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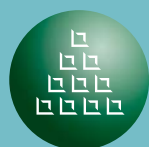
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## QUANTITATIVE STRATEGIES: *FACTOR INVESTING*

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### Not All Factor Exposures Are Created Equal

ERIC SORENSEN, MARK BARNES, NICK ALONSO,  
AND EDWARD QIAN



PANAGORA



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ERIC SORENSEN, MARK BARNES, NICK ALONSO,  
AND EDWARD QIAN

**ERIC SORENSEN** is the chief executive officer and president of PanAgora Asset Management in Boston, MA.  
[esorensen@panagora.com](mailto:esorensen@panagora.com)

**MARK BARNES** is director of the Multi Asset Group at PanAgora Asset Management in Boston, MA.  
[mbarnes@panagora.com](mailto:mbarnes@panagora.com)

**NICK ALONSO** is director of the Multi Asset Group at PanAgora Asset Management in Boston, MA.  
[nalonso@panagora.com](mailto:nalonso@panagora.com)

**EDWARD QIAN** is the chief investment officer of the Multi Asset Group at PanAgora Asset Management in Boston, MA.  
[eqian@panagora.com](mailto:eqian@panagora.com)

Approaches to quantitative equity investing have evolved markedly. Thirty years ago, active and index-enhanced approaches applied standard optimization to a set of presumed alpha factors to obtain portfolio weights superior to a capitalization-weighted alternative. These were largely anchored in value, momentum, and other demonstrable factors. For example, consensus earnings forecast revisions were the darling of quants in the 1990s, until they became arbitrated away.

The focus was on the alpha generation. The capital asset pricing model (CAPM) was a troublesome constraint. Factor exposures did not have unique tickers, and the approach was eschewed by most (if not all) fundamental stock pickers.

## HARVESTING OLD GROWTH

As with timber harvesting, old growth is now logged away, and the focus is on second growth and beyond. With the recent decade's acceptance of smart (alternative) beta, the CAPM constraint is dissipating; the focus is turning to transparent methods of construction. However, factors remain a viable component. This new direction for quantitative equity strategies is a hybrid—blending smart beta with proven factor (alpha) exposures. Effectively, this is an alpha-beta blend. If done properly, it is elegant and provides value added.

The benefits are apparent. First, it frees investors of the hamstringing of capitalization-weighted approaches (now much too bloated). Second, it brings a refreshingly clean transparency. Third, it does not cost as much (lower management fees and trading efficiencies).

In this article, we present an approach for evaluating the alternatives. Four portfolios are of interest: factor weighted (FW), cap weighted (CW), equal weighted (EW), and risk parity weighted (RP). We analyze these four portfolios for eight of the factors in the Barra Global Equity Model for Long-Term Investors (GEM LT) risk model. We compare these portfolios based on standard performance statistics. We also consider new metrics such as performance participation rates and portfolio sector concentrations. What does it mean to “beat” the index?

## RUN OF THE MILL

Most smart beta portfolios use simplistic rules. Often there is an absence of both sophistication of technique and experience of the investor. The objective appears to be a purely mathematical deviation from cap weights, with an attached cost that is similar to capitalization-weighted indexes.

The term *passive* no longer has its singular meaning. Today, it is common for many

multiple-factor smart beta strategies to be offered at a cost of a few basis points. Indeed, if the premise is that smart beta for a few basis points can beat a capitalization-weighted benchmark (also at a few basis points), the buy decision is quite easy. However, what does *beat* mean? What horizon is relevant? What should be the pertinent comparative metrics?

When factors are added to the mix, the various strategies can be quite disparate. Some factor-targeting strategies bring unintended consequences. First, a smart beta portfolio targeting one factor might have embedded (unwanted) exposures to other factors. Second, a smart beta portfolio might lack diversification over important dimensions such as fundamentals, sectors, and countries.

## PRIME TIMBER NOT SLASH

Not all factor exposures are created equal. Surprisingly, most researchers do not incorporate the concept of diversification based simultaneously on risk and stock return correlation. In previous research, Alonso and Barnes [2016] analyzed the top quintile of stocks for a given factor score and observed the portfolios using four different weighting schemes: FW, CW, EW, and RP. They found that performance improves in both higher return and lower risk when the factor exposure is diversified across other dimensions. The improvement in performance stems, in part, from reduced exposures to unintended factors. In other words, using risk inputs to build truly diversified portfolios of factor exposure delivers excellent exposure to the intended factor with minimal adverse effects.

In this article, we offer a framework for analysis that holds the factor exposure constant while permitting the selection of stocks to vary according to different weighting schemes. This enables a richer window on portfolio performance.

## CLEAR CUTTING AT ITS BEST

Our framework compares different weighting schemes that generate portfolios with the same exposure for a given factor. First, we build a portfolio using a simple factor-weighted scheme for the top quintile of stocks, ranked by the factor. For example, if the factor is dividend yield, then we rank stocks by dividend yield, select the top quintile, and then weight those stocks

proportionally to their dividend yield ranks within the portfolio. We use the factor definitions included in the Barra GEM LT risk model and restrict ourselves to those factors that are expected to have positive risk premiums (earnings quality, dividend yield, earnings yield, investment quality, size [small], momentum, growth, and profit). Note that for the size factor we invert the Barra size score so that small size stocks rank higher than large size stocks. The FW portfolio provides the baseline factor exposure that the CW, EW, and RP portfolios are required to match. The RP portfolios balance risk across sectors and across stocks within sectors, consistent with our prior research. The investable universe constitutes the MSCI World Index. We proceed to perform backtests assuming monthly rebalancing over the period January 1995 to October 2017 for each weighting scheme.

Formation of the non-FW portfolios takes the following steps. We start with the stocks in the FW portfolio as a baseline and reweight them using a non-FW weighting scheme (e.g., EW). If the portfolio's factor exposure is lower than that of the FW portfolio, we remove the stock with the lowest factor score and repeat the process until the portfolio's factor exposure matches that of the FW baseline portfolio.

Compared to the FW portfolio, all of the other portfolios are concentrated in fewer names to match the factor exposure. Because the ordering of stocks is the same for all of the portfolios, the non-FW portfolios hold subsets of the stocks that are in the baseline FW portfolio. This requirement may not be optimal, but it reduces other deviations between portfolios that would cloud the analysis. Exhibit 1 shows the average factor exposure for each portfolio. All factor portfolios have very similar exposures. We adopt the convention of retaining the last stock removed that would have pushed the exposure above that of the baseline FW portfolio. These are Barra exposures, which explains why the MSCIWI has near-zero exposure.

Exhibit 2 shows the average number of stocks in each portfolio, with a comparison to the full MSCI World Index. Note the number of names needed to match the baseline factor exposure. As the number of names decreases, the portfolio is concentrated more in the high-factor stocks. By design, these portfolios all have similar factors scores but very different characteristics, including a different number of names.

## EXHIBIT 1

### Average Portfolio Exposure by Factor Strategy

Average Factor Score	FW	CW	EW	RP	MSCIWI
Earnings quality	1.66	1.61	1.62	1.60	-0.01
Dividend yield	1.64	1.59	1.61	1.60	0.07
Earnings yield	1.32	1.24	1.28	1.25	0.03
Investment quality	1.24	1.19	1.21	1.20	0.06
Size	-1.72	-1.70	-1.70	-1.69	0.32
Momentum	1.00	0.96	0.97	0.95	-0.02
Growth	1.51	1.45	1.46	1.45	-0.05
Profit	1.69	1.63	1.65	1.64	0.00

## EXHIBIT 2

### Average Number of Names by Factor Strategy and Portfolio

Average Holdings	FW	CW	EW	RP	MSCIWI
Earnings quality	318	198	211	195	1,611
Dividend yield	318	196	211	206	1,611
Earnings yield	318	191	211	191	1,611
Investment quality	318	191	211	201	1,611
Size (small)	318	197	211	200	1,611
Momentum	318	205	211	196	1,611
Growth	318	204	211	203	1,611
Profit	318	201	211	201	1,611

## COMPARISON OF PERFORMANCE

Exhibit 3 shows standard performance statistics of the portfolios for each single-factor strategy, as compared to the MSCI World Index: annualized geometric average return, excess return (in excess of the 3-month T-bill rate), annualized portfolio volatility, and Sharpe ratio.

The results indicate that there is a positive payoff to the factors over this period. This is true for almost all factor strategies. Generally, the portfolios have higher volatility than the MSCIWI, with the exception of those in the investment quality and dividend yield strategies, which is expected. The EW portfolios tend to have higher volatility because small-capitalization stocks overweighed in the EW portfolio have higher volatility. The RP portfolios have the lowest volatility, consistent with the philosophy of risk weighting.

## COMPARISON OF PARTICIPATION RATIOS

How do the portfolio strategies add value over a market cycle? If a portfolio outperforms the benchmark

when the benchmark is up but performs in line when the benchmark is down, is that good or bad? We can categorize this portfolio as *cyclical* in that its advantage lies in periods when the market is up. Conversely, a portfolio with benefits accruing primarily when the market is down can be considered *defensive*. Understanding participation, then, gives a better idea of how different weighting schemes determine portfolio performance patterns independent of the factor exposures. This is important for investors who have a preference regarding the cyclical nature of their portfolio's performance.

Investors have some expectation of a factor strategy's return and volatility characteristics. In addition to using return and volatility characteristics to compare different factor portfolios, our approach adds characteristics based on participation rates that are also useful for describing strategies. *Upside participation and downside protection* can be rigorously defined and empirically analyzed for strategies relative to an index (Qian [2015]). From upside and downside participation rates, we derive the *average participation* and the *participation advantage*, which is the difference between upside and downside participation rates. The average participation gives an intuitive measure of the strategy's cyclical nature or defensiveness, whereas the participation advantage indicates the efficiency of the strategy's ability to generate value by exploiting the asymmetric co-movement of the portfolio with the benchmark. Using all six of these characteristics—return, volatility, upside participation, downside participation, average participation, and participation advantage—we can better understand how strategies fit into an overall equity allocation.

Exhibit 4 captures this for four hypothetical portfolios. Portfolio A has an upside participation of 1.0 and thus has the same return as the benchmark when the benchmark is up. It also has a downside participation of 1.0, which yields an average participation of 1.0 and a participation advantage of 0.0. Portfolio B has an upside participation of 1.1 and a downside participation of 0.9. This means that the portfolio will beat the benchmark by approximately a factor of 0.2 over a full market cycle, as indicated by the participation advantage. However, the average participation is 1.0, which indicates that the portfolio is neither cyclical nor defensive but rather neutral. Our convention is that portfolios with average participations above 1.0 are cyclical, and portfolios with average participations below 1.0 are defensive. The distance from 1.0 indicates how strongly

## EXHIBIT 3

### Backtest Performance Characteristics of Portfolios

#### Panel A: Earnings Quality Strategy

Earnings Quality	FW	CW	EW	RP	MSCIWI
Geometric return	9.46	8.18	9.55	12.46	7.97
Excess return	6.55	5.30	6.63	9.48	5.10
Portfolio risk	19.14	16.55	19.00	14.04	14.78
Sharpe ratio	0.34	0.32	0.35	0.68	0.35

#### Panel B: Size (small) Strategy

Size (small)	FW	CW	EW	RP	MSCIWI
Geometric return	9.92	11.65	10.17	12.49	7.97
Excess return	6.99	8.68	7.23	9.50	5.10
Portfolio risk	22.16	21.94	21.91	18.14	14.78
Sharpe ratio	0.32	0.40	0.33	0.52	0.35

#### Panel C: Dividend Yield Strategy

Dividend Yield	FW	CW	EW	RP	MSCIWI
Geometric return	11.92	10.14	11.87	13.23	7.97
Excess return	8.95	7.22	8.90	10.24	5.10
Portfolio risk	16.97	15.14	16.79	12.84	14.78
Sharpe ratio	0.53	0.48	0.53	0.80	0.35

#### Panel D: Momentum Strategy

Momentum	FW	CW	EW	RP	MSCIWI
Geometric return	12.87	10.83	12.59	13.28	7.97
Excess return	9.88	7.89	9.61	10.28	5.10
Portfolio risk	16.73	17.24	16.45	13.87	14.78
Sharpe ratio	0.59	0.46	0.58	0.74	0.35

#### Panel E: Earnings Yield Strategy

Earnings Yield	FW	CW	EW	RP	MSCIWI
Geometric return	11.90	11.90	11.80	12.79	7.97
Excess return	8.93	8.93	8.82	9.80	5.10
Portfolio risk	20.78	18.52	20.53	17.17	14.78
Sharpe ratio	0.43	0.48	0.43	0.57	0.35

#### Panel F: Growth Strategy

Growth	FW	CW	EW	RP	MSCIWI
Geometric return	5.73	7.13	5.74	9.40	7.97
Excess return	2.90	4.27	2.91	6.49	5.10
Portfolio risk	20.80	21.23	20.59	16.32	14.78
Sharpe ratio	0.14	0.20	0.14	0.40	0.35

#### Panel G: Investment Quality Strategy

Investment Quality	FW	CW	EW	RP	MSCIWI
Geometric return	11.35	10.37	11.35	11.63	7.97
Excess return	8.39	7.44	8.39	8.67	5.10
Portfolio risk	15.33	13.77	15.23	12.08	14.78
Sharpe ratio	0.55	0.54	0.55	0.72	0.35

#### Panel H: Profit Strategy

Profit	FW	CW	EW	RP	MSCIWI
Geometric return	10.34	11.93	10.33	11.48	7.97
Excess return	7.40	8.96	7.40	8.52	5.10
Portfolio risk	14.39	13.13	14.31	12.75	14.78
Sharpe ratio	0.51	0.68	0.52	0.67	0.35

## EXHIBIT 4

### Hypothetical Portfolio Statistics Show a Range of Defensive Characteristics

	Portfolio A	Portfolio B	Portfolio C	Portfolio D
Upside participation	1.0	1.1	1.0	1.2
Downside participation	1.0	0.9	0.8	1.0
Average participation	1.0	1.0	0.9	1.1
Participation advantage	0.0	0.1	0.1	0.1

cyclical or defensive the portfolio is. Portfolio C has no advantage on the upside but does on the downside, meaning that this portfolio is defensive with an average participation of 0.9. Finally, Portfolio D has an advantage on the upside but no advantage on the downside, which means this portfolio is cyclical with an average participation of 1.1.

Exhibit 5 shows participation relative to the full-market MSCIWI. We observe the following:

- For several of the factor strategies (earnings quality, earnings yield, size, and growth), the portfolios tend to be cyclical. Conversely, other factors are defensive and tend to pay off more in down markets (including dividend yield, investment quality, and profit). The remaining factor, growth, is relatively neutral.
- RP tends to be more defensive than the other three, although dividend yield jumps out as an exception.
- Earnings quality, size, and growth show fairly low participation advantages across the board. Others show considerable potential, with participation advantages generally around 0.20–0.25. That is, some factors should be considered more opportunistic than others over the cycle.

## EXHIBIT 5

### Participation of Strategies Relative to the MSCI World Index

**Panel A: Earnings Quality Strategy Relative to the MSCI World Index**

Earnings Quality	FW	CW	EW	RP
Upside	1.16	1.03	1.16	0.98
Downside	1.11	1.02	1.10	0.71
Advantage	0.05	0.01	0.05	0.27
Average	1.14	1.03	1.13	0.85

**Panel B: Size (small) Strategy Relative to the MSCI World Index**

Size (small)	FW	CW	EW	RP
Upside	1.22	1.28	1.22	1.10
Downside	1.15	1.13	1.13	0.85
Advantage	0.08	0.15	0.09	0.25
Average	1.18	1.21	1.17	0.97

**Panel C: Dividend Yield Strategy Relative to the MSCI World Index**

Dividend Yield	FW	CW	EW	RP
Upside	1.01	0.89	1.00	0.95
Downside	0.76	0.69	0.76	0.57
Advantage	0.25	0.20	0.25	0.38
Average	0.89	0.79	0.88	0.76

**Panel D: Momentum Strategy Relative to the MSCI World Index**

Momentum	FW	CW	EW	RP
Upside	1.11	1.12	1.09	0.95
Downside	0.86	1.00	0.85	0.62
Advantage	0.25	0.13	0.24	0.33
Average	0.99	1.06	0.97	0.79

**Panel E: Earnings Yield Strategy Relative to the MSCI World Index**

Earnings Yield	FW	CW	EW	RP
Upside	1.25	1.17	1.24	1.09
Downside	1.08	0.99	1.08	0.84
Advantage	0.16	0.18	0.16	0.26
Average	1.16	1.08	1.16	0.96

**Panel F: Growth Strategy Relative to the MSCI World Index**

Growth	FW	CW	EW	RP
Upside	1.19	1.26	1.18	1.06
Downside	1.36	1.39	1.35	0.99
Advantage	-0.17	-0.12	-0.17	0.07
Average	1.28	1.33	1.26	1.02

**Panel G: Investment Quality Strategy Relative to the MSCI World Index**

Investment Quality	FW	CW	EW	RP
Upside	1.01	0.94	1.00	0.85
Downside	0.81	0.78	0.80	0.58
Advantage	0.20	0.16	0.20	0.27
Average	0.91	0.86	0.90	0.72

**Panel H: Profit Strategy Relative to the MSCI World Index**

Profit	FW	CW	EW	RP
Upside	0.98	0.95	0.97	0.91
Downside	0.83	0.70	0.82	0.67
Advantage	0.15	0.25	0.15	0.24
Average	0.90	0.82	0.90	0.79

Exhibit 6 shows participation patterns relative to the baseline FW portfolio, which we use as a proxy for the factor return. Here, the interpretation of participation is how the portfolio performs when the factor is paying off or not. The differences in these participation rates can be quite small; most of the advantages are zero or even positive. In particular, the EW participation advantage is generally very close to zero, indicating that having an agnostic weighting scheme does as well as factor-weighting for a given factor exposure. The RP advantage is generally much higher than zero, indicating that there is a more significant asymmetry to its participation. This finding is important because it shows that using risk inputs to build diversified factor portfolios yields advantages over other, more common approaches.

This highlights the defensive nature of the RP portfolio. In general, the upside participation is fairly high, indicating that the portfolio participates meaningfully when the factor is paying off. However, it also has fairly low downside participation, suggesting that having a diversified exposure to the factor helps when the factor return is negative. Notice that this defensiveness does not come strictly from diversifying across stocks because the EW portfolio does not show this defensiveness relative to the factor. RP defensiveness comes from balancing across sectors and favoring lower-risk stocks over higher-risk stocks in the portfolio.

One reason for differences in behavior between the RP and other portfolios comes from the sector positioning. In particular, performance is affected by

## EXHIBIT 6

### Participation of Strategies Relative to the Factor Portfolio

#### Panel A: Earnings Quality Strategy

Earnings Quality	FW	CW	EW	RP
Upside	1.00	0.82	0.99	0.84
Downside	1.00	0.81	0.98	0.66
Advantage	0.00	0.01	0.01	0.19
Average	1.00	0.82	0.99	0.75

#### Panel B: Size (small) Strategy

Size (small)	FW	CW	EW	RP
Upside	1.00	0.97	0.99	0.87
Downside	1.00	0.88	0.98	0.75
Advantage	0.00	0.09	0.01	0.12
Average	1.00	0.92	0.99	0.81

#### Panel C: Dividend Yield Strategy

Dividend Yield	FW	CW	EW	RP
Upside	1.00	0.82	0.99	0.91
Downside	1.00	0.80	0.99	0.73
Advantage	0.00	0.03	0.00	0.18
Average	1.00	0.81	0.99	0.82

#### Panel D: Momentum Strategy

Momentum	FW	CW	EW	RP
Upside	1.00	0.96	0.98	0.87
Downside	1.00	1.03	0.98	0.73
Advantage	0.00	-0.07	0.00	0.14
Average	1.00	1.00	0.98	0.80

#### Panel E: Earnings Yield Strategy

Earnings Yield	FW	CW	EW	RP
Upside	1.00	0.88	0.99	0.89
Downside	1.00	0.82	0.99	0.81
Advantage	0.00	0.06	0.00	0.08
Average	1.00	0.85	0.99	0.85

#### Panel F: Growth Strategy

Growth	FW	CW	EW	RP
Upside	1.00	1.02	0.99	0.88
Downside	1.00	0.96	0.99	0.71
Advantage	0.00	0.06	0.00	0.17
Average	1.00	0.99	0.99	0.80

#### Panel G: Investment Quality Strategy

Investment Quality	FW	CW	EW	RP
Upside	1.00	0.87	1.00	0.86
Downside	1.00	0.84	0.99	0.72
Advantage	0.00	0.03	0.00	0.14
Average	1.00	0.86	1.00	0.79

#### Panel H: Profit Strategy

Profit	FW	CW	EW	RP
Upside	1.00	0.91	0.99	0.98
Downside	1.00	0.75	0.99	0.85
Advantage	0.00	0.16	0.00	0.13
Average	1.00	0.83	0.99	0.91

sector concentrations in the portfolio. We calculated the weight in each portfolio for cyclical (consumer discretionary, industrials, financials, and technology), neutral (energy, materials, and telecommunications), and defensive (consumer staples, healthcare, and utilities) sectors. Exhibit 7 shows the average weight in each sector category and the difference of Cyclical-Defensive. The pattern that stands out is that the FW, CW, and EW portfolios all tend to favor cyclical sectors, whereas the RP portfolio tends to have very balanced exposure to cyclical and defensive sectors by design, which gives it a defensive performance pattern despite having the same factor exposures as the other portfolios.

## DISCUSSION AND CONCLUSIONS

Our purpose here is to highlight the consequences of using different portfolio construction methodologies to achieve factor exposures. We isolate differences

in portfolio characteristics attributable to different weighting schemes. Our results indicate that once the desired factor exposure is obtained, it is critical to build the portfolio with the most desirable characteristics. Comparisons of the FW and EW portfolios suggest that there is low payoff to factor exposures within the top factor quintile, and factor weighting therefore is not very useful, particularly because it can result in portfolio concentrations.

By focusing on portfolio construction, a portfolio will yield the desired defensiveness relative to both the market and the factor payoff. The results here support our previous findings (Alonso and Barnes [2016]). Using a risk-aware weighting scheme, exemplified here by the RP portfolio, solves many of these problems by building a diversified portfolio that has the desired factor exposure.

This approach suggests that an appropriate way for investors to manage factor portfolios is first to match the



## EXHIBIT 7

### Cyclical, Neutral, and Defensive Sector Exposure for the Various Strategies

#### Panel A: Earnings Quality Strategy

Earnings Quality	FW	CW	EW	RP	MSCIWI
Cyclical	50%	40%	51%	33%	57%
Neutral	37%	50%	37%	28%	19%
Defensive	12%	9%	12%	38%	24%
Cyclical–Defensive	39%	31%	39%	–5%	33%

#### Panel B: Size (small) Strategy

Size (small)	FW	CW	EW	RP	MSCIWI
Cyclical	69%	74%	69%	44%	57%
Neutral	17%	14%	17%	21%	19%
Defensive	13%	11%	13%	34%	24%
Cyclical–Defensive	56%	63%	56%	9%	33%

#### Panel C: Dividend Yield Strategy

Dividend Yield	FW	CW	EW	RP	MSCIWI
Cyclical	54%	39%	54%	34%	57%
Neutral	20%	26%	20%	26%	19%
Defensive	25%	34%	25%	39%	24%
Cyclical–Defensive	30%	5%	30%	–5%	33%

#### Panel D: Momentum Strategy

Momentum	FW	CW	EW	RP	MSCIWI
Cyclical	62%	60%	62%	39%	57%
Neutral	18%	17%	18%	23%	19%
Defensive	19%	22%	19%	37%	24%
Cyclical–Defensive	44%	39%	43%	3%	33%

#### Panel E: Earnings Yield Strategy

Earnings Yield	FW	CW	EW	RP	MSCIWI
Cyclical	64%	59%	64%	41%	57%
Neutral	23%	28%	24%	26%	19%
Defensive	11%	13%	12%	32%	24%
Cyclical–Defensive	53%	46%	53%	9%	33%

#### Panel F: Growth Strategy

Growth	FW	CW	EW	RP	MSCIWI
Cyclical	65%	67%	65%	41%	57%
Neutral	20%	20%	20%	26%	19%
Defensive	14%	13%	14%	33%	24%
Cyclical–Defensive	52%	54%	51%	8%	33%

#### Panel G: Investment Quality Strategy

Investment Quality	FW	CW	EW	RP	MSCIWI
Cyclical	65%	56%	65%	36%	57%
Neutral	17%	20%	17%	23%	19%
Defensive	18%	23%	18%	39%	24%
Cyclical–Defensive	47%	33%	47%	–3%	33%

#### Panel H: Profit Strategy

Profit	FW	CW	EW	RP	MSCIWI
Cyclical	56%	42%	56%	40%	57%
Neutral	10%	9%	10%	26%	19%
Defensive	33%	48%	33%	34%	24%
Cyclical–Defensive	24%	–6%	23%	6%	33%

factor exposure of the reference benchmark and second to build a portfolio that deviates from the benchmark in other dimensions. Once a portfolio has the desired factor exposure, other portfolio characteristics become more important. A factor-weighted portfolio construction methodology implies that the most important characteristic is the factor exposure itself: the stocks with higher factor scores get more weight. This can even be exacerbated in optimized portfolios (not discussed here), in which marginally higher factor scores can lead to much higher weights. The implied rationales of the other portfolio construction methodologies are different, although they all share the implied view that factor weighting within the portfolio is not important. For CW, the implied view is that the portfolio should give more weight to larger stocks, either because there is some expected payoff to larger-capitalization stocks or for some other reason, such as liquidity or turnover considerations. The EW portfolio implies that there is

no distinction between stocks for any reason and so it is appropriate to invest equally in all stocks. Finally, the RP portfolio implies that once the required risk exposure is attained, the most important consideration is building a risk-balanced portfolio.

## REFERENCES

Alonso, N., and M. Barnes. “Efficient Smart Beta” *The Journal of Investing*, Vol. 25, No. 1 (2016), pp. 103–115.

Qian, E. “On the Holy Grail of ‘Upside Participation and Downside Protection.’” *The Journal of Portfolio Management*, Vol. 41, No. 2 (Winter 2015), pp. 11–22.

To order reprints of this article, please contact David Rowe at [drowe@ijournals.com](mailto:drowe@ijournals.com) or 212-224-3045.



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