



LINE OF  
**SIGHT**

**The Equity Imperative**

Through the  
Looking  
Glass

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Portfolio truths.  
Factor solutions.



Northern Trust



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We hope you enjoy the latest presentation from Northern Trust's *Line of Sight*. By providing research, findings, analysis and insight on the effects and implications of our changing financial landscape, *Line of Sight* offers the clarity you need to make better informed decisions. **The Equity Imperative** research series provides new insights around the evolving equity landscape to help you navigate a better route to achieving your investment objectives.

## **THROUGH THE LOOKING GLASS: PORTFOLIO TRUTHS. FACTOR SOLUTIONS.**

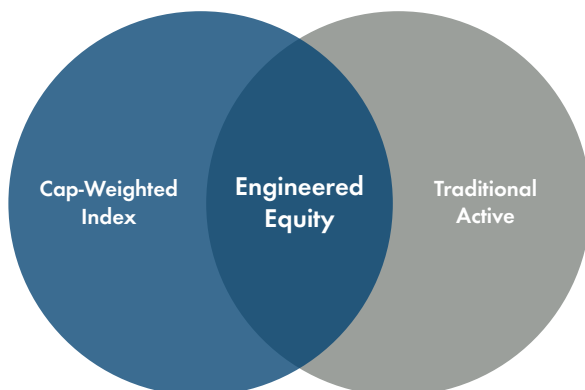
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Investors are faced with an increasingly complex array of decisions ... from reconciling long-term objectives with the current market environment to selecting the most efficient implementation strategy from a plethora of investment options. The heightened regulatory environment and need for ever-more transparency to boards, trustees and constituencies adds to the challenge.

September 2014

These changing dynamics in equity investing have led to an evolution in investors' perspectives. We have studied these evolving business dynamics and the changes they are bringing about, and we saw a growing use of passive strategies and a blurring of the line between passive and active management. A key reason for this shift: many investors today are less concerned with beating a benchmark and more interested in meeting their overall objective.

### **BLURRING LINES OF EQUITY**



Although it's clear there is an emerging category of strategies and products in the space between passive and active management, the terminology used to describe these strategies differs across the industry. At Northern Trust, we call these strategies "Engineered Equity." They aim to capture exposure to specific factors, either individually or in combination, to meet investors' specific goals. Engineering exposure to certain factors, while engineering out unintended exposures are both equally critical to achieving objectives.

While there has been much discussion about these emerging strategies at a theoretical level, we wanted to explore how institutional investors are implementing them into their portfolios and analytic systems. We wanted to help investors interested in moving beyond a traditional active vs. passive strategy to do so – to help them learn from the experience of early adopters and benefit from robust research.

In 2014, we engaged in a multi-step research project that included three main components:

- **Quantitative Survey:** An online survey<sup>1</sup> of 139 global institutional investors to gain insights into how they're addressing strategic risk;
- **Portfolio Analysis:** Analysis of a sampling of complex institutional portfolios to understand how to better execute Engineered Equity strategies to achieve successful outcomes; and
- **Qualitative Insights:** Conversations with existing users of Engineered Equity strategies to provide a roadmap for effective implementation.

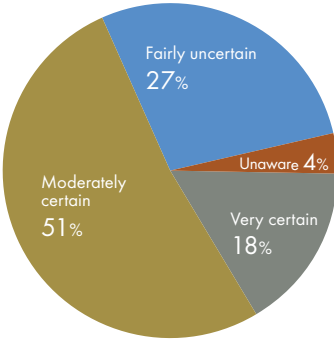
What we discovered helped further refine the asset allocation process we developed for implementing a factor-based Engineered Equity strategy (see Appendix 1).

#### **SURVEY INSIGHTS: ADDRESSING STRATEGIC RISK**

We asked investors what risks they were most concerned about in their equity portfolios. Their top four – overexposure to certain factors or regions; absolute volatility; unexpected factor bias; and tracking error versus the benchmark – all could be addressed by employing the right Engineered Equity strategy.

This question also led us to look at how well investors understood the current factor exposure in their portfolios. If their key concern is overexposure to a certain factor or region, being able to look across the portfolio to understand how that exposure looks is imperative. We found the knowledge gap was widespread: only 18% of the 139 investors surveyed globally felt they were certain of their overall equity portfolio's actual factor exposures (see Exhibit 1 on page 3).

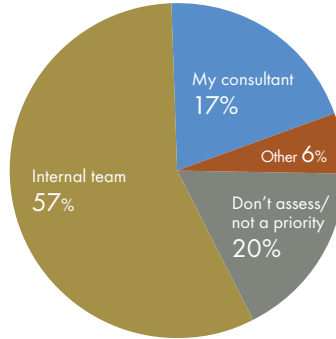
**EXHIBIT 1: INVESTOR KNOWLEDGE OF ACTUAL FACTOR EXPOSURE**



If you look at your listed equity portfolio as a whole across all your investment managers, how certain are you of your actual risk factor exposures?

Source: Northern Trust Equity Investor Survey 2014

**EXHIBIT 2: ASSESSMENT OF OVERALL FACTOR EXPOSURE**



How do you assess and monitor the risk/style factor exposure in your overall listed equity allocation?

Source: Northern Trust Equity Investor Survey 2014

We then explored how the respondents monitored their risk factor exposure across their entire portfolio; the majority did so internally (see Exhibit 2). Surprisingly, one fifth of respondents indicated they do not undertake any form of monitoring.

We also asked survey respondents to rank their overall concerns about their portfolio. Overexposure to unintended factors ranked highest, followed closely by absolute volatility (see Exhibit 3).

**EXHIBIT 3: TOP INVESTOR CONCERNS**

Within your total listed equity portfolio, across all of your investment managers, please rank the following issues in order of what concerns you most; 1 = most concerned, 5 = least concerned.

Overall rank	Item	TOTAL SCORE*
1	Overexposure to certain factors/regions	336
2	Absolute volatility	332
3	Unexpected factor bias within the overall combined exposure	317
4	Tracking error (ex-post) versus benchmark	279
5	Managers' style combinations and unexpected results	0

\*Score is a weighted calculation. Items ranked first are valued higher than the subsequent ranks. The score is the sum of all weighted rank counts.

Source: Northern Trust Equity Investor Survey 2014. Total respondents: 134

## KNOWING YOUR PORTFOLIO: REAL-LIFE ANALYSIS OF FACTOR EXPOSURE

To better understand how investors analyze the factor risk in their portfolios, we decided to examine how well real-life equity portfolios actually met their investors' objectives. We explored whether investors really had the exposures they thought they had, and if not, what their actual factor exposures were. We worked with three substantial and experienced pension funds<sup>2</sup> from the United Kingdom, Europe and the United States to analyze the factor exposure of their overall equity portfolios. Our analysis of data, taken as a snapshot in time, focused on the entire listed equity component in each pension fund. We analyzed both the portfolios' equity holdings and the benchmark index holdings using a third-party factor model<sup>3</sup> designed for forecasting global equity risk. Our analysis determined exposure to common factors, including:

- Volatility
- Value
- Size
- Momentum
- Yield
- Leverage

What we found was that, regardless of the approach used to define the asset allocation – asset liability management, core satellite, tactical or strategic – the portfolios didn't always reflect the investors' goals, objectives and intended exposures. Why? Irrespective of an investor's sophistication, a portfolio's performance is a function of a multitude of conditions, both intended and unintended, such as valuation, idiosyncratic events, leverage, tilts, hedging, bias, style drift, external managers and cash levels. When these factors influence a portfolio in conjunction with one another, they can cause shifts in exposures that may not be easy to identify.

We learned that in many cases, investors incorporating a wide range of active and passive equity strategies in their overall portfolio end up with a neutral factor exposure – despite intended tilts to one or more factors (see Exhibit 4).

In addition to analyzing the current factor exposure of these portfolios, we also wanted to explore what types of allocation changes would be necessary to bring the portfolios in line with the investors' expectations. We discovered that in general, investments in

### EXHIBIT 4: OVERALL PORTFOLIO FACTOR TILT VS. WHAT INVESTORS EXPECTED

	# of Equity Portfolios	# of Equity Benchmarks	Investor Objectives	Actual Factor Tilt
<b>Pension Fund 1</b> – U.K. fund with a sterling base currency. Uses a mix of strategies ranging from active to passive, and spanning developed markets, emerging markets and small capitalization stocks.	11	9	Value Tilt	Neutral
<b>Pension Fund 2</b> – multi-billion U.S.-dollar AUM European pension fund. Uses a mix of active and passive strategies spanning 11 equity asset classes.	25	9	Low Volatility Tilt	Neutral
<b>Pension Fund 3</b> – large U.S. pension fund with a liability-driven structure allocated approximately 60% to long-duration fixed income, 30% to equities and the remaining 10% to real assets and private equity.	4	4	Structuring portfolio to match liabilities	Neutral

Note: Based on portfolio holdings at a snapshot in time, rather than over a longer performance period.

Source: Northern Trust

factor-based strategies needed to be a significant size to have the desired effect. However, we were able bring the portfolio's risk and performance more in line with expectations by thoughtfully moving an equivalent, albeit substantial holding, from one strategy to another better-suited strategy.

### Portfolio Case Study 1: U.K. Pension Fund

This pension fund, based in the United Kingdom, has 11 portfolios covering its equity exposure. The base currency of its investments is sterling. The fund uses a mix of strategies ranging from active to passive, and spans developed markets, emerging markets and small capitalization stocks. One portfolio is based on a fundamentally weighted index strategy while all others are benchmarked against market-capitalization-weighted indices. While this investor did not have specific factor goals for its portfolio, it expected an inherent strategy bias to value within the overall equity portfolio given the allocation and factors adopted by its consultant.

Exhibit 5 summarizes the equity portfolio. The identified benchmark indices formed the investor's policy benchmark.

#### EXHIBIT 5: EQUITY PORTFOLIO SUMMARY FOR CASE STUDY 1

Equity Portfolio		Benchmark Index	Equity Portfolio Weight (%)	Total Risk (Annualized Standard Deviation)	Contribution to Total Risk (%)	Active Total Risk (Tracking Error)
				<b>13.9</b>		<b>0.99</b>
<b>1</b>	Active Large Cap	MSCI World	11.7%	12.8	10.3%	4.61
<b>2</b>	Active Large Cap	MSCI World	6.8%	13.6	6.2%	4.61
<b>3</b>	Index UK Equity	FTSE All Share 5% Cap	4.8%	16.8	5.4%	6.59
<b>4</b>	Index Developed Europe ex UK	FTSE World Europe ex UK	29.7%	14.4	28.8%	5.58
<b>5</b>	Index Developed World	FTSE Rafi Developed 1000	5.5%	17.3	6.1%	7.32
<b>6</b>	Index Developed World	FTSE All World	16.6%	14.7	17.2%	2.85
<b>7</b>	Active Asia Pac ex Japan	MSCI Asia Pacific ex Japan	4.7%	13.9	4.6%	2.86
<b>8</b>	Active US Small Cap	S&P Small Cap Developed	6.6%	16.9	7.2%	7.67
<b>9</b>	Active Emerging Markets	MSCI Emerging Markets	5.4%	15.7	5.8%	4.38
<b>10</b>	Active Emerging Markets	MSCI Emerging Markets	4.6%	16.8	5.1%	6.87
<b>11</b>	Absolute Return Equity	Custom Index	3.8%	14.0	3.4%	6.77

Notes: Portfolio and index holdings are as of 12/31/2013. Actual portfolio manager names remain confidential. General strategy names are used to indicate style. Total risk measured in standard deviation at the individual strategy level and overall equity portfolio. Numbers have been rounded and may not add up to 100%.

Source: Northern Trust



### Portfolio Truths: Findings From Original Portfolio Analysis

The portfolio's overall total risk (or annualized standard deviation) was 13.9% with individual equity portfolio standard deviations ranging from 12.8% to 17.3%. These results are very much in line with industry expectations. The equity portfolio's tracking error, or active risk, versus the policy benchmark was approximately 0.99%, which is tight tracking.

The goal of our analysis was to identify sources of equity return that are common across securities. To do this, we isolated the return associated with certain style exposures (given as units of standard deviation) as shown in Exhibit 6. Standard deviations below +/- 0.20 of the benchmark are not considered significant (see *The Significance Threshold* below for more information). The Portfolio column represents the absolute factor exposures and the Active column represents the factor exposure relative to the policy benchmark.

While the investor believed the equity portfolio was designed with an emphasis on **value**, the absolute and relative measures of factor exposure point to a diversified equity strategy without any meaningful factor tilt. In essence, the actual factor tilt was **neutral**.

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*While the investor believed the equity portfolio was designed with an emphasis on **value**, the actual factor tilt was **neutral**.*

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#### EXHIBIT 6: GLOBAL FACTOR EXPOSURE FOR PORTFOLIO

Factor	Exposure		
	Portfolio	Benchmark	Active
Global Growth	0.03	-0.03	0.05
Global Momentum	0.01	-0.01	0.02
Global Volatility	0.00	0.01	-0.01
Global Liquidity	0.08	0.10	-0.02
Global Yield	0.01	0.05	-0.04
<b>Global Value</b>	<b>0.04</b>	<b>0.09</b>	<b>-0.05</b>
Global Leverage	-0.02	0.04	-0.06
Global Size	0.00	0.12	-0.12

*Notes: Portfolio and index holdings are as of 12/31/2013. Factor estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark.*

*Source: Northern Trust*

#### THE SIGNIFICANCE THRESHOLD

Factor exposures produced by the risk model are used to provide a comprehensive assessment of risk. The numerical values for each factor exposure range between -4 and 4, and represent the number of standard deviations from the mean exposure of all assets within the local market. The materiality threshold of +/-0.20 has been determined by practical considerations. To sufficiently tilt toward a single factor or set of factors, small deviations in unintended factor exposures must be taken. While subtle, correlations among risk factors make it difficult to isolate a single factor exposure while keeping all other factors neutral. We have found through our backtests that +/-0.20 works reasonably well as a range for neutrality.



### Factor Solutions: Hypothetical Portfolio Optimization and Analysis

After our analysis of the investor's existing portfolio, we wanted to see what allocation changes might better align the portfolio with the asset owner's policy of a long-term view toward value investing. To do this, we replaced Active Large Cap Manager 1 and Active Large Cap Manager 2 with Northern Trust's Quality Value Strategy<sup>4</sup>. Following discussion with the investor, we determined that yield would also be an appropriate tilt for the portfolio. We therefore included our Quality Dividend Focus portfolio in the optimization. (Our previous research has shown that incorporating Northern Trust's proprietary quality factor with either a value or yield factor tilt creates persistence in return and an improved Sharpe ratio versus the original portfolio.<sup>5</sup>)

#### EXHIBIT 7: REVISED PORTFOLIO WEIGHTS, POST-OPTIMIZATION

Equity Portfolio		Original Portfolio Weight	Revised portfolio weights		
			Scenario A	Scenario B	Scenario C
1	Active Large Cap	12%	0%	0%	0%
2	Active Large Cap	7%	0%	0%	0%
3	Index UK Equity	5%	5%	5%	5%
4	Index Developed Europe ex UK	30%	22%	22%	22%
5	Index Developed World	6%	5%	5%	5%
6	Index Developed World	17%	17%	17%	17%
7	Active Asia Pac ex Japan	5%	5%	5%	5%
8	Active US Small Cap	7%	7%	7%	7%
9	Active Emerging Markets	5%	5%	5%	5%
10	Active Emerging Markets	5%	5%	5%	5%
11	Absolute Return Equity	4%	4%	4%	4%
12	Northern Trust Quality Value Strategy	0%	10%	18%	15%
13	Northern Trust Quality Dividend Focus	0%	16%	9%	11%

Note: Portfolio and index holdings are as of 12/31/2013. Numbers have been rounded and may not add up to 100%.

Source: Northern Trust

Exhibit 7 presents the output from the scenario and optimization process. We considered lower and upper bounds to each portfolio allocation. The three scenarios presented reduce allocations to portfolios 1, 2 and 4 by a total of 25% and hypothetically allocate the assets at different levels across the Northern Trust Quality Value Strategy and Quality Dividend Focus portfolios (represented by portfolios 12 and 13 in Exhibit 7). Each original portfolio contained low exposure to the value and yield factors, and the Northern Trust portfolios combine<sup>6</sup> quality with value and yield, respectively. The resulting allocation in these three scenarios had a lower tracking error to the policy benchmark and increase value and yield exposure (as shown in Exhibit 8 on page 8).

## EXHIBIT 8: HYPOTHETICAL STYLE EXPOSURE REALLOCATION

	Original Exposure	Revised Exposure A	Revised Exposure B	Revised Exposure C
Style Factors Exposure: Value	0.04	0.14	0.10	0.11
Style Factors Exposure: Yield	0.01	0.12	0.14	0.14
Active Risk (Tracking Error)	0.76*	0.68	0.66	0.66

\*The policy benchmark has been adjusted in this analysis to include the index of the two Northern Trust strategies (the MSCI World Index) that have been included in the data set.

Source: Northern Trust

In Exhibit 8 we see the aggregate exposure. The active risk for the portfolio prior to optimization was 0.76. In each of the three scenarios, by altering the exposure and incorporating the Northern Trust strategies, we were able to increase exposure to both value and yield factors, while decreasing active risk to the redefined benchmark.

The original equity strategy in this case study clearly demonstrates that an allocation across capitalizations and regions results in a diversified and broadly neutral portfolio. To achieve a true bias to one or more factors, we needed to make significant allocations to styles designed to offer the intended exposures to achieve even a modest tilt toward any specific factor.

### Portfolio Case Study 2: European Pension Fund

The pension fund in our second case study is based in Europe and holds 11 equity asset classes in 25 portfolios. The base currency of its investments is the U.S. dollar. This pension fund uses a combination of active and passive strategies to implement its asset class exposure, and uses market-capitalization-weighted indices for its policy benchmark.

This investor's goal is to achieve a long-term return over the risk-free rate. It has incorporated exposure to low volatility within the equity portfolio with a goal of reducing the total equity portfolio's absolute volatility by approximately 10%. Additionally, the fund is exploring the possibility of adding other factors such as quality, momentum and value to the mix.

Exhibit 9 (on page 9) provides a summary of the investor's equity portfolios, benchmarks and allocations.

### Portfolio Truths: Findings From Original Portfolio Analysis

The portfolio's total risk is 15.3%, which is consistent with a diversified equity basket. The total risk of individual strategies within the portfolio ranged from 12.7% to 19.2%. The overall portfolio tracking error of 0.68% is rather tight considering that 19 of the 25 equity portfolios are active strategies. This demonstrates the tracking error reduction benefit of manager diversification and correlation between managers. However, given the cost associated with active strategies, this is an expensive way to achieve a market portfolio.

**EXHIBIT 9: EQUITY PORTFOLIO SUMMARY FOR CASE STUDY 2**

Equity Portfolio		Benchmark Index	Equity Portfolio Weight (%)	Total Risk (Annualized Standard Deviation)	Contribution to Total Risk (%)	Active Total Risk (Tracking Error)
				<b>15.3</b>		<b>0.68</b>
<b>1</b>	Europe ex UK Large & Mid Cap Passive	MSCI Europe ex UK	20.1%	19.2	22.2%	7.32
<b>2</b>	Europe Including UK Small Cap Active	MSCI Europe Small Capitalization	3.9%	17.5	4.3%	5.96
<b>3</b>	UK Large Cap Passive	MSCI United Kingdom	4.9%	18.0	5.4%	7.05
<b>4</b>	UK Large Cap Active	MSCI United Kingdom	5.7%	17.2	5.2%	6.79
<b>5</b>	US Small Cap Active & Passive	MSCI USA Small Capitalization	3.2%	17.3	3.1%	7.22
<b>6</b>	US Large & Mid Cap Active & Passive	MSCI USA	18.3%	14.8	15.9%	6.25
<b>7</b>	Canada Large & Mid Cap Passive	S&P Toronto Stock Exchange (TSX)	1.6%	17.4	2.0%	8.67
<b>8</b>	Pacific Including Japan Passive	MSCI Pacific incl. Japan	6.0%	16.2	5.0%	10.52
<b>9</b>	Global Emerging Markets Passive	MSCI Global Emerging Markets	2.3%	18.4	2.2%	6.97
<b>10</b>	Global Emerging Markets Active	MSCI Global Emerging Markets	13.4%	18.6	18.3%	6.76
<b>11</b>	<b>Global Equity Low Volatility</b>	<b>MSCI World Developed</b>	<b>20.5%</b>	<b>12.7</b>	<b>16.4%</b>	<b>3.97</b>

Notes: Portfolio and index holdings are as of 12/31/2013. Actual portfolio manager names remain confidential. General strategy names are used to indicate style. Total risk is measured in standard deviation at the individual strategy level and overall equity portfolio. Numbers have been rounded and may not add up to 100%.

Source: Northern Trust

With a goal of reducing absolute equity portfolio volatility by 10%, the investor allocated one-fifth of the total portfolio to a global equity low volatility strategy comprising four distinct managers – this is shown as Portfolio 11 in Exhibit 9. This move mirrors a trend we have observed, of investors seeking to reduce volatility by including low volatility strategies in an equity mix. Our ongoing research<sup>7</sup> also has highlighted that risk reduction is the primary objective for investors using alternative weighted indices or Engineered Equity.

While Portfolio 11 has a much lower volatility (active total risk) than Portfolios 1 through 10 (Exhibit 9), did its inclusion in the overall portfolio help reach the investor’s goal of reducing the absolute volatility? To answer, we needed to undertake a more thorough review.

Factor analysis often requires peeling back the layers of a total portfolio to uncover the sources of equity return that are common across securities. Portfolio 11 is composed of four managers: Low Vol A through Low Vol D in Exhibit 10. We isolated the return associated with specific style factor exposures. The global volatility factor exposures for the managers Low Vol A, Low Vol B and Low Vol C are all meaningful; however Low Vol D contains style exposure to growth, high volatility, leverage and small cap securities, which are not attributes typically associated with dedicated low volatility products.

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*While the investor believed a 20% allocation to the low volatility mandates would help reduce the overall portfolio's volatility, the actual reduction was only 4% – short of the 10% goal.*

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**EXHIBIT 10: GLOBAL FACTOR EXPOSURE OF LOW VOLATILITY MANAGERS COMPRISING PORTFOLIO 11**

Factor	Low Vol A	Low Vol B	Low Vol C	Low Vol D	Portfolio 11 (Consolidated)	Northern Trust QLV
Global Growth	-0.05	-0.24	-0.30	<b>0.56</b>	-0.02	-0.22
Global Momentum	0.04	-0.17	0.10	<b>0.18</b>	0.00	-0.20
<b>Global Volatility</b>	<b>-0.28</b>	<b>-0.33</b>	<b>-0.38</b>	<b>0.32</b>	<b>-0.24</b>	<b>-0.63</b>
Global Liquidity	-0.05	-0.04	-0.06	<b>0.06</b>	0.04	-0.03
Global Yield	0.14	0.39	0.41	<b>-0.38</b>	0.18	0.27
Global Value	-0.10	0.35	0.00	<b>-0.15</b>	0.02	-0.11
Global Leverage	0.13	-0.09	-0.05	<b>0.22</b>	0.02	-0.17
Global Size	-0.47	-0.37	-0.52	<b>-0.97</b>	-0.28	-0.01

*Note: This analysis shows factor exposure in units of standard deviation. Any exposure within +/-0.20 is not considered significant.*

*Source: Northern Trust*

To get a sense of the total equity portfolio's volatility prior to the introduction of the low volatility allocation, we excluded the Global Equity Low Volatility portfolio (Portfolio 11) and proportionally distributed its 20% allocation to the other existing equity portfolios (see Exhibit 11 on page 11). This results in an overall portfolio volatility of 16.00%. Introducing Portfolio 11 brings the absolute volatility down slightly to 15.30%.

While the investor believed that including a 20% allocation to the low volatility mandates in Portfolio 11 would help reduce the overall portfolio's volatility, the actual reduction in volatility was only 4% – well short of the 10% goal. This likely is a result of both the size of the allocation and the underlying exposure taken by the four individual managers in Portfolio 11.

Exhibit 11 highlights each individual strategy in Portfolio 11. The individual volatilities by strategy ranged from 11.83% to 14.42%. It is important to note the slightly higher overall tracking error when the low volatility strategies were included (0.68 vs. 0.52). The tracking error is measured versus the policy benchmark; however this investor's primary objective was to lower absolute volatility even at the expense of tracking error.

Investors measure risk in a variety of ways. When structuring a portfolio, it's important to consider how boards of directors, trustees and stakeholders interpret risk and tracking error. Our survey found that tracking error versus the benchmark ranked fourth in the priority of concerns (see Exhibit 3 on page 3), while overexposure to certain factors or regions ranked first. Absolute volatility was the second highest concern and unexpected factor bias was the third highest concern for investors.

#### EXHIBIT 11: VOLATILITY SUMMARY FOR PORTFOLIO 11

	Total Risk (Annualized Standard Deviation)	Active Total Risk (Tracking Error)
Equity Portfolio: Excluding Low Volatility Strategies	16.00	0.52
Equity Portfolio: Including Low Volatility Strategies	15.30	0.68
Low Volatility Strategies Consolidated	12.73	2.85
Low Volatility Strategy 1	12.80	4.14
Low Volatility Strategy 2	12.48	3.28
Low Volatility Strategy 3	11.83	3.86
Low Volatility Strategy 4	14.42	3.90
Northern Trust Quality Low Volatility Strategy	10.57	5.17
<b>Total Portfolio Using Northern Trust's QLV</b>	<b>14.81</b>	<b>1.02</b>

Notes: Factor exposure estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark.

Source: Northern Trust

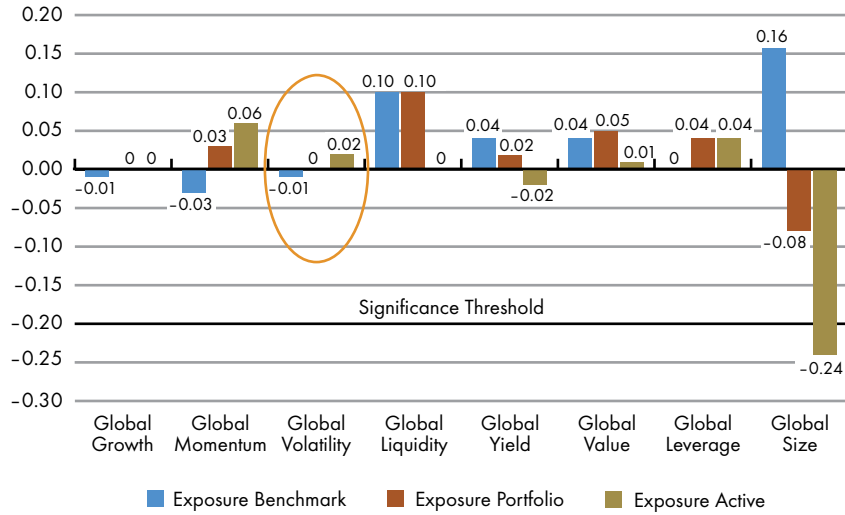
#### Factor Solutions: Hypothetical Portfolio Optimization and Analysis

To see what allocation changes might better align the portfolio with the investor's objectives of reducing the portfolio's absolute volatility by 10%, we substituted our own Quality Low Volatility (QLV) strategy for the entire 20% allocation to Portfolio 11. Northern Trust's QLV strategy has low-volatility factor exposure of nearly three times that of the consolidated Portfolio 11, as shown in Exhibit 10 on page 10 (−0.63 versus −0.24). The resulting absolute volatility using the QLV strategy (as shown in Exhibit 11) is 14.81%, a risk reduction of 7.5%, providing the investor a more efficient way of meeting the original objective. However, the trade-off is that tracking error nearly doubles from 0.52 to 1.02. Since tracking error was not raised as a priority for the investor, this approach might suit its needs.

Exhibits 12 and 13 (on page 12) compare the factor exposures of the original portfolio and the portfolio using the Northern Trust QLV strategy. In the charts, the blue bar represents the investor's policy benchmark, the red bar shows the portfolio's absolute factor exposure and the gold bar shows the style exposure relative to the benchmark. Evidence of lower volatility factor exposure in the original portfolio was missing, a surprise given the 20% allocation to low volatility portfolios. Using the Northern Trust QLV, which has



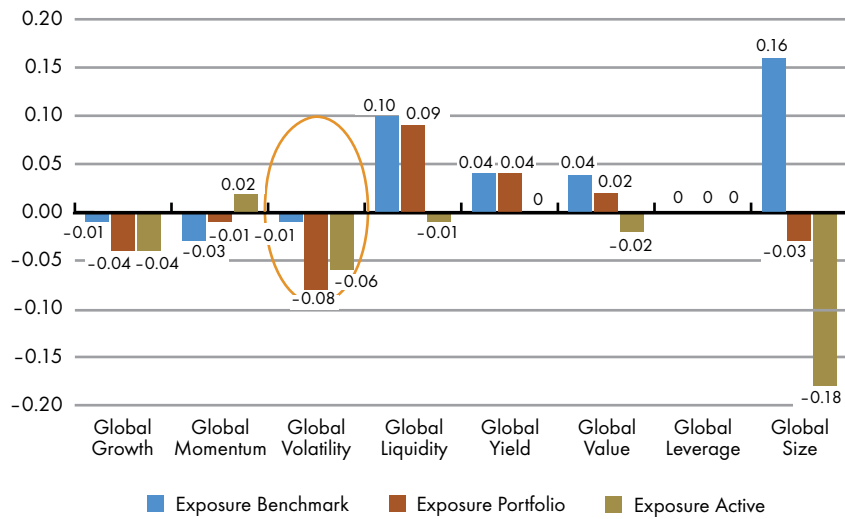
**EXHIBIT 12: FACTOR EXPOSURE OF ORIGINAL PORTFOLIO**



Notes: Factor exposure estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark.

Source: Northern Trust

**EXHIBIT 13: FACTOR EXPOSURE OF PORTFOLIO WITH QLV**



Notes: Factor exposure estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark, which was redefined as a blend of the MSCI World Developed Index and the Dow Jones U.S. Total Stock Market Index.

Source: Northern Trust

significant low volatility exposure, does change the results, but not dramatically. Incorporating the Northern Trust QLV would move the overall equity portfolio closer to achieving the investor's objective of low volatility exposure (taking it from 0.02 to -0.06), and would also neutralize unintended exposure, such as to size (from -0.24 to -0.18).

When we shifted the low volatility allocation to the Northern Trust QLV strategy, we saw some reduction in overall volatility. This helped move toward achieving the investor's primary goal, but it wasn't significant enough to fully achieve the 10% objective. If investors want to meet a factor-based goal of this sort, they will need to make substantial allocations to achieve meaningful adjustments to the portfolio's outcomes. This move also brought a higher tracking error to the market-capitalization weighted policy benchmark. If tracking error is a concern, the investor could amend the policy benchmark to incorporate a low volatility index.

### Portfolio Case Study 3: U.S. Liability-Driven Pension Fund

Our final case study is a large U.S. pension fund with a streamlined, liability-driven structure. The overall portfolio is allocated approximately 60% to long duration fixed income – including custom liability benchmarks – 30% to equities and the remaining 10% to real assets and private equity. The investor allocates across four equity portfolio managers in passive and active strategies using market capitalization-based benchmark indices. The allocation to U.S. equities includes large-, mid- and small-cap stocks as represented by the Dow Jones U.S. Total Stock Market Index. The remaining global equities span both developed and emerging markets. This investor's goal was to implement a liability-driven structure while maintaining some risk assets in the form of equity exposure, using this exposure to offer downside protection. It was also considering adding other strategies to enhance the risk efficiency and cost effectiveness of the overall portfolio versus its liabilities.

Exhibit 14 provides a summary of the equity portfolios, benchmarks and allocations.

#### EXHIBIT 14: EQUITY PORTFOLIO SUMMARY FOR CASE STUDY 3

Equity Portfolio/Strategy	Benchmark Index	Equity Portfolio Weight (%)	Total Risk (Annualized Standard Deviation)	Contribution to Total Risk (%)	Active Total Risk (Tracking Error)
			<b>15.0</b>		<b>0.77</b>
<b>1</b> U.S. Total Market Passive	Dow Jones U.S. Total Stock Market Index	51.0%	14.9	49.7%	2.83
<b>2</b> Developed Market ex-U.S.	MSCI All-Country World ex-U.S. Index	16.5%	17.3	17.8%	6.50
<b>3</b> Global Developed Market Active	MSCI All-Country World Index	16.5%	16.6	18.0%	3.95
<b>4</b> Global Developed Market Active	MSCI All-Country World Index	16.1%	13.8	14.5%	3.87

Notes: Portfolio and index holdings are as of 12/31/2013. Actual portfolio manager names remain confidential. General strategy names are used to indicate style. Total risk is measured in standard deviation at the individual strategy level and overall equity portfolio. Numbers have been rounded and may not add up to 100%.

Source: Northern Trust

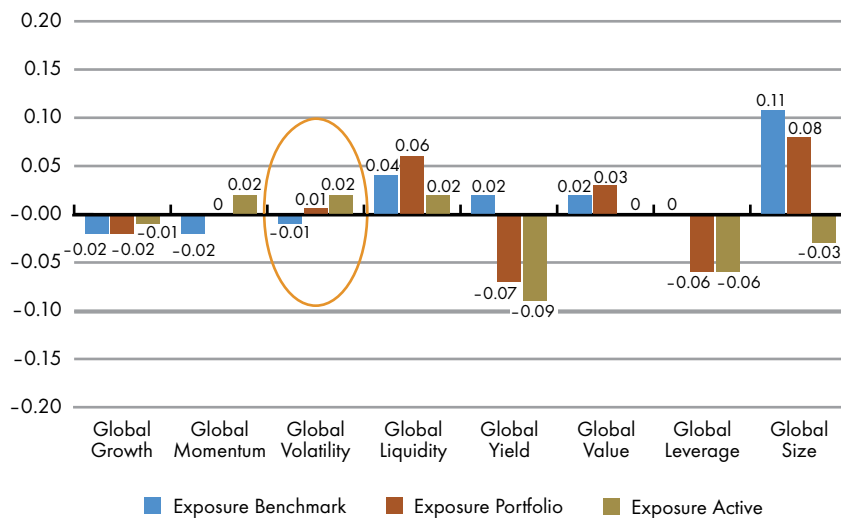
### Portfolio Truths: Findings From Original Portfolio Analysis

This investor’s combined equity portfolios have an annualized standard deviation, or total risk, of 15%, with individual standard deviations of each individual manager ranging from 13.8% to 17.3%. The tracking error for the entire equity portfolio versus the policy benchmark is 0.77%<sup>8</sup>.

In Exhibit 15 we show the portfolio exposure for each of the industry standard factors, the blended policy benchmark and finally the relative exposure (Exposure Active bar). Recall from the earlier cases that results need to be in excess of +/-0.20 to signify a significant tilt to a factor.

A well-balanced portfolio is not necessarily a risk-efficient or cost-effective portfolio. Our analysis confirmed that this investor had achieved a balanced equity exposure. We wanted to see if the investor could maintain that balance while improving the portfolio’s risk efficiency and cost effectiveness.

**EXHIBIT 15: GLOBAL FACTOR EXPOSURE OF ORIGINAL PORTFOLIO**



Notes: Factor exposure estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark.

Source: Northern Trust

### Factor Solutions: Hypothetical Portfolio Optimization and Analysis

In our hypothetical portfolio optimization for this investor, given its desire to include equity strategies that minimize fees and are aligned with its liability hedging strategy, we introduced an allocation to a low volatility equity portfolio. Implementing a factor-based low-volatility equity strategy in conjunction with common liability hedging practices can allow the investor to participate in equity markets while better managing systematic risk, and ultimately increases the correlation of the pension’s asset returns to liabilities. But how much of an allocation is needed to move the factor exposure beyond the 0.20 threshold of significance?

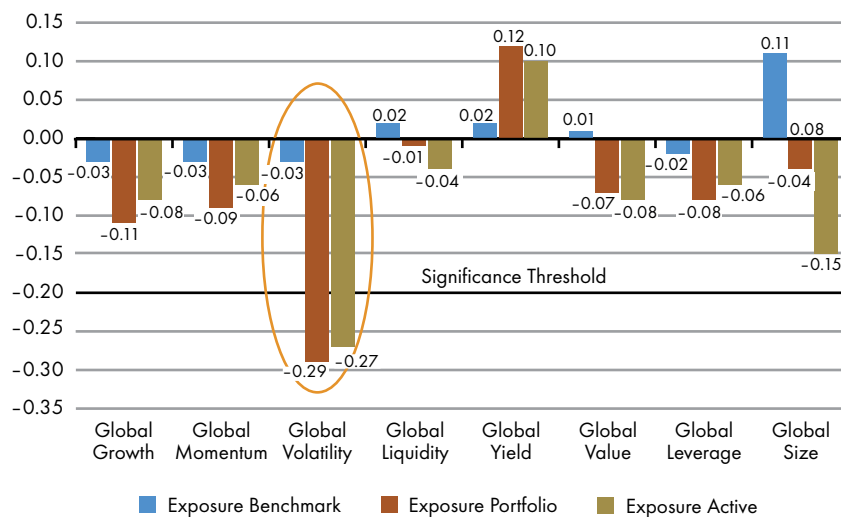
Our first two case studies highlighted that a significant allocation to factor strategies is needed to achieve the desired result. Through our analysis and optimization for this third case study, we determined that to achieve a significant tilt, we needed to reallocate more than 50% of the portfolio to a dedicated low-volatility strategy. Exhibit 16 shows the total portfolio factor exposure after we replaced portfolios 2, 3 and 4 from the original portfolio (shown in Exhibit 14 on page 13) with Northern Trust’s Quality Low Volatility strategy. Doing this demonstrates a meaningful tilt to the low volatility factor, as the exposure relative to the policy benchmark resulted in a –0.27 standard deviation.

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*To achieve a significant tilt, we needed to reallocate more than 50% of the portfolio to a dedicated low-volatility strategy.*

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**EXHIBIT 16: GLOBAL FACTOR EXPOSURE OF PORTFOLIO INCORPORATING NORTHERN TRUST QLV**



Notes: Factor exposure estimates are provided in units of standard deviation. Active risk (tracking error) is calculated versus the policy benchmark, which was redefined as a blend of the MSCI World Developed Index and the Dow Jones U.S. Total Stock Market Index.

Source: Northern Trust

An additional benefit of our hypothetical portfolio changes was a reduction in investment management fees. While factor-based or Engineered Equity products have fees higher than the general passive portfolios, these fees are often much less than traditional active management fees. This particular investor was paying between 2 basis points and 75 basis points for its entire equity exposure across both active and passive strategies. By using an Engineered Equity strategy in place of the higher cost active strategies, we estimated that the investor could expect an overall fee reduction of approximately 20 basis points – significantly improving the portfolio’s cost efficiency while improving its overall risk allocation.

### **Lessons Learned: What the Case Study Analyses Mean to You**

It is intriguing to see that across all three investor portfolios, the starting equity exposure was almost entirely factor neutral – their actual exposures were all well under the level generally considered significant. We also saw, with our hypothetical optimization and analysis that achieving an investor’s goals using factor-based strategies requires a substantial commitment. A small allocation may provide some improvement, but is not enough to have a significant impact on the portfolio’s results. With this in mind investors may want to consider adopting more meaningful factor tilts using an active risk budgeting approach<sup>9</sup>.

Our in-depth analysis of the portfolios reinforced what the survey data told us: many investors don’t truly understand their factor exposure. This is true for large investors with internal portfolio management resources as well as for smaller investors. Determining the factor exposure is made more challenging by the myriad factors that can affect a portfolio’s performance.

### **IMPLEMENTATION ROADMAP: LEARNING FROM EXPERIENCE**

Typically, an investor is not provided with the opportunity to develop a portfolio from scratch. Instead, investors must follow a course of tweaking and adjusting existing allocations. Based on the experience of our early adopters, we wanted to explore real-world strategies investors can use to implement an Engineered Equity strategy.

So how do investors who have successfully implemented Engineered Equity strategies overcome the challenges inherent in incorporating these strategies into their portfolios? To answer this, we talked with some early adopters who have already incorporated factor-based strategies into their portfolios. We interviewed four large, sophisticated institutional investors in Europe and Asia with a combined total assets under management in excess of \$375 billion. Using their experience, we can draw a roadmap for others considering implementation themselves.

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*By using an Engineered Equity strategy in place of the higher cost active strategies, the investor could significantly improve the portfolio’s cost efficiency while improving its overall risk allocation.*

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### Determining Objectives

While they all used factor-based strategies, the investors we interviewed had adopted these strategies in different ways – from just starting out with a small allocation to alternative strategies to managing highly complex portfolios that are primarily factor-based. Despite this, we found they shared similar goals: better risk-adjusted returns or an improved information ratio.

- **AP3** is one of the Swedish national pension buffer funds. One of the boldest characteristics of AP3's policy has been to disband traditional active mandates, preferring instead to organize its allocation to public securities by a handful of categories of risk. AP3 has a stated total-fund objective of delivering an annualized return of 4% over inflation; it does not use traditional active management mandates to meet this goal, instead preferring to allocate according to risk exposure.
- **Bureau of Labor Funds (BLF)** looks after retirement savings totalling more than \$80 billion for millions of Taiwanese workers. It began using nontraditional equity strategies three years ago. BLF is a major index investor with many members to satisfy. As the last investor of our quartet of investors to adopt factor based strategies, its move has been tentative. It has defined its main objective for the step as delivering better returns for lower risk than the market-cap-weighted index – a popular objective according to our research.
- **PGGM** is a Dutch fiduciary manager that is responsible for the pensions investing of 2.5 million people in the Netherlands. PGGM began using an alternative approach to equity investing almost 10 years ago in response to a realization that its traditional active portfolio was not performing as hoped, falling short of its stated benchmark. The majority of equity assets are passively managed to market-cap indices, but a large minority is run with fixed exposures to three alternative indices.
- **PKA** is a €22 billion pension fund for health workers based in Denmark. PKA has received many plaudits since it decided to end traditional mandates in equities and manage its equity exposure according to risk premia instead. PKA uses factor-based strategies because it believes that while alpha does exist, it is not persistent. PKA seeks long-term outperformance but has often found that it can be explained by tilts to certain factors. Unlike PGGM, PKA is far more dynamic in its exposure to different risk premia and to some extent employs a risk parity approach.

**EXHIBIT 17: EARLY ADOPTERS AT A GLANCE**

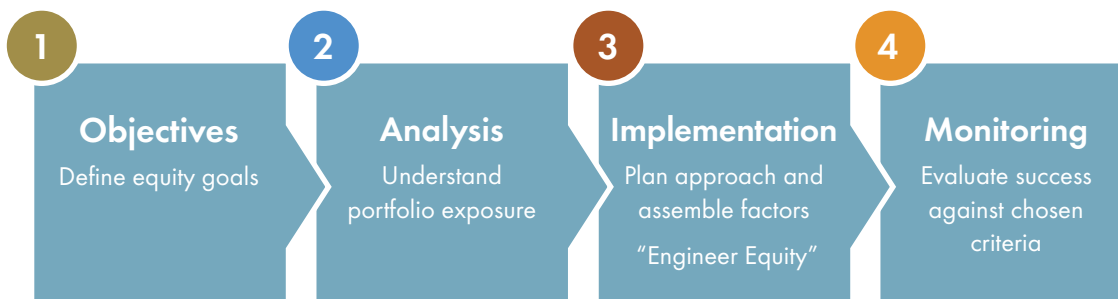
Fund	Objective	Implementation Approach	Monitoring Performance
<b>AP3</b>	Annualized return of 4% over inflation	Market Timing With Factors <ul style="list-style-type: none"> <li>■ E.g., value tilt at right time</li> </ul>	<ul style="list-style-type: none"> <li>■ Outsources to asset manager</li> <li>■ In-house exposure analysis</li> </ul>
<b>BLF</b>	Performance: better risk-adjusted returns than cap-weighted indices	Alternative Indices <ul style="list-style-type: none"> <li>■ MSCI Minimum Volatility Index</li> <li>■ RAFI Global Equities Index</li> </ul>	<ul style="list-style-type: none"> <li>■ Absolute return/Sharpe ratios</li> <li>■ Gauge relative performance vs. cap-weighted indices</li> </ul>
<b>PGGM</b>	Performance: cost efficient	Equally Weighted Factors <ul style="list-style-type: none"> <li>■ Value</li> <li>■ Minimum Variance</li> <li>■ Quality</li> </ul>	External systems: <ul style="list-style-type: none"> <li>■ Style Research</li> <li>■ FactSet</li> </ul>
<b>PKA</b>	Performance: long term, persistent	Risk Parity/Factor Bets <ul style="list-style-type: none"> <li>■ Value</li> <li>■ Momentum</li> <li>■ Quality</li> </ul>	<ul style="list-style-type: none"> <li>■ Discounts “newer” risk premia</li> <li>■ Still relies on market beta</li> </ul>

Three key takeaways emerged from their experience:

- Analyzing what is currently in your portfolio before making any future investment decisions is crucial to success.
- Failing to base future investment decisions on a strong understanding of your current portfolio can lead to unintended bias or cancel out intended bias.
- Using Engineered Equity strategies in your portfolios can provide more risk-efficient and cost-effective outcomes.

To see how the investors we interviewed created a roadmap for successful implementation, we focused on how they applied the last two steps of our four-step Engineered Equity asset allocation process: planning their implementation approach and monitoring their progress.

**FOUR-STEP ENGINEERED EQUITY ASSET ALLOCATION PROCESS**



### **Planning Implementation Approach**

The complexity of the approach of the investors we interviewed varied from a relatively straightforward to the highly complex.

The **BLF's** approach was the mildest – an initial testing of the waters. As the fund's first foray into alternative equity investing, the Taiwanese investor has chosen to put, in the near term, approximately 15% of its overall portfolio in mandates tracking the MSCI Minimum Volatility index as well as a fundamental RAFI global equities index. These alternative index exposures have been sourced from the BLF's considerable allocation to traditional passive market-capitalization-weighted index tracking. Consequently, the BLF considers these allocations close to passive, with complementary diversifying portfolios, but nevertheless not active management. At the same time, the fund's goals for the alternative equity mandates resemble those for its numerous active managers: to outperform the cap-weighted market indices over the long run. By allocating to two alternative indices, the BLF hopes to reduce the influence of the herd; the BLF believes that because alternative indexing is still new, the crowding effect has not yet set in with these new indices. Even if it does, the distinction between the two indices chosen is expected to provide diversification from each other.

While they have begun to test the waters of alternative equity investing, the lion's share of the fund's equity investments continue to follow the market-cap weighted index. As the majority of the new flows into the fund are from defined contribution scheme participants, the BLF's guiding principle is to not surprise its millions of contributors. As such, the BLF tends to take one year at a time. This is not just a cliché: asset allocation between equities and bonds is reviewed every April. In time there may be greater allocation to alternative equity strategies, but they need to prove themselves first.

**PGGM's** implementation appears superficially to be very simple, but the simplicity is deceptive. The fund has an equal weighting to value, minimum variance and quality, and claims no attempt to time them. PGGM insists that it wants a robust combination over the full economic cycle, equally weighting its factor exposures to avoid over-engineering the solution. However, much is going on beneath the surface of this seemingly calm policy. First, while the allocations are fixed, PGGM is monitoring its exposure to a large number of factors all the time. External systems such as Style Research, a holdings-based style and risk analysis tool, and FactSet, a manager, composition and asset allocation monitoring tool, help it evaluate its exposure to growth and momentum, for example. Although PGGM makes no intervention at this level, the fund does acknowledge that the strategies themselves can be changed from time to time to improve their effectiveness. In other words, the fund doesn't attempt to time factor exposure, on either risk or return grounds, but the volume of observable data can be used to implement fundamental changes to the strategies for the long term.

While **PKA** would, in an ideal world, allocate across all its strategies on an equal risk basis, this is impractical as some of the rarer strategies it employs lack the depth and liquidity to allow this. PKA is not a huge fund, but it is aware of moving markets adversely when dealing in esoteric strategies, particularly given that some of these also involve shorting, which makes them even more vulnerable to illiquidity. Instead, PKA applies a framework for

actual risk and return across all risk premia that guides its allocations – a form of risk parity. If a strategy begins to appear costly (i.e., expected returns exceed the risk budget), PKA lowers or withdraws exposure. This is an acknowledgement of the time-varying nature of risk premia; important factors such as the size or value premium can underperform for many years.

An in-house team at PKA oversees the factor bets on value, momentum and quality (implementation is by a raft of external managers). This means any crossover of bets, notably with the long-only market betas, can be seen and marshaled clearly.

**AP3's** implementation of factor-based investing stems from a belief that markets are inefficient. As such, profits can be reaped by tilting toward particular factors such as value at the right time. At the same time, the Stockholm-based fund recognizes that the strength of factors themselves waxes and wanes, so this approach to investing is not particularly easy. Evaluating factors is difficult because so much of their analysis is purely historical. Banks and fund managers analyze industrial sectors, but there isn't a comparable depth of analysis on factors. AP3 is confident that its feeds from the stock markets are sufficient to guide it on adapting to the change in a factor's strength in its "home" market of Europe. This analysis is conducted in-house. But for the world's biggest equity market, the United States, AP3 does not attempt factor-based investing and instead passively tracks the market-cap index.

### **Monitoring Progress**

The final step in the Northern Trust allocation process is monitoring your allocations so you can feel confident they are delivering on your objectives. This step brings us back full circle to the prerequisite step of understanding what your portfolio is doing for you. Our early adopters all take practical steps to ensure they stay on track.

The **BLF**, before outsourcing, prefers to use absolute return and Sharpe ratios to gauge relative performance of alternative equity indices against market-cap weighted indices. After selecting a specific alternative equity index to use as the benchmark of passive mandate, it will look at the tracking error as set forth in the investment guidelines. All of the BLF's equity mandates are long-only, so its portfolio is very dependent on market beta across the whole asset class. It is not clear the extent to which this has been modified by the alternative equity mandates (or active management). Currently the BLF is not in a position to look at aggregate exposures to factors, even well established ones such as industrial sectors or regions. The BLF says it works to identify any suitable future additional components or factor combinations for its portfolio.

We have previously mentioned how the team at **PGGM** uses external systems such as Style Research and FactSet to help them monitor their various factor exposures across the portfolio. This level of monitoring and the ability to change their holdings improve the portfolio's effectiveness. However, PGGM's large internal team undertook extensive research prior to building its strategies, and created them to be durable. The exposures by stock, sector and risk weighting to the trio of strategies were devised to be practical. Without a large internal resource, other investors would need help from their asset managers to do this at the development stage.

At **AP3**, the team highlighted the need for a partnership with a trusted asset manager. According to AP3 “it is easy to analyze the data and get a 30-year back test, but it is far harder to act upon the analysis. You need either a manager you can trust or an in-house team to understand what exposures you have. Much of the problem rests on the fact that while commonly understood metrics for valuing companies exist, most of the arguments for factor-based investing rely on historical data. There are utilities analysts and pharmaceutical analysts at work in brokerage houses but they have no equivalents covering momentum or value.”

**PKA** remains open-minded about the sustainability of some strategies. Pragmatically, the in-house team also accepts that for all its innovation, PKA still relies more on market beta than other premia. But this is no cause for complacency. The Danish fund notes that “newer” risk premia are heavily discounted. This is one incentive for a well-organized fund to exploit them – the discount can be excessive precisely because the market overcompensates for a lack of certainty. But there is also a much larger, holistic reason: the long-term nature of pension funds makes them natural suppliers of liquidity on capital markets.

#### **DRAWING CONCLUSIONS: PUTTING THE RESEARCH TO WORK IN YOUR PORTFOLIO**

Investors are faced with increasingly complex decisions when attempting to select the most efficient implementation strategy from a plethora of investment options. Consolidating the experience of the early Engineered Equity adopters with our research and experience, we have three key takeaways:

- Taking stock of what is currently in your portfolio before making any future investment decisions is crucial to success.
- Failing to base future investment decisions on a strong understanding of your current portfolio can lead to unintended bias or cancel out intended bias.
- Using Engineered Equity strategies in your portfolios can provide more risk-efficient and cost-effective outcomes.

Our analysis showed that to realize noticeable results, you need to make a deliberate and substantial commitment to Engineered Equity strategies. Dipping a toe in the Engineered Equity waters will typically not have a significant impact on your results. You also need to be prepared for the possibility of increased tracking error versus a standard benchmark. This is not a simple decision, since board members and trustees continue to monitor investment performance against standard benchmarks.

#### **WANT TO LEARN MORE?**

As investors learn more about the benefits of Engineered Equity strategies, we expect to see growing numbers embracing the idea of using factor-based investing to help better achieve their investment objectives. If you would like to learn more about how you can benefit from using factor-based investing or Engineered Equity solutions in your portfolio, contact your relationship manager or visit [northerntrust.com/equityimperative](https://northerntrust.com/equityimperative). See more details on the Equity Imperative series on page 22.



## THE EQUITY IMPERATIVE RESEARCH SERIES

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- Improving Active Risk Budgeting
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- Understanding Factor Tilts
- Combining Risk Factors for Superior Returns



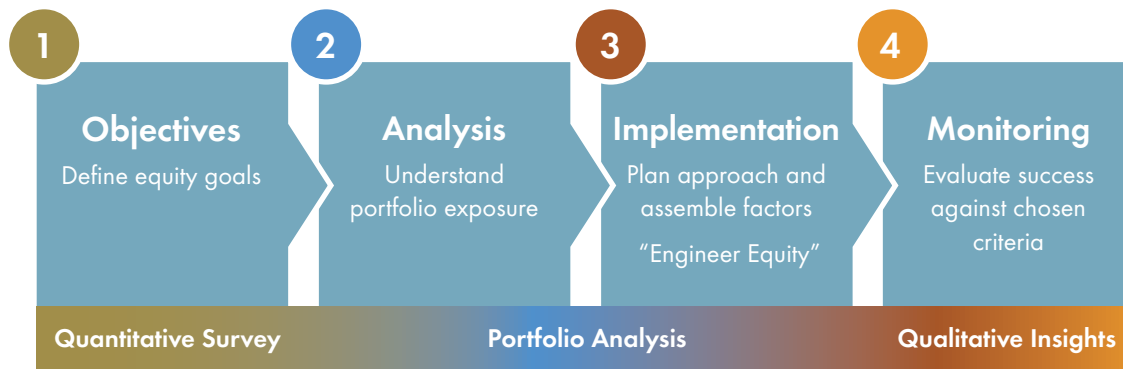
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## APPENDIX 1: FOUR-STEP ENGINEERED EQUITY ASSET ALLOCATION PROCESS

In our 2013 paper, “The New Active Decision in Beta Management,” we defined a framework for implementing an alternative beta strategy. We did this because the expanding range of investment solutions falling between traditional passive strategies and active management meant that the decision-making process was changing. The proliferation and increasing acceptance of Engineered Equity strategies meant asset owners were no longer simply choosing between active management and indexing. Instead, they were assessing their objectives, identifying appropriate corresponding factors (such as value, low volatility or quality) or strategies, choosing indices, defining a weighting strategy among the indices, and determining metrics to measure success.

Our subsequent research has led us to further refine the process and emphasize the importance of analyzing the portfolio to understand existing factor exposure. Omitting this step can result in your existing factor exposure neutralizing the intended tilts you make.



## ENDNOTES

- 1 Our global Equity Investor Survey incorporated views of 139 institutional investors, approximately 45% of whom had more than \$1 billion in assets under management. Of the respondents, 49.3% were from the United States, 24.3% from Europe, 13.2% from the United Kingdom, 11.1% from Asia, 1.5% from the Middle East and 0.7% from Africa.
- 2 The names of the specific investors in these case studies remain confidential, as do the actual portfolio manager names. We have described the types of investor and used general strategy names to indicate style.
- 3 The Barra Global Equity Model 2 (GEM2). This model features a broad estimation universe based on the MSCI All Country World Investable Market Index. A broad estimation universe is necessary to accurately represent the investment opportunity set for institutional investors and to generate robust risk forecasting results.
- 4 Northern Trust developed a proprietary method, the Northern Trust Quality Score (NTQS), which gauges multiple dimensions of quality grouped under the headings of management efficiency, profitability and cash flow. These signals are based on our fundamental belief that a quality company should demonstrate the following abilities:
  - To convert assets into sales
  - To convert assets into earnings
  - To convert equity into returns
  - To convert invested capital into returns
  - To remain solvent
  - To self-finance
  - To grow prudently without becoming overextended
- 5 Based on Northern Trust Quantitative Research published in "Understanding Factor Tilts" in June 2013.
- 6 Northern Trust's paper, "Combining Risk Factors," demonstrates that combining factors is a more efficient way to structure factor exposure.
- 7 "New Active Decision in Beta Management," Northern Trust 2013. Page 13, Exhibit 11.
- 8 The tracking error for each individual portfolio is based on its corresponding benchmark, while the overall equity holding tracking error is determined by the equity policy benchmark, a blend of the indices in Exhibit 13.
- 9 For more information about improving your active risk budgeting approach please read: "Improving Active Risk Budgeting," Northern Trust, May 2014.

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