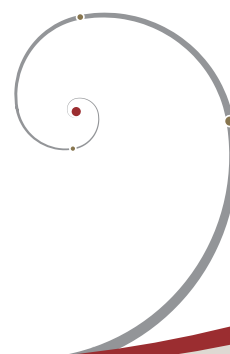


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**Multi-Style Global Equity  
Investing: A Statistical Study  
on Combining Fundamentals,  
Momentum, Risk, and Valuation  
for Improved Performance**

*By David J. Garff, CIMA®*



# Multi-Style Global Equity Investing

## A Statistical Study on Combining Fundamentals, Momentum, Risk, and Valuation for Improved Performance

By David J. Garff, CIMA<sup>®</sup>

### Abstract

Factor exposures exhibit alpha across countries, not just within countries, and momentum and valuation factors generate the greatest outperformance. These factors exhibit low correlations to each other, creating valuable diversification opportunities for portfolio managers. Long-only multi-style portfolios that use fundamental, momentum, risk, and valuation factors significantly improve absolute and risk-adjusted performance. Long/short multi-style portfolios substantially outperform the long-only benchmark on a risk-adjusted basis.

### Introduction

Over the past fifty years, the institutional investment management marketplace has expanded, leading to greater competition and more investment strategies, particularly in the global equity and bond markets. The advent of separate accounts, commingled trusts, mutual funds, and exchange-traded funds (ETFs) has provided a wide spectrum of access points for investors and their advisors. At the same time, there are literally hundreds of approaches to global equity investing, ranging from simple buy-and-hold strategies to more complex high-frequency quantitative strategies.

Quantitative tools and theories have advanced, with several lines of research focused on pricing anomalies—those equity return patterns that cannot be explained by traditional asset pricing models (Bali et al. 2011). Fama and French (1996) were among the first to try to understand these anomalies. Since that time, the most widely accepted factors are known as the value effect, the small-cap effect, and the momentum effect. These anomalies often are referred to as “effects” or “factors.” In this study, we refer to these as “factors.”

Investment managers, consultants, and advisors care—or should care—about the performance of these factor portfolios because they may represent sources of unidentified beta or be sources of alpha for active managers.

The majority of factor analysis to-date has been limited to the individual equity markets or a cross-asset class framework; very little literature analyzes these factors across the equity markets of different countries. The goal of this study is to add to the body of research by exploring an additional question: Does a multi-style investment strategy add value when analyzed across a universe of countries?

### A Brief History of Investment Styles

Equity portfolio management boasts dozens—if not hundreds—of investment styles. Strategies generally are based on combinations of one or more paradigms. Starting in the early 1990s, strategies largely were “boxed” to make them more convenient to analyze (for the consultant) and easier to manage (for the manager). We use this same construct to consider different investment styles, which generally are reflections of factor exposures at one level or another. From many style definitions we chose some simple classifications, which are by no means exhaustive.

### Fundamental Investing

Traditional fundamental investors are concerned with the strength of the fundamental metrics of a company such as growth of earnings, growth of sales, profit margin expansion, and return on equity. Despite the popularity of fundamental investing, and growth investing in particular, academic research on the persistence of fundamental factors is scarce. According to Hong et al. (2003), however, earnings momentum strategies are profitable in international equity markets. Drechsler and Turner (2011) state that they believe earnings drive equity prices.

Research and practical application indicate that equities with better, or improving, fundamentals should outperform those with weak fundamentals.

### Value Investing

The value effect is the most prevalent of all the factor effects studied by academics and employed by investment managers. Simply put: Buying cheap (however that is defined) is preferable to buying expensive. Legions of analysts and investment managers have followed the theories of Graham and Dodd, Sir John Templeton, and Warren Buffett in an attempt to outperform the market. In addition, following the test of the notion that value effects might be anomalies by Basu (1977), academics and practitioners researched the topic; see De Bondt and Thaler (1987), Fama and French (1992), Campbell and Shiller (1998), and Babameto and Harris (2008). More recently, another paper on the value effect (Chaves et al. 2012) leads with this affirmative statement: “[V]alue stocks outperform growth stocks.”

Perhaps the greatest challenge for investors is to determine precisely what constitutes a cheap investment, because the

primary tenet of the value effect is that buying cheap is better than buying expensive.

### Momentum Investing

Momentum is the “tendency of investments in every market and asset class, to exhibit persistence in their relative performance for some period of time” (Berger et al. 2009).

Since the first significant studies on momentum in the 1990s (Jegadeesh and Titman 1993; Asness 1994), this theory has been one of the most strongly tested in all of modern finance, with more than 300 academic and practical papers including 150 in the past five years. Asness et al. (1997), the first to evaluate momentum across countries, concluded that even accounting for currency effects, the momentum effect was consistent. In a subsequent study, Balvers and Wu (2004) revealed that a combination of short-term momentum and intermediate-term mean reversion provide strong risk-adjusted returns. Extending the work of Asness et al. (1997), Griffin et al. (2004) find that price and earnings momentum profits are significant globally.

Again, the theme that recent outperformance tends to continue in the near term is consistent across geographies and asset classes.

### Risk-Based Investing

Risk avoidance, or risk-based strategies, is another investing style that has deep roots in academia and with investment managers.

Haugen and Baker (1991) found that minimum-variance portfolios exhibited superior performance over market-capitalization weighted portfolios, results confirmed by Clarke et al. (2006), Ang et al. (2006), and Blitz and van Vliet (2007).

In addition, Baker and Haugen (2012) found that “... the benefit of the low-volatility anomaly can be earned through country selection ... in lieu of individual stock selection.” Baker et al. (2011) found that low-beta portfolios outperformed market-cap indexes, as well as low-volatility portfolios.

Risk-avoidance portfolios generally are created by a mean-variance type analysis in which equities are selected based on their contribution to overall volatility of the portfolio, according to their covariance to the other portfolio holdings. This analysis makes it difficult to apply the same quartile rankings analysis performed on other factors. Recent studies, including Malkiel and Xu (2006), suggest that equities with higher realized volatility outperform in the near term.

Whether seeking to invest in lower-beta securities or to exploit the low-volatility anomaly, risk-based investing is rooted in the premise that buying lower-risk positions is better than buying higher-risk positions.

### Combining Styles

Investment management firms have created strategies based on all of these effects. In some instances, managers combine factors such as momentum or growth at a reasonable price (GARP). In this study, we refer to these portfolios as “styles,”

“Whether seeking to invest in lower-beta securities or to exploit the low-volatility anomaly, risk-based investing is rooted in the premise that buying lower-risk positions is better than buying higher-risk positions.”

the most common convention. Deep value, relative value, GARP, momentum, and low volatility are all well-recognized strategies among investment practitioners.

The overarching question around this study of combining strategies is simple: Why? If each of these individual strategies outperforms its benchmark over time, why bother with the extra work of combining strategies to create portfolios?

Let us look at Butler et al. (2012): “We know from a variety of studies of investor behavior that investors find it very difficult to pull the trigger on investments when all of the news is negative, and everyone they know is scrambling to abandon those same investments as quickly as possible, and at any price. As a result, while investors may know cognitively that they should ‘hold their nose’ and buy the cheapest markets, when it comes right down to it most investors will chicken out.”

Veteran investors who bear the scars of the 1990s style cycles intuitively understand that, from a practical standpoint, investors, investment committees, and boards generally cannot withstand the long periods of underperformance (three to five years) that can come with a single-style manager. So, the answer, for consultants and investment managers, may well be that a combination of styles can result in a smoother ride for investors. This combination of styles may, in fact, reduce the stress on investors that can lead to poor decisions such as abandoning potentially lucrative positions and making unwise purchases. Perhaps the simplest reason for using multiple styles is the potential for diversification and its risk-reducing benefits.

### Study Parameters

#### Factor Selection

Chincarini and Kim (2006) provide an excellent treatise on selection of factors in their book *Quantitative Equity Portfolio Management*. By definition, this study cannot be an exhaustive review of all possible factors or combinations of factors, so we selected factors based on two main criteria. First, the factors must be grounded in solid economic intuition. Second, the factors are calculated in a consistent way across countries, which allows for additional tests of our results. We did not backtest a large number of factors and then cherry-pick those that performed the best. We simply chose four factors that would be well-understood and broadly

representative of the main factor groups. The chosen factors are:

- Fundamentals: return on equity (ROE)
- Momentum: three-month trailing returns in local currency terms (3M)
- Risk: Monthly change in semi-standard deviation (SSD)
- Valuation: twelve-month trailing earnings yield (EY)

ROE is a measure of a company's efficiency in generating profits. Theoretically, higher ROE companies should yield higher profits, and therefore have higher returns. Three-month momentum is a measure of short-intermediate relative strength of a market. We wanted to choose a timeframe that was different than the traditional 12 minus 1 timeframe, and ultimately chose a shorter lookback window. The monthly change in semi-standard deviation, or downside volatility, measures whether downside volatility is increasing or decreasing. Most investors do not mind volatility if it is to the upside; however, they do very much mind downside volatility. Increasing downside volatility theoretically should indicate increasing risk. Earnings yield is the most plain-vanilla of all of the factors, and is a clear measure of how cheap a market is based on its trailing twelve-month earnings. In theory, all things being equal, buying cheap should be better than buying expensive.

These factors represent different paradigms for viewing the markets, and in theory, should not yield similar results.

#### Universe Selection

The universe of countries in our analysis was based on two criteria. First, the country must be included in the Morgan Stanley Capital International (MSCI) All Country World Index. Second, a single-country ETF must be available to investors who want to own that country's equity market. The research universe included forty-one countries: Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia,

**“ Most investors do not mind volatility if it is to the upside; however, they do very much mind downside volatility. ”**

Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom, and the United States.

The sample covers January 1975–May 2013, starting with eighteen equity indexes. Over time this number increases, with all forty-one countries represented after 2005. The benchmark portfolio is a combination of the MSCI World and MSCI All Country World indexes. From inception to 1988 the benchmark is represented by the MSCI World Index and from 1988 forward it is represented by the MSCI All Country World Index.

We chose the MSCI indexes for three reasons. First, the potential implementation in real portfolios is close to the indexes we are analyzing. Currently 90 percent of the single-country ETFs available are based on MSCI indexes. Second, MSCI uses identical criteria in creating its indexes across global markets. Third, MSCI indexes are free of survivorship bias; therefore, the returns most closely approximate those available in practice.

#### Factor Testing

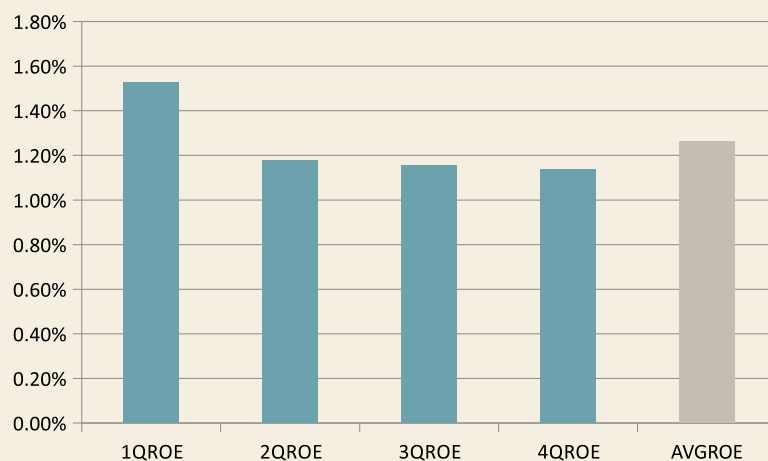
For each month  $t$ , we ranked the country universe in quartiles according to the value of each factor at the end of the month  $t-1$ . The top-quartile portfolio (1Q) held the most-attractive countries (highest ROE, highest 3M momentum, lowest change in semi-standard deviation, highest earnings yield), and the bottom-quartile portfolio (4Q) held the least-attractive countries. Then the equal-weighted return of each country in that quartile for the month  $t$  was calculated.

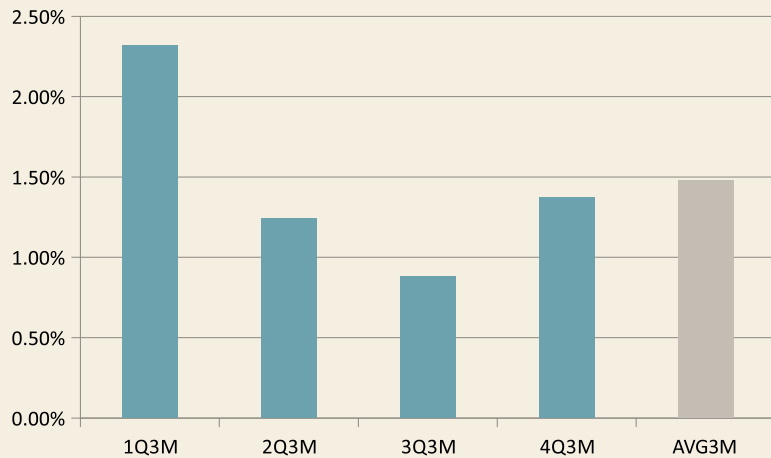
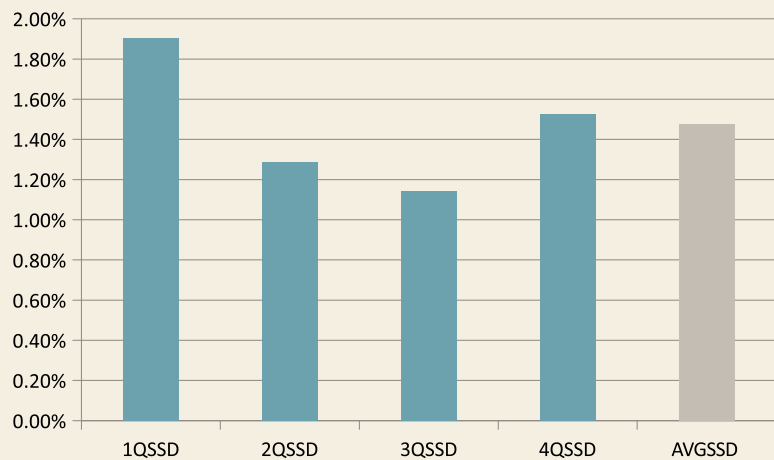
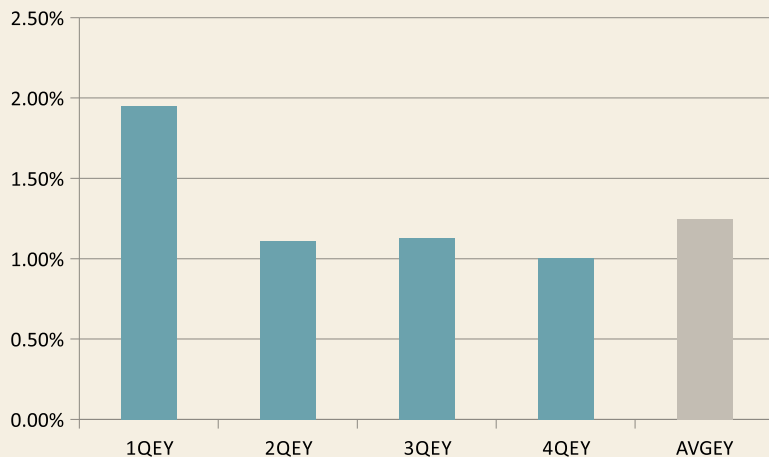
Next, we calculated the performance of portfolios 1Q through 4Q, as well as the performance of the average of all countries in the universe. Each position was held for one month, and then rebalanced based on the results of the next month's ranking.

#### Study Results Top-Quartile Portfolios

We first examined a breakdown of monthly returns between the top and bottom quartiles, to see if the more highly ranked countries outperformed lower-ranked countries. Figures 1–4 present the results for each factor group.

**FIGURE 1: MONTHLY RETURNS BASED ON RETURN ON EQUITY (1975–2013)**



**FIGURE 2: MONTHLY RETURNS BASED ON TRAILING 3-MONTH MOMENTUM (1975–2013)****FIGURE 3: MONTHLY RETURNS BASED ON CHANGE IN 30-DAY SEMI-STANDARD DEVIATION (1975–2013)****FIGURE 4: MONTHLY RETURNS BASED ON 12-MONTH TRAILING EARNINGS YIELD (1975–2013)**

Figures 1–4 show that the top-quartile countries outperformed the bottom-quartile countries across all the factors. Next, we asked if the performance characteristics of the quartile portfolios were significantly different from the benchmark return or the return of an equal-weighted portfolio. Results are shown in tables 1 and 2.

The benchmark averaged 0.94 percent monthly, which translates to just shy of 12 percent per year, and the top-quartile portfolios averaged between 2.32 percent (3M) and 1.53 percent (ROE). The portfolios outperformed the capitalization-weighted benchmark in every case, even in the 4Q portfolios. At the same time, the 1Q portfolio beta was very close to that of the benchmark.

Next, we reviewed some of the risk-based statistics. All the portfolios exhibited greater volatility, and most exhibited larger drawdowns, than the benchmark. In addition, most of the portfolios exhibited significant excess kurtosis, indicating a higher level of tail risk than the benchmark. On average, the quartile portfolios were adding outperformance without taking on market risk (generating alpha). The fatter tails and downside volatility, however, seemed to indicate other dynamics were influencing the results.

The initial results support the theory that alternative-weighting methodologies (such as equal-weight), as opposed to capitalization-weights, can be a source of outperformance in selecting countries. As a result, we decided to compare the factors against a portfolio that is equal-weighted for all of the countries in the universe, as well as the global benchmark.

In figure 5, note the magnitude of the momentum portfolios' outperformance, which makes comparisons difficult. To make observations easier, we put the y-axis on a log scale (see figure 6).

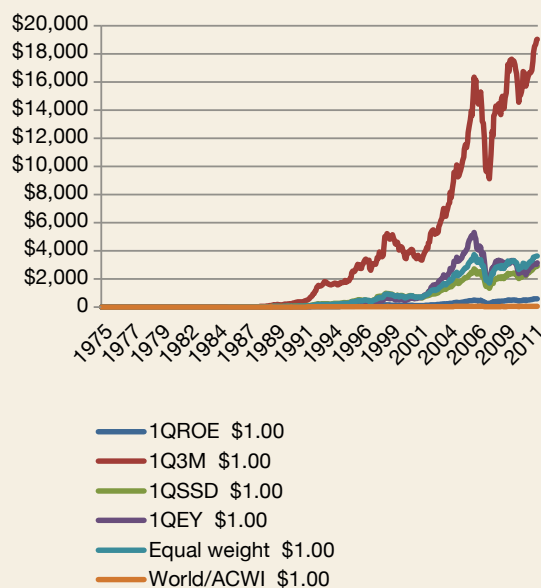
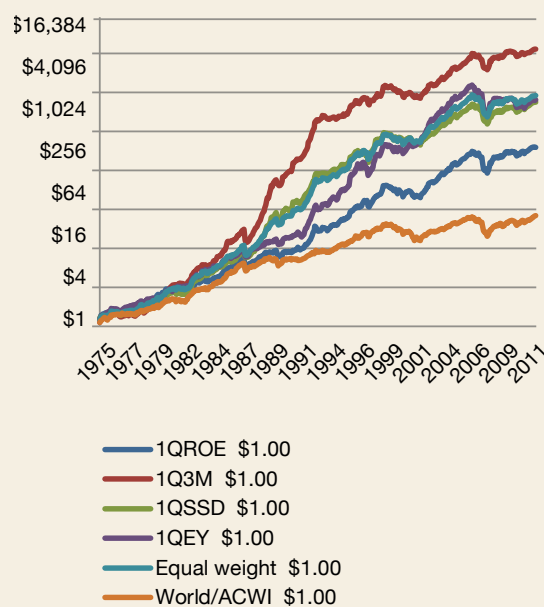
ROE was the clear laggard of the factors and momentum dominated. A portfolio equally weighted to the four factor groups performs largely in line with the risk and valuation factor

**TABLE 1: RETURNS FOR BENCHMARK AND QUARTILE PORTFOLIOS—ROE AND 3M (1975–2013)**

	World Equities	Fundamental			Momentum		
		1QROE	4QROE	AVGROE	1Q3M	4Q3M	AVG3M
Average Monthly Return	0.94%	1.53%	1.14%	1.26%	2.32%	1.37%	1.48%
Standard Deviation	4.0%	5.2%	5.0%	4.4%	5.6%	5.4%	4.5%
Maximum Return	14.1%	30.4%	22.0%	20.1%	23.2%	32.5%	17.4%
Minimum Return	-19.6%	-27.1%	-24.8%	-24.4%	-30.9%	-27.8%	-24.4%
Maximum Drawdown	-50.6%	-54.0%	-51.1%	-51.8%	-44.3%	-57.2%	-51.8%
Beta-to World Equities	–	1.03	0.98	0.98	0.96	1.04	0.97
R2-to World Equities	–	0.64	0.63	0.81	0.47	0.61	0.77
Skewness	-0.81	-0.28	-0.55	-0.96	-0.09	-0.27	-1.00
Kurtosis	2.61	4.90	4.31	5.15	3.80	5.42	4.92

**TABLE 2: RETURNS FOR BENCHMARK AND QUARTILE PORTFOLIOS—SSD AND EY (1975–2013)**

	World Equities	Risk			Valuation		
		1QSSD	4QSSD	AVGSSD	1QEY	4QEY	AVGEY
Average Monthly Return	0.94%	1.90%	1.53%	1.47%	1.95%	1.00%	1.25%
Standard Deviation	4.0%	5.7%	5.1%	4.5%	6.2%	4.6%	4.4%
Maximum Return	14.1%	33.6%	23.6%	17.4%	35.8%	16.9%	18.9%
Minimum Return	-19.6%	-26.6%	-22.4%	-24.4%	-23.7%	-20.6%	-24.4%
Maximum Drawdown	-50.6%	-51.2%	-57.7%	-51.8%	-66.8%	-49.9%	-51.8%
Beta-to World Equities	–	1.04	0.94	0.96	1.03	0.92	0.98
R2-to World Equities	–	0.54	0.56	0.77	0.45	0.65	0.81
Skewness	-0.81	0.15	-0.46	-1.00	0.16	-0.57	-1.00
Kurtosis	2.61	5.13	3.06	4.93	3.79	2.69	5.15

**FIGURE 5: GROWTH OF \$1 FOR EACH OF THE TOP-QUARTILE PORTFOLIOS****FIGURE 6: GROWTH OF \$1 FOR EACH OF THE TOP-QUARTILE PORTFOLIOS (LOG SCALE)**

portfolios. Given the results in tables 1 and 2, these results were not surprising. The next step was to determine if the individual factors' performance was based on random noise or something more statistically significant.

### Zero Exposure Portfolios

We isolated the factor effects by creating zero exposure portfolios, which means taking the returns from the 1Q portfolios and subtracting the returns from the comparison portfolios (4Q, average, and capitalization-weighted). Tables 3 and 4 summarize the findings.

Again, monthly returns were positive across the board, ranging from 0.26 percent to 1.38 percent. Note the large downside in monthly returns as well as sizable drawdowns in some factors. For example, a portfolio with long 1QMomentum and short 4QMomentum declined 17.9 percent in one month and posted a drawdown of 54 percent. The magnitude of those losses is similar to those we would expect in a long-only portfolio. The fact that these return streams exhibited very low betas (minimum of -0.09 and maximum of 0.11) and R-squared (minimum 0.00 and maximum of 0.01) also is noteworthy.

**TABLE 3: ZERO EXPOSURE PORTFOLIOS—ROE AND 3M (1975–2013)**

	Fundamental			Momentum		
	1QROE–4QROE	1QROE–AVGROE	1QROE–World BM	1Q3M–4Q3M	1Q3M–AVG3M	1Q3M–World BM
Average Monthly Return	0.39%	0.26%	0.59%	0.94%	0.84%	1.38%
Standard Deviation	3.89%	2.13%	3.15%	4.96%	2.89%	4.10%
Maximum Return	13.91%	10.26%	16.31%	18.63%	16.34%	21.30%
Minimum Return	-17.7%	-7.8%	-13.5%	-17.9%	-6.5%	-11.3%
Maximum Drawdown	-63.8%	-37.8%	-31.8%	-54.0%	-18.1%	-23.1%
Beta-to World Equities	0.05	0.05	0.03	-0.09	-0.01	-0.04
R <sup>2</sup> -to World Equities	0.00	0.01	0.00	0.01	0.00	0.00
Skewness	-0.20	0.17	0.37	0.25	1.24	1.23
Kurtosis	2.24	2.37	2.32	1.50	3.78	3.55
Count	461	461	461	461	461	461
Standard Error	0.18%	0.10%	0.15%	0.23%	0.13%	0.19%
t-value	2.15	2.66	4.01	4.09	6.26	7.22
p-value	0.032295	0.008148	0.000072	0.000051	0.000000	0.000000
Confidence Level	96.8%	99.2%	100.0%	100.0%	100.0%	100.0%

**TABLE 4: ZERO EXPOSURE PORTFOLIOS—30D AND EY (1975–2013)**

	Risk			Valuation		
	1QSSD–4QSSD	1QSSD–AVGSSD	1QSSD–World BM	1QEY–4QEY	1QEY–AVGEY	1QEY–World BM
Average Monthly Return	0.38%	0.43%	0.97%	0.95%	0.70%	1.01%
Standard Deviation	4.56%	2.66%	3.88%	5.02%	3.66%	4.60%
Maximum Return	22.45%	16.27%	19.67%	31.03%	26.74%	31.63%
Minimum Return	-20.4%	-7.3%	-12.3%	-19.1%	-9.2%	-10.5%
Maximum Drawdown	-43.4%	-20.3%	-33.7%	-49.1%	-44.5%	-43.4%
Beta-to World Equities	0.09	0.07	0.04	0.11	0.05	0.03
R <sup>2</sup> -to World Equities	0.01	0.01	0.00	0.01	0.00	0.00
Skewness	0.19	1.21	1.22	0.82	1.18	1.06
Kurtosis	3.60	4.98	4.29	3.76	5.74	4.24
Count	461	461	461	461	461	461
Standard Error	0.21%	0.12%	0.18%	0.23%	0.17%	0.21%
t value	1.78	3.47	5.34	4.05	4.13	4.73
p value	0.075859	0.000568	0.000000	0.000061	0.000043	0.000003
Confidence Level	92.4%	99.9%	100.0%	100.0%	100.0%	100.0%

With very strong historical returns, very low betas, and low R-squared relative to the global benchmark, the results provided guidance for using these factors in a portfolio construction context. First, though, we needed to test the statistical significance of the factors. In each case, we found the returns were statistically significant at the 92-percent level, with t-statistics ranging from 1.78 to 7.22.<sup>1</sup>

### Factor Correlations

To gain a better sense of the reasons for the factor diversification effect, we measured the Spearman Rho rank correlation among the 1Q portfolios.<sup>2</sup> We also added another portfolio made up of an equal-weighting among the four factor groups (see table 5).

We immediately noticed that the 1Q factor-tilted portfolios exhibited diversification benefits and that the correlation of 1Q portfolios to World Equities was between 0.60 and 0.73. ROE–Earnings Yield was the highest intra-factor correlation at 0.75 (red shaded), and the Three-Month Momentum–Earnings Yield was the lowest at 0.57 (green shaded). The equal-weight portfolio's correlation to World Equities of 0.75 (orange shaded) compared favorably to the style/cap size correlations between large-growth and small-value U.S. equities as measured over the past thirty years.

To better understand the correlations, and strip out the equity market effect, we ran the correlations of the zero-net portfolio returns. Our results are summarized in tables 6–8.

**TABLE 5: CORRELATION OF 1Q PORTFOLIOS**

	Return on Equity	Three-Month Momentum	Change in Semi-Standard Deviation	Earnings Yield	Equal Weight Four Factors	World Equities
Return on Equity	1.00	0.70	0.73	0.75	0.89	0.73
Three-Month Momentum	0.70	1.00	0.73	0.57	0.85	0.66
Change in Semi-Standard Deviation	0.73	0.73	1.00	0.68	0.89	0.69
Earnings Yield	0.75	0.57	0.68	1.00	0.84	0.60
Equal Weight Four Factors	0.89	0.85	0.89	0.84	1.00	0.75
World Equities	0.73	0.66	0.69	0.60	0.75	1.00
Average Correlation	0.73	0.67	0.71	0.67		0.67

**TABLE 6: CORRELATION OF 1Q–4Q PORTFOLIOS**

	Return on Equity	Three-Month Momentum	Change in Semi-Standard Deviation	Earnings Yield	Equal Weight Four Factors	World Equities
Return on Equity	1.00	0.06	–0.07	0.34	0.57	0.06
Three-Month Momentum	0.06	1.00	–0.11	–0.17	0.39	–0.05
Change in Semi-Standard Deviation	–0.07	–0.11	1.00	0.03	0.38	0.01
Earnings Yield	0.34	–0.17	0.03	1.00	0.60	0.06
Equal Weight 4 Factors	0.57	0.39	0.38	0.60	1.00	0.02
World Equities	0.06	–0.05	0.01	0.06	0.02	1.00
Average Correlation	0.11	–0.07	–0.05	0.07		0.02

**TABLE 7: CORRELATION OF 1Q–AVERAGE PORTFOLIOS**

	Return on Equity	Three-Month Momentum	Change in Semi-Standard Deviation	Earnings Yield	Equal Weight Four Factors	World Equities
Return on Equity	1.00	0.06	0.00	0.25	0.52	0.09
Three-Month Momentum	0.06	1.00	–0.10	–0.11	0.34	–0.04
Change in Semi-Standard Deviation	0.00	–0.10	1.00	0.12	0.43	0.05
Earnings Yield	0.25	–0.11	0.12	1.00	0.68	0.06
Equal Weight Four Factors	0.52	0.34	0.43	0.68	1.00	0.07
World Equities	0.09	–0.04	0.05	0.06	0.07	1.00
Average Correlation	0.10	–0.05	0.01	0.09		0.04

**TABLE 8: CORRELATION OF 1Q-BENCHMARK PORTFOLIOS**

	Return on Equity	Three-Month Momentum	Change in Semi-Standard Deviation	Earnings Yield	Equal Weight Four Factors	World Equities
Return on Equity	1.00	0.44	0.50	0.59	0.79	-0.03
Three-Month Momentum	0.44	1.00	0.43	0.33	0.69	-0.11
Change in Semi-Standard Deviation	0.50	0.43	1.00	0.50	0.76	-0.08
Earnings Yield	0.59	0.33	0.50	1.00	0.81	-0.04
Equal Weight Four Factors	0.79	0.69	0.76	0.81	1.00	-0.08
World Equities	-0.03	-0.11	-0.08	-0.04	-0.08	1.00
Average Correlation	0.51	0.40	0.48	0.48		-0.07

Several observations were particularly enlightening. First, the average correlation between factors was notably low, with the 1Q–4Q Earnings Yield–Momentum of  $-0.17$  (green shaded) the lowest, as shown in table 6. Intuitively, this made sense, because buying what is hot (momentum) is seemingly the opposite of buying what is cheap (valuation). Second, the correlation of the equal-weight portfolio relative to World Equities was  $-0.08$  (green shaded), as shown in table 8. Clearly, diversification was available compared to global equities.

So, why are the correlations between these factor groups low? We will leave that question to the behavioral finance experts; that type of analysis is beyond the scope of this paper. Suffice it to say, these factor effects exist across country equity markets. Each strategy exhibits relatively long streaks of outperformance and troughs of underperformance, and style diversification seems to provide risk-reducing benefits to portfolio construction. Therefore, dynamic style allocation, or style rotation, is a relevant topic worthy of additional research.

At this point in our analysis, we turned our attention to the role of factor tilts in portfolio construction.

### Building Portfolios

In order to build actual portfolios based on country equity markets, we evaluated instruments that could be used to cost-effectively create portfolios.

Single-country futures are the most long-standing instrument to achieve exposures, but recently swaps have increased in popularity as a means to gain exposure to particular country indexes. Both instruments, however, are difficult to purchase for both institutional and retail-oriented clients. At the same time, settling these products across a large number of underlying client accounts can be challenging.

Since 1998, ETFs have allowed investors to express a view on a particular country in a liquid, transparent, low-cost vehicle. ETF options available to country-based investors are plentiful. Single-country ETFs in our universe of forty-one countries represent just more than 99 percent of the capitalization of the MSCI All Country World Index. In addition, the lack of minimum investments and the ubiquitous settlement

ability of ETFs make them the best choice for creating global equity portfolios. The average annual expense ratio for the countries in this universe is roughly 0.40 percent, with some as low as 0.09 percent and others as high as 0.60 percent.

Until this point, we purposely ignored the costs of the underlying index because it is impossible to replicate the cost structure of all potential investors in a way that makes the analysis meaningful to each. In this case, however, we made certain reasonable assumptions provided it would be practical to build portfolios based on the prior analysis.<sup>3</sup> These assumptions were the same for the long-only and long-short portfolio analysis.

### Building Long-Only Portfolios

The most obvious next step in our analysis was to build a long-only portfolio with weights tilted toward the countries that exhibit good fundamentals, strong momentum, low risk, and low valuations. For ease of calculation, and to avoid biasing the portfolio toward any particular style, we chose the simplest model available: an equal-weight strategy. We created a portfolio with 25-percent weighting to the 1Q basket in each of the factor groups to create the 1QLong portfolio. The statistical analysis of the 1QLong portfolio is presented in table 9.

From an absolute return standpoint, the 1QLong portfolio substantially outperformed the benchmark, generating significant alpha. In terms of risk, the 1QLong portfolio was more volatile, presented significant tracking error relative to the benchmark, and posted downside statistics such as worst month, maximum drawdown, bear beta, and kurtosis, which were worse than the benchmark. That said, on a risk-adjusted basis, the 1QLong portfolio outperformed the benchmark. At the same time, its Sharpe, Sortino, and information ratios, and up capture were above the benchmark, and down capture was below the benchmark.

Next, we determined how various portfolio statistics including beta, excess return, alpha, and information ratio varied over time. First we plotted the trailing rolling monthly beta over twelve-month and three-year time periods (see figure 7).

For each of the statistics, the twelve-month rolling measures were more volatile than the three-year trailing numbers. We expected more-stable measures from the longer timeframes, but the degree of variability of the portfolio beta was surprising.

The long-term beta of the 1QLong portfolio is just over 1.0, the twelve-month measure ranged between 0.08 and 1.94, and the three-year beta landed between 0.74 and 1.51. The variability in beta over time demonstrated the dynamic nature of the exposures that

came out of the country selection process. Clearly, this was not a benchmark-hugging strategy.

The portfolio's alpha was also quite volatile (see figure 8). Despite a long-term alpha of more than 11 percent annualized, the twelve-month alpha ranged between –18 percent and 73 percent, with the three-year alpha between –3 percent and 19 percent. The worst relative performance happened in the most recent timeframe.

As figure 9 shows, the pattern of outperformance across the rolling excess returns was very similar to the alpha chart in figure 8. Since 1975, the 1QLong portfolio underperformed the index for nine extended periods of time, including a roughly sixteen-month time of underperformance.

Figure 10 shows that despite larger-than-expected tracking error, the portfolio has a strong information ratio. The information ratio, much like the alpha in figure 8, varies over time. The three-year trailing measure shows more consistency than the one-year trailing measure.

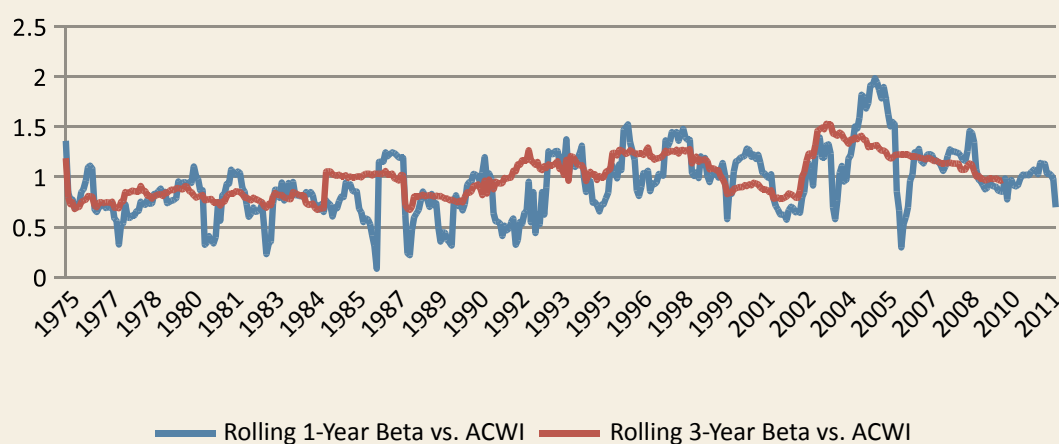
Figure 11 shows that the draw-downs of performance of the 1QLong portfolio versus the benchmark broke the 10-percent barrier in at least nine periods, with the largest drawdown at 18.5 percent.

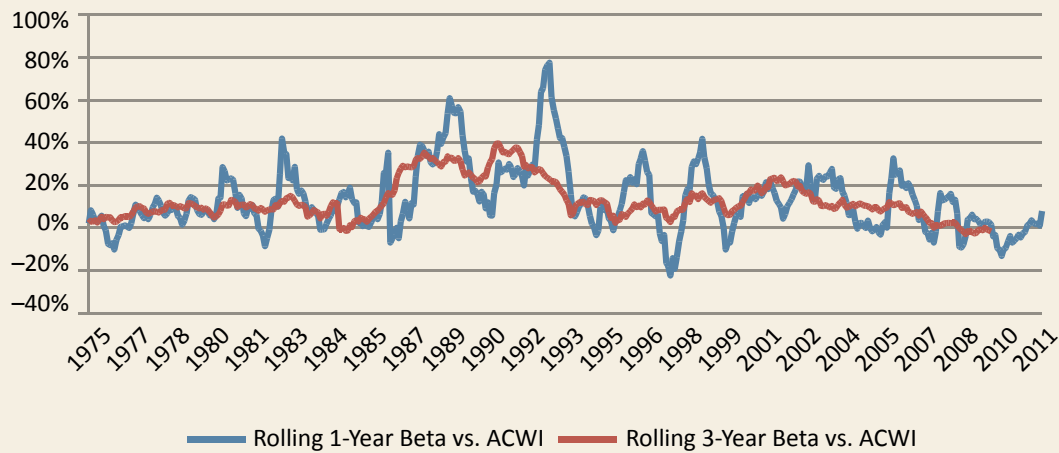
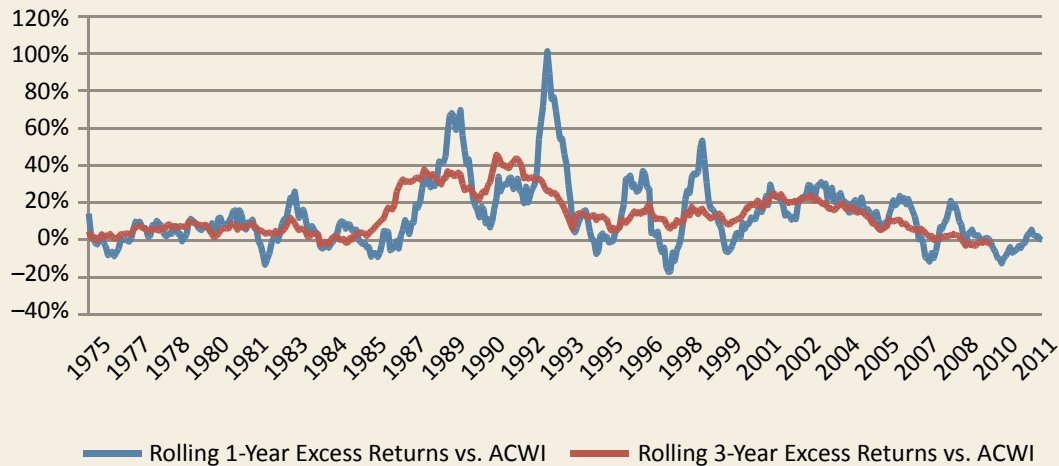
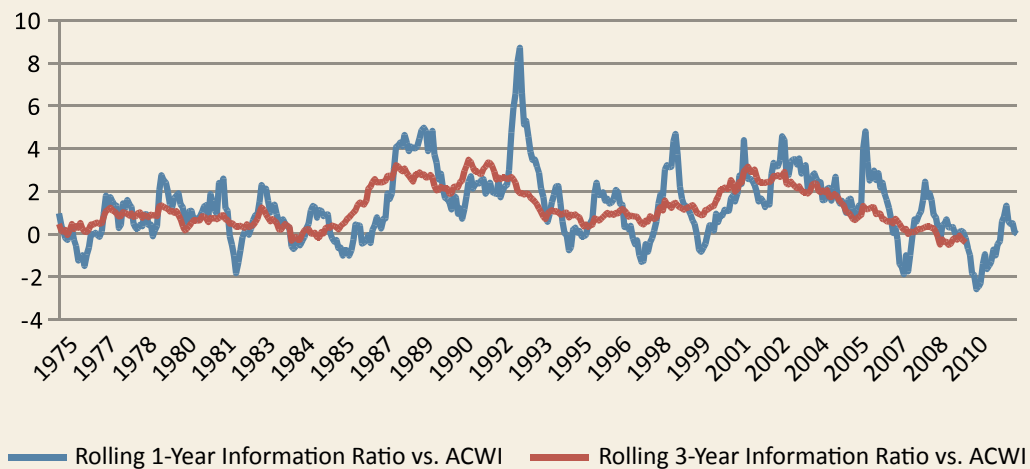
Based on the majority of statistical aspects, the 1QLong portfolio was superior to the benchmark portfolio.

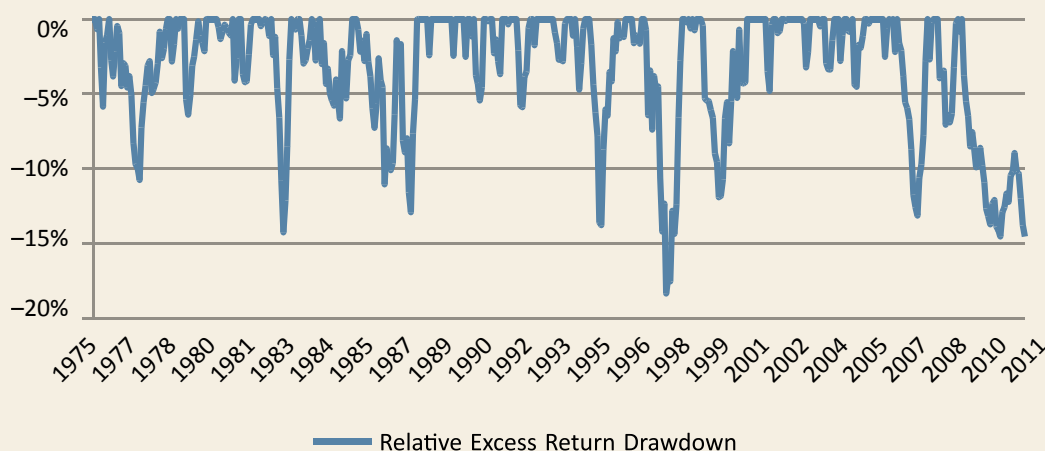
**TABLE 9: PORTFOLIO STATISTICS FOR 1QLONG PORTFOLIO VS. BENCHMARK**

	1QLong Portfolio	Benchmark Portfolio	+/-
Annualized Return	23.79%	10.77%	13.02%
Standard Deviation	17.71%	13.99%	3.72%
Alpha	11.74%	0.00%	11.74%
Beta	1.02	1.00	0.02
R-Squared	64.42	100.00	-35.58
Correlation	0.80	1.00	-0.20
Sharpe Ratio	1.00	0.42	0.58
Sortino Ratio	1.68	0.60	1.08
Best Month	26.48%	14.08%	12.40%
Worst Month	-26.13%	-19.57%	-6.56%
Max Drawdown	-54.63%	-50.57%	-4.06%
Max Drawdown Length	16 Months	16 Months	0 Months
Tracking Error	10.58	0.00	10.58
Bull Beta	1.03	1.00	0.03
Bear Beta	1.17	1.00	0.17
Up Capture Ratio	126.29%	100.00%	26.29%
Down Capture Ratio	65.06%	100.00%	-34.94%
Up Period Percent	69.63%	64.86%	4.77%
Down Period Percent	30.37%	35.14%	-4.77%
Gain/Loss Ratio	2.86	1.84	1.02
Gain Std Dev	12.31%	8.05%	4.26%
Loss Std Dev	14.02%	11.12%	2.91%
Kurtosis	4.75	2.61	2.14
Skew	-0.37	-0.81	0.43
Information Ratio	1.23		

**FIGURE 7: 1QLONG PORTFOLIO—ROLLING ONE- AND THREE-YEAR BETA TO WORLD EQUITIES**



**FIGURE 8: 1Q MULTI-STYLE PORTFOLIO—ROLLING ONE- AND THREE-YEAR ALPHA TO WORLD EQUITIES****FIGURE 9: 1Q MULTI-STYLE PORTFOLIO—ROLLING ONE- AND THREE-YEAR EXCESS RETURN TO WORLD EQUITIES****FIGURE 10: 1Q MULTI-STYLE PORTFOLIO—ROLLING ONE- AND THREE-YEAR INFORMATION RATIO**

**FIGURE 11: 1Q MULTI-STYLE PORTFOLIO—EXCESS RETURN DRAWDOWN ANALYSIS VS. WORLD EQUITIES**

In practice, however, some of the drawdowns relative to the benchmark might have been too difficult for certain investors to tolerate. For example, an investor in this strategy would have suffered more than 10-percent underperformance versus the benchmark from 1975 to late 1976. In no fewer than nine time periods was the trailing underperformance of the 1QLong portfolios more than 10 percent. Investors willing to ride the inevitable cycles of underperformance, however, would have been rewarded with improved absolute and risk-adjusted performance in the long run.

### Building Long-Short Portfolios

The factor strategies initially generated promising returns. Given the significant interest in alternative investment strategies, and long-short portfolios in particular, it seemed prudent to use the information to evaluate a global equity long-short strategy. A portfolio was created going long the top-quartile portfolio then short the benchmark index. Table 10 provides a statistical analysis of the Long/Short portfolio (L/S portfolio).

Broadly speaking, these results aligned with our expectations. The L/S strategy's correlation (0.03) and beta (0.02) were low relative to the benchmark. At the same time, the risk-adjusted returns including Sharpe ratio,

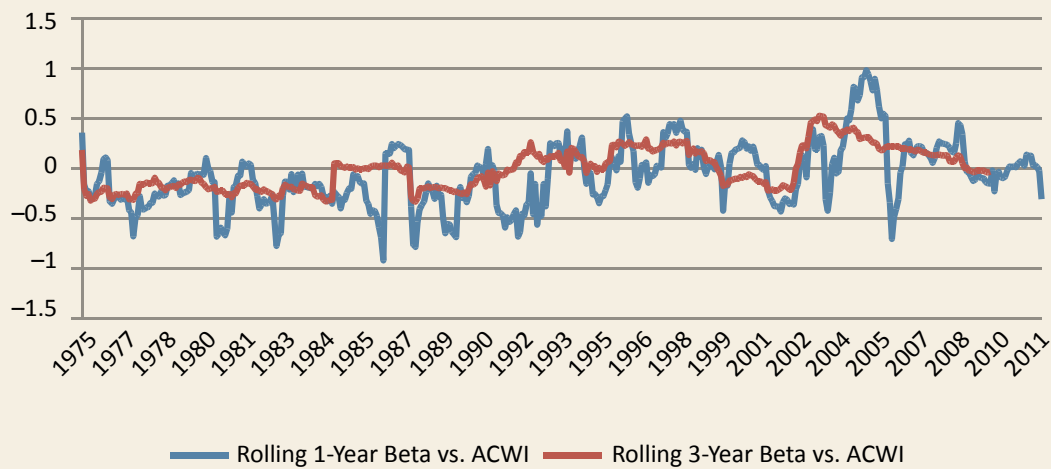
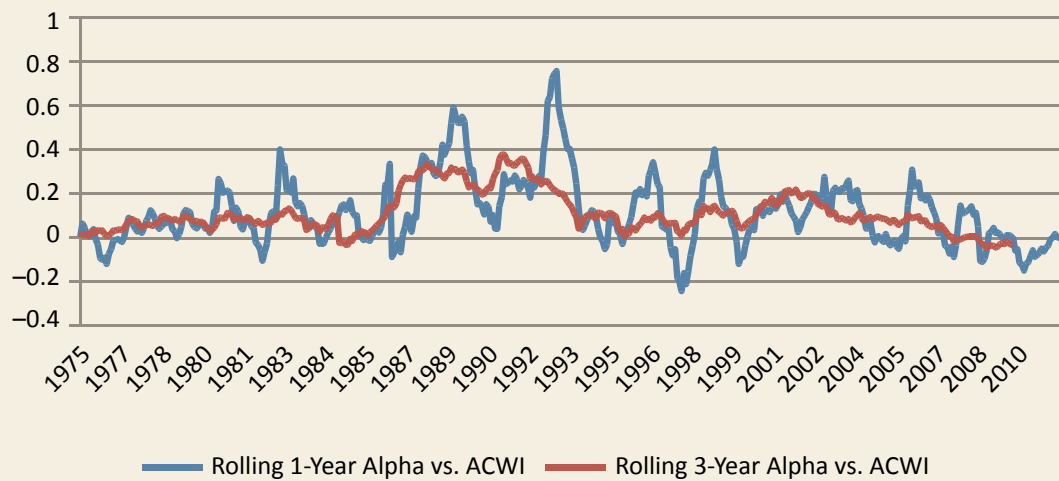
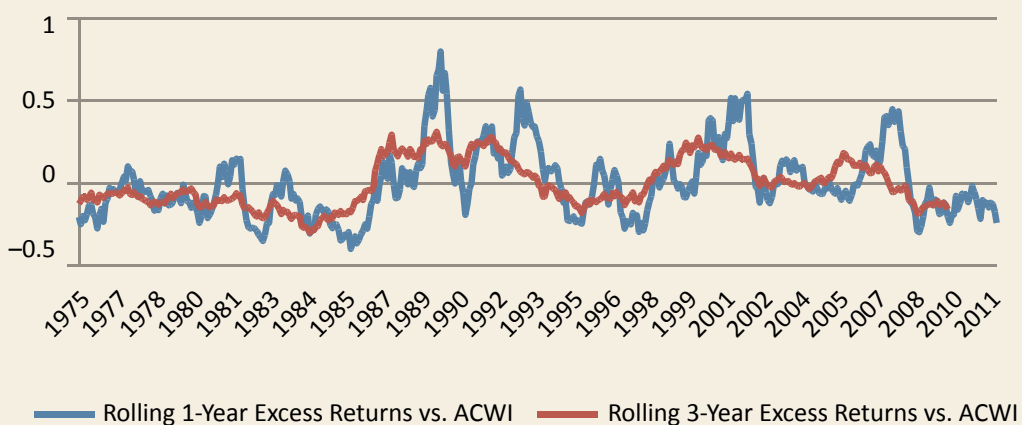
**TABLE 10: MONTHLY RETURNS OF LONG/SHORT STRATEGIES—NET OF ASSUMED COSTS**

	Long/Short Portfolio	Benchmark Portfolio	+/-
Annualized Return	9.97%	10.77%	-0.80%
Standard Deviation	10.58%	13.99%	-3.41%
Alpha	4.65%	0.00%	4.65%
Beta	0.02	1.00	-0.98
R-Squared	0.07	100.00	-99.93
Correlation	0.03	1.00	-0.97
Sharpe Ratio	0.43	0.38	0.05
Sortino Ratio	0.75	0.54	0.22
Best Month	17.68%	14.08%	3.59%
Worst Month	-7.03%	-19.57%	12.54%
Max Drawdown	19.67%	50.57%	30.90%
Max Drawdown Length	11.00	16.00	-5.00
Tracking Error	17.36	0.00	17.36
Bull Beta	0.03	1.00	-0.97
Bear Beta	0.17	1.00	-0.83
Up Capture Ratio	21.62%	100.00%	-78.38%
Down Capture Ratio	-31.16%	100.00%	-131.16%
Up Period Percent	57.27%	64.86%	-7.59%
Down Period Percent	42.73%	35.14%	7.59%
Gain/Loss Ratio	2.13	1.84	0.29
Gain Std Dev	8.49%	8.05%	0.44%
Loss Std Dev	5.12%	11.12%	-6.00%
Kurtosis	2.45	2.61	-0.16
Skew	0.82	-0.81	1.63

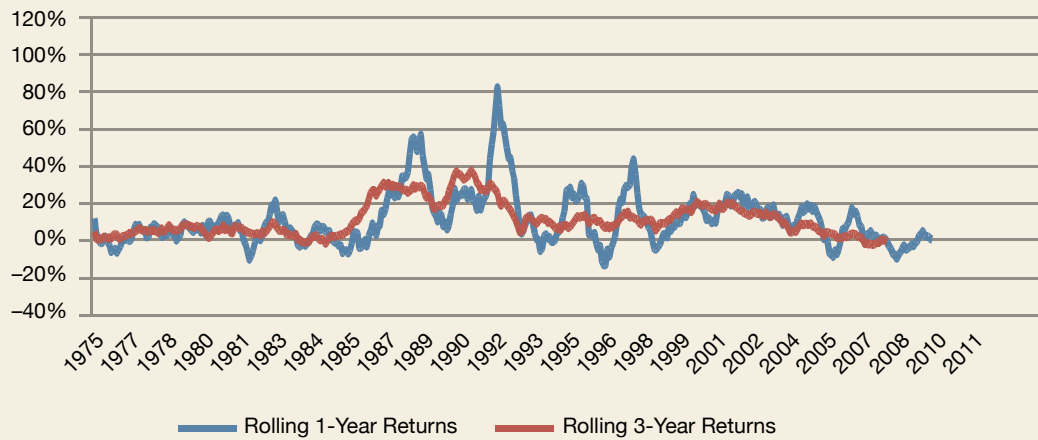
Sortino ratio, and alpha were better than the benchmark.

The downside protection inherent in a zero-net strategy also became apparent. The worst month was

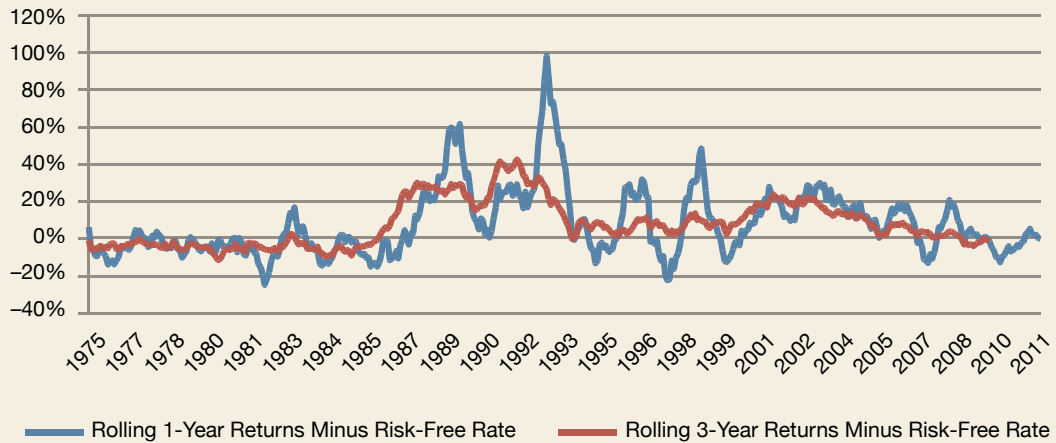
-7.03 percent relative to the benchmark at -19.57 percent, with the biggest drawdown at -19.67 percent compared to the benchmark at -50.57 percent. The strategy exhibited a positive up

**FIGURE 12: LONG/SHORT PORTFOLIO—ROLLING ONE- AND THREE-YEAR BETA VS. WORLD EQUITIES****FIGURE 13: LONG/SHORT PORTFOLIO—ROLLING ONE- AND THREE-YEAR ALPHA VS. WORLD EQUITIES****FIGURE 14: LONG/SHORT PORTFOLIO—ROLLING ONE- AND THREE-YEAR EXCESS RETURN VS. WORLD EQUITIES**

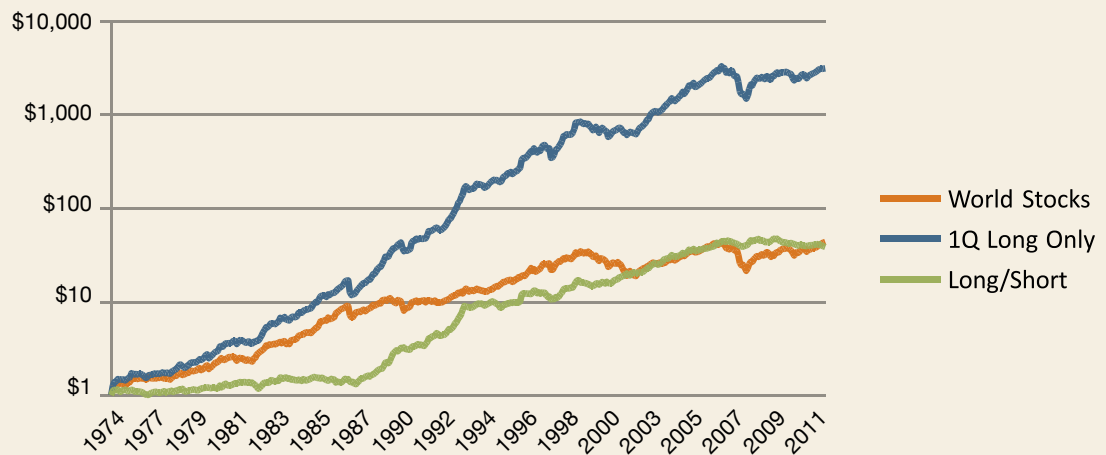
**FIGURE 15: LONG/SHORT PORTFOLIO—ROLLING ONE- AND THREE-YEAR RETURNS**



**FIGURE 16: LONG/SHORT PORTFOLIO—ROLLING ONE- AND THREE-YEAR MINUS THE RISK-FREE RATE**



**FIGURE 17: GROWTH OF \$—NET OF FEES**



capture of 21.62 percent and a downside capture ratio of -31.16 percent, which added to the downside-protection elements of the strategy relative to the benchmark. Perhaps most noteworthy, the strategy's annualized absolute returns were on par with those of the long-only benchmark at 9.97 percent versus 10.77 percent. With that outperformance, however, came significantly more volatility than might be expected. The L/S portfolio exhibited roughly 80 percent of the volatility of the benchmark (10.6 percent versus 14 percent), which was unexpected from a dollar-neutral, zero-beta portfolio.

The Long/Short portfolio's volatility was surprising. Despite the portfolio's lack of net long exposure, the variability in beta was significant, with the long-term beta at 0.01. The twelve-month rolling beta ranged between -0.63 and 0.97, and the three-year rolling beta ranged between -0.28 and 0.49.<sup>4</sup>

Figures 12–14 show that the strategy underperformed the long-only benchmark on a rolling three-year basis during the first fifteen years of the study. From that perspective alone, if this was an equity substitute, the strategy most likely would not have survived. The rolling alpha measures, however, paint a different picture, with alpha negative only four times in that rolling twelve-month period. In addition, the three-year trailing alpha was positive during the timeframe. The need to evaluate the strategy from a risk-adjusted perspective, not just an absolute return perspective, is highlighted by examining these statistics.

Note also that, despite times of significant underperformance compared to the benchmark, the rolling alpha measures were generally positive during the duration of the study. The maximum alpha was 79 percent and the minimum was -19 percent. In fact, within the twelve-month rolling periods, the L/S portfolio's alpha was negative for extended periods of time.

Figure 15 shows the absolute returns of the L/S portfolio since inception. The monthly returns of the L/S strategy are positive in 59 percent of observations. Seventy-four percent of the twelve-month rolling observations are positive and 94 percent of the three-year rolling observations are positive.

Because the analysis started in 1975, it was reasonable to ask whether the strategy was helped by higher short-term interest rates. Figure 16 shows the trailing returns of the strategy, net of the risk-free rate (ninety-day Treasury-bills). During the study period, the risk-free rate averaged 0.43 percent per month and the trailing one-year and three-year rates averaged 5.39 percent and 5.52 percent, respectively.

Even when adjusting for the risk-free rate, the L/S portfolio showed solid performance, with 59 percent of one-year observations and 65 percent of three-year observations in positive territory.

### Implications for Investors


The goal of this study was to answer a simple question: Does a multi-style investment strategy add value across a universe of countries? As we have seen above, and as summarized in figure 17, the answer is yes.

First, we scoured the literature on factor effects, noting that fundamental, momentum, risk, and valuation factors all are backed by substantial research. In most cases, however, the analysis is based on specific country markets rather than across country markets. When evaluated across country equity markets, all the factor groups generated positive performance that was statistically significant at the 99-percent level. This study was not designed to speculate on why factors work, which is beyond the scope of this paper and is for additional study.

Next, when considering the relationship between the factors, we learned that strong diversifying properties are driven by low to negative cross-correlation.

We then built long-only and long/short portfolios made up of the countries with a combination of strong fundamentals, strong momentum, lower risk, and lower valuation. These portfolios generated significant alpha, even after taking into consideration implementation costs, with the Long/Short portfolio, in particular, exhibiting extremely strong risk-adjusted returns.

These results should give investors conviction that an alpha-seeking strategy, built on country selection and not stock selection, is a worthwhile pursuit. With a large number of single-country ETFs, which allow investors to access global markets in a liquid and cost-effective manner, these strategies can be made available to individual and institutional investors alike.

Bottom-line: A multi-style approach to portfolio construction, using country ETFs as implementation vehicles, creates portfolios that seem to be superior to long-only benchmarks on an absolute and risk-adjusted basis. 

*David J. Garff, CIMA\*, is president and chief investment officer of Accuvest Global Advisors. Contact him at david.garff@accuvest.com.*

### Endnotes

- 1 The t-stat measurement was about as sophisticated as we wanted to get for this study. The goal of the study was to be complete yet understandable for practitioners and academics. Additional time series review would be worthwhile for additional research, but it is beyond the scope of this paper.
- 2 The traditional measure of correlation is the Pearson correlation. Spearman's rank correlation coefficient is a measure of rank correlation—the relationship between two sets of data is based on the ranking of the variables rather than their values. Spearman's rho and Kendall's tau are both nonparametric measures of statistical dependence (i.e., they make no assumptions about the underlying data distributions). Both produce rank correlation coefficients, but they differ significantly in terms of how the correlations are calculated, and hence the results also can differ significantly. The Spearman correlation is less sensitive than the Pearson correlation to strong outliers that are in the tails of both samples. That is because Spearman's rho limits the outlier to the value of its rank.
- 3 The average expense ratio for ETFs is 0.40 percent; the portfolio turnover is 150 percent per year; the average round-trip trading cost is 0.50 percent; and the short interest expense is 1.0 percent.

- <sup>4</sup> We were surprised that the volatility was this high, but we never expected no risk. Even though the long-term beta is 0, it is volatile (as shown in figure 12). Most of the time when building portfolios, managers or consultants will use the long-term correlations in their work. There is nothing wrong with using those numbers, but if you expect 0 correlation and get 0.5 over a twelve-month period, that is a surprise, especially if it is in a down equity market.

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