These strategies employ modest amounts of leverage to target a similar level of expected return as equities, while retaining broad diversification across return drivers. The task of managing factor exposures and leverage can be

outsourced to the manager. While holistic macro factor strategies will generally include a healthy allocation to economic growth to seek robust long-run returns, the strategies can still be highly diversifying to investors' portfolios.

The portfolio changes are detailed below. Each approach may be appropriate for institutions with varying investment parameters. Options one and two offer the most direct diversification benefit by explicitly reducing exposure to economic growth in favor of real rates, and, in the case of option two, inflation. However, these options require leverage to maintain returns in-line with equities, which may be costly in the case of option one, or prohibited altogether at the plan level. Option three mitigates this leverage concern without sacrificing returns.

Figure 8
Weighing The Options: Three Options To Help Reduce Exposure To The Economic Growth Factor



Source: Aladdin Factor Workbench, BlackRock Investment Institute, September 2017. See factor strategies modeling assumptions following article for more information.

Investors choosing any of these options may additionally attempt to boost returns further by tactically rotating between single-factor smart beta strategies, to take advantage of the inherent cyclicity in style factor returns.

A Future With Factors

As we've now seen, macro factors can provide an intuitive way to build an institutional portfolio from the ground up and to reallocate the risks within an existing portfolio. In either case, the addition of a targeted exposure to style factors can introduce a diversifying source of returns. The examples we've laid out are just some of the many ways that investors can use factors to incorporate their unique market views, preferences and constraints into the portfolio construction process. As investors become better versed with the language of factors and their fundamental role in driving both risk and return, we expect their usage to grow in the years ahead. ■

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ENDNOTE

- 1 K. Hogan, P. Hodges, M. Potts, D. Ransenberg. 2015. "Rewarding risk: How the science of 'rewarded risks' is redefining diversification."