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"… there is nothing either good or bad, but thinking makes it so."

—William Shakespeare

The rapid industrialization during the late 19th century imposed a greater need for countries to expand their economies via global commerce. In the United States, the harsh economic realities of the Panic of 1893 encouraged Americans to look for new conduits to expand the economy beyond its borders. Consequently, a country rich with an isolationist history of avoiding permanent or entangling alliances embraced sympathetic views toward engagement in global commerce. World War I and World War II then interrupted global commerce. When global commerce resumed under a new paradigm without wartime embargoes and sanctions at the end of World War II, the United States was the preeminent economic power. For example, the U.S. economic output nearly equaled the economic output of the rest of the world combined. Moreover, the U.S. economy was nearly five times greater than its next-largest competitor, producing half of the world's steel and oil and controlling the majority of international financial reserves. Certainly, the United States was the only superpower with atomic bombs and an air force capable of reaching any place in the world. Arguably, this was its first unipolar moment, having great influence and being in full control of its own future.

At this unipolar moment in 1944, the United States attained economic hegemony and reached the Bretton Woods Agreement. Indeed, the goal of Bretton Woods was to remake a stable international monetary order. Accordingly, the agreement created the International Monetary Fund (IMF). The IMF established a system of fixed but adjustable exchange rates relative to the U.S. dollar. Hence, the dollar became the *numéraire*, a reserve currency. As the numéraire, the dollar could be converted into an ounce of gold at a fixed rate of $35, maintaining its credibility via the gold linkage. Unequivocally, the dollar was king. The IMF monitored exchange rates and lent to those countries running a balance of payments deficits. The Bretton Woods thus announced the changing of the guard in the world economic order. Indisputably, Pax-Americana replaced Pax-Britannica. According to Harlan and Rahschulte [2011], this was an era that experienced great technological advances in transportation, machinery, livability, and communication, allowing the world to

become smaller. The world was clearly becoming more globalized. Yet, for a global equity investor, the U.S. market was still the only market of consequence.

This U.S. economic hegemony finally came to an abrupt end on August 15, 1971, when President Richard M. Nixon announced his new economic policy (*Nixon shock* became a common name to describe this announcement). As part of the new economic policy, Nixon closed the gold window, ending the dollar's convertibility to gold and effectively ending Bretton Woods. Although this signaled the rise of other markets to rival that of the United States, it would take until the end of the 20th century to achieve the global market as we know it today. Harlan and Rahschulte [2011] point to the explosion of information technology, which led to a globalized economy in which international business flourished. Moreover, the interest rates among the developed nations have become comparable since global economic cooperation strengthened interest rate parity. There are also concerted regional efforts to achieve interest parity, such as the one proposed by European Monetary Union countries in the Maastricht Treaty of 1992. Thus, for a global equity investor, there is growing importance for allocation decisions based on regions as compared to allocation decision based on countries. Furthermore, as globalization trends continue, the importance of global sector allocation has begun to emerge.

Previous research evaluated the impact of globalization on country effect versus sector effects. Baca, Garbe, and Weiss [2000] conclude that country-based approaches for global investors may be losing effectiveness. Cavaglia, Brightman, and Aked [2000] find that industry allocation is an increasingly important consideration for global investors, and investors should reconsider home-country-biased equity allocation policies. Regional-based studies, on the other hand, have not reached the same conclusion. Estrada, Kritzman, and Page [2006] conclude that the relative importance of country effect versus industry effect is not clear. The authors found that after adjusting for the technology-media-telecommunication bubble, country effects still dominate industry effect. Recognizing the impact of regions, Brooks and Del Negro [2005] conclude that the regional effect accounted for half of the return variation resulting from country effects. Thus, in this article, we intend to review the impact of globalization on global equity investors via a 21st century lens and to evaluate the importance of regions versus sectors.

Are equity returns explained by the drivers of stock returns or factors within the regions in which they operate, or are they influenced by factors across regions? This question must be entertained by global equity investors. Answering this question should be a priority because the recent rise of smart beta strategies suggests investors are moving away from the traditional bottom-up research approach to a more top-down, factor-based approach. These smart beta strategies profess to deliver a better risk–return profile than a traditional bottom-up strategy. Should smart beta strategies be employed intraregion or intrasector? We intend to investigate this question.

Smart beta strategies are based on factors such as value, size, profitability, quality, capital expenditure, yield, market sentiment (technical and momentum), company-specific risk, and low-volatility factors. Although the smart beta phenomenon may be recent, this factor-based investing has been used by quantitative investors in the investment industry for over 30 years. Basu [1977] concludes that a low price-to-earnings portfolio earned superior returns on a risk-adjusted basis. Fama and French [1992] also find that book-to-market provides insights into a cross section of average stock returns. Banz [1981] finds that smaller firms delivered higher returns, on average, than larger firms. Fama and French [1992] also find that there is a strong negative relation between size and average returns. Novy-Marx [2013] observes that profitable firms, as defined by gross profits-to-assets, generate significantly higher returns than unprofitable firms. Sloan [1996] argues that earnings success from cash flow (better quality) is more likely to persist than earnings performance attained via accruals (poorer quality). Livnat and Lopez-Espinosa [2008] further argue that quarterly net operating cash flow is a more precise indicator of the next quarter's returns than accruals. Ang et al. [2009] report that high volatility of stock-specific factors leads to poor future performance. Titman, Wei, and Xie [2004] conclude that firms that extensively increase capital investments achieve future negative returns. Naranjo, Nimalendran, and Ryngaert [1998] find a consistent positive relationship between dividend yield and stock returns. Jegadeesh and Titman [1993] observe that buying stocks that have performed well in the past and selling stocks that have performed poorly in the past can generate future positive returns over a less than one-year time horizon. Clarke, de Silva, and Thorley [2006] indicate the existence of the low-volatility effect in a global setting.

Blitz and van Vliet [2007] illustrate that stocks with low historical volatility have superior risk-adjusted returns, and the low-volatility effect is similar in magnitude to value, size, and momentum. Baker, Bradley, and Wurgler [2011] show that high-beta and high-volatility stocks underperformed low-beta and low-volatility stocks. We seek to find the evidence of globalization pushing the importance of sector selection ahead of regional selection when implementing smart beta strategies.

The remainder of this article is organized as follows. The following section describes the data. The third section discusses the research and design of measuring region and sector effects. The fourth section presents empirical results, and the fifth section concludes.

DATA

The research universe is defined as publicly traded companies in the global market with a minimum market capitalization of $250 million, excluding American Depositary Receipts. To avoid survivorship bias, not only did we include companies that are currently trading but also companies that have dropped out of our data sample due to a bankruptcy or a merger. As a result, we can be confident that our backtest results are unlikely to suffer from upward performance bias. Shares-outstanding data for U.S.-domiciled securities are retrieved from Compustat Point-in-Time Monthly databases for the period December 31, 1987, to March 31, 2017. Shares-outstanding for non-U.S.-domiciled securities is retrieved from the FactSet Fundamentals database for the period December 31, 1987, to March 31, 2017. Stock price/returns data are provided by FactSet Research Systems, Inc. Sector classification is based on the current Global Industry Classification System (GICS). Throughout this article, we use GICS sector classification to define sector membership. There are a total of 2,785 companies and 11,961 companies in our research universe as of December 31, 1987, and March 31, 2017, respectively. The starting date of December 31, 1987, is chosen due to data availability.

RESEARCH AND DESIGN

Measuring Globalization

We retrieved monthly total returns, measured in U.S. dollars, of the companies in our research universe from December 31, 1987, to March 31, 2017. By design, we used dollar-denominated returns to ensure that currency effects be measured as part of region effects. Griffin and Karolyi [1998] find that dollar and local currencies showed no differences in industry effects. In other words, currency effect can be included in the country or region returns. We then equally weighted the constituents of 10 regions and 10 sectors from our research universe. Appendix A lists the region and sector indexes. Equal weighting is necessary to remove the impact of market capitalization in a given region or sector.

Each stock in the universe is then correlated with its sector index and region index, respectively, over a trailing 36-month period beginning in November 30, 1990, and repeated over the next 316 months. For example, Apple is correlated with the information technology index and the U.S. index. We proposed the following equation to estimate a globalization index (*GI*) for each of the 10 sectors at time *t*.

$$GI_t = \frac{1}{N}\sum_{i=1}^{N} Cor(i, S_x) - \frac{1}{N}\sum_{i=1}^{N} Cor(i, R_x) \quad (1)$$

where i is stock i; S_x is stock i's sector; R_x is stock i's region; N is the number of stocks in sector S_x; $Cor(i, S_x)$ is the correlation of stock i with its sector S_x; and $Cor(i, R)$ is the correlation of stock i with its region R_x.

Equation (1) compares the correlation with the sector to the correlation with the region. If sector correlation is greater than region correlation, we can conclude that the sector is integrated beyond regions and hence is global. On the other hand, if sector correlation is less than region correlation, the sector is regional.

Measuring Globalization Trend

To determine the globalization trend for the 10 sectors, we analyzed the results of Equation (1) over the 316-month period for each of the 10 sectors. If average *GI* is above zero, we designate the sector as global. On the other hand, if the average *GI* is below zero, we designate the sector as regional. We also calculated various descriptive statistics for each of the sectors. Based on Page [1954], we applied the cumulative sum (CUSUM) technique, designed to detect small changes in a data series, to the 316-month time-series data for each sector. Equation (2) describes the CUSUM:

$$\text{CUSUM} = \sum_{1}^{n} (X_n - \overline{X}) \quad (2)$$

EXHIBIT 1
Globalization Descriptive Statistics

	Consumer Discret.	Consumer Staples	Energy	Financials	Health Care	Industrials	Information Technology	Materials	Telecomm. Services	Utilities
Mean	–0.099***	–0.076***	0.100***	–0.081***	–0.066***	–0.100***	–0.051***	–0.084***	0.002	0.036***
	(–57.03)	(–31.35)	(29.54)	(–38.79)	(–36.01)	(–66.16)	(–22.03)	(–37.98)	(1.34)	(9.33)
Standard Error	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.004
Median	–0.096	–0.078	0.096	–0.073	–0.064	–0.099	–0.038	–0.073	–0.001	0.030
Standard Deviation	0.031	0.043	0.060	0.037	0.032	0.027	0.041	0.039	0.033	0.068
Sample Variance	0.001	0.002	0.004	0.001	0.001	0.001	0.002	0.002	0.001	0.005
Kurtosis	–0.689	0.254	–0.533	–0.707	–0.933	–0.933	–0.351	–0.656	0.402	–0.711
Skewness	–0.381	0.549	0.148	–0.164	–0.381	0.147	–0.941	–0.106	0.103	0.469
Range	0.128	0.203	0.273	0.160	0.128	0.115	0.167	0.171	0.189	0.277
Minimum	–0.175	–0.157	–0.014	–0.163	–0.137	–0.156	–0.165	–0.161	–0.091	–0.059
Maximum	–0.046	0.046	0.259	–0.004	–0.009	–0.040	0.003	0.010	0.098	0.219
Sum	–31.438	–24.051	31.691	–25.629	–20.781	–31.757	–16.013	–26.526	0.784	11.308
Count	317	317	317	317	317	317	317	317	317	317
Confidence Level (95.0%)	0.003	0.005	0.007	0.004	0.004	0.003	0.005	0.004	0.004	0.008

Notes: The t-statistics are in parentheses. Reported kurtosis is excess kurtosis. Data as presented are for the period December 31, 1987 to June 30, 2016.

Sources: Compustat, FactSet Research Systems Inc.

, **, and * indicate statistical significance at the 10%, 5% and 1% level, respectively.*

where n is the number of observations; X_n is observation n; and $\overline{X}$ is the mean of X.

We then charted the CUSUM data to help identify globalization trends for each sector. This method of using charts to identify trends dates back to Shewart's [1930] statistical process for quality controls, which he developed for Bell Labs. Shewart charts are still being used today in manufacturing process control.

Smarter Smart Beta

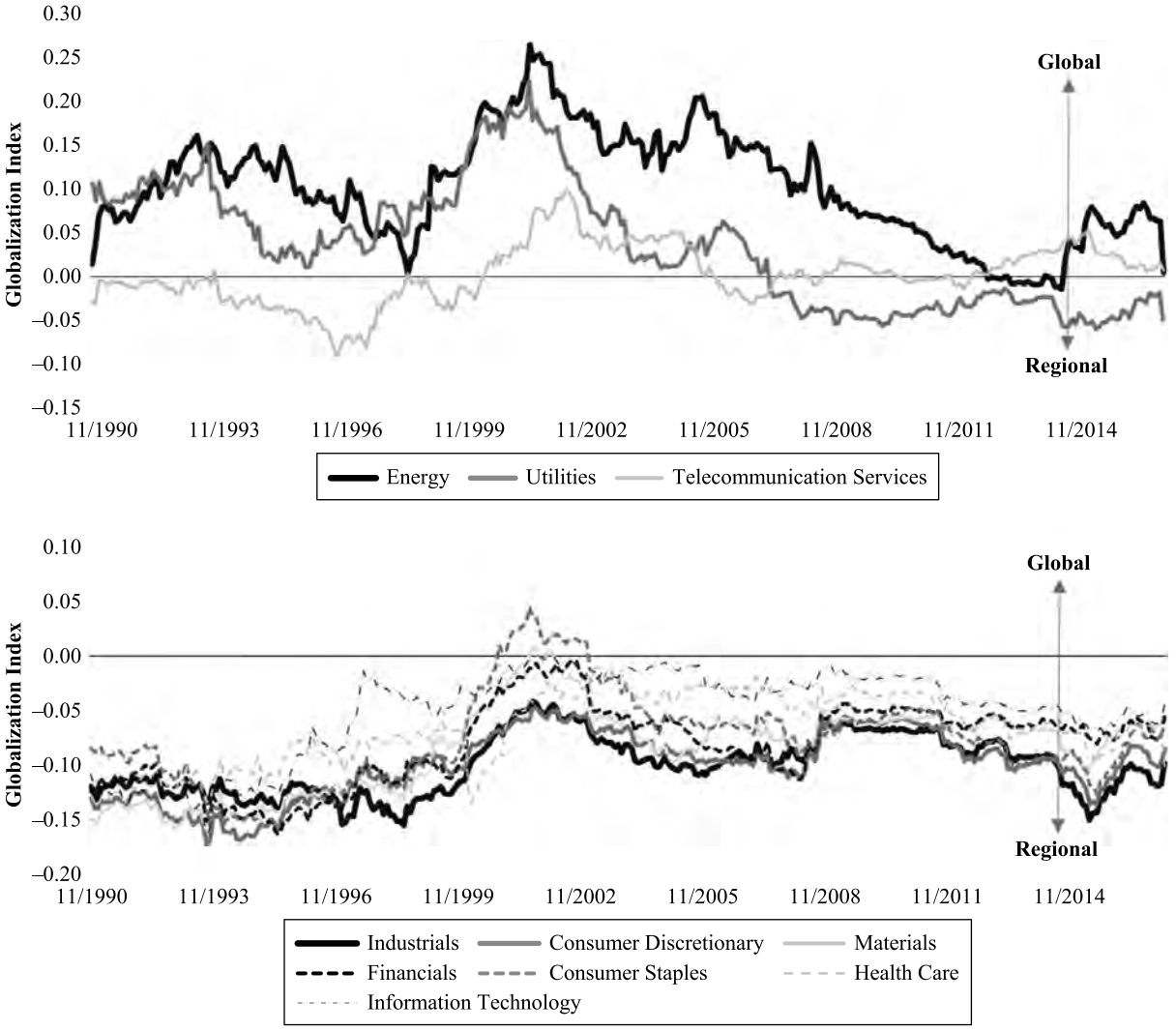
To determine the impact of globalization on smart beta strategies, we evaluated a representative list of factors (see Appendix B) in both intrasector and intraregional universes using the methodology of Aw, Dornick, and Jiang [2014] (see Appendix C). We expected the factor performance intrasector to be superior relative to the results across our research universe for the global sectors. We also expected the factor performance intraregion to be superior relative to the results across our research universe for the regional sectors. If the intrasector and intraregion results are superior relative to the results across our research universe, we can conclude that being cognizant of regional and sector effects provides an opportunity for smart beta strategies to be smarter.

EMPIRICAL RESULTS

The globalization descriptive statistics shown in Exhibit 1 indicates that 7 out of 10 sectors (consumer discretionary, consumer staples, financials, health care, industrials, information technology, and materials) are regional. The results are statistically significant at the 1% level. Three out of 10 sectors (energy, telecommunication services, and utilities) are global. The results for energy and utilities are statistically significant at the 1% level. The distribution of consumer staples and information technology shows moderate positive and negative skews, respectively. Eight out of 10 sectors (consumer discretionary, energy, financials, health care, industrials, information technology, materials, and utilities) displayed negative kurtosis or platykurtic distribution, which indicates that the distribution has tails that are less fat (with less major fluctuations) than a normal distribution.

The globalization trend across all sectors (a time series of Equation (1)) are shown in Exhibit 2. Seven out of 10 sectors (consumer discretionary, consumer staples, financials, health care, industrials, information technology, and materials) maintained their regional characteristics for the period November 30, 1990 to March 31, 2017. For the same period, 3 out of 10 sectors

EXHIBIT 2
Globalization Index Trend

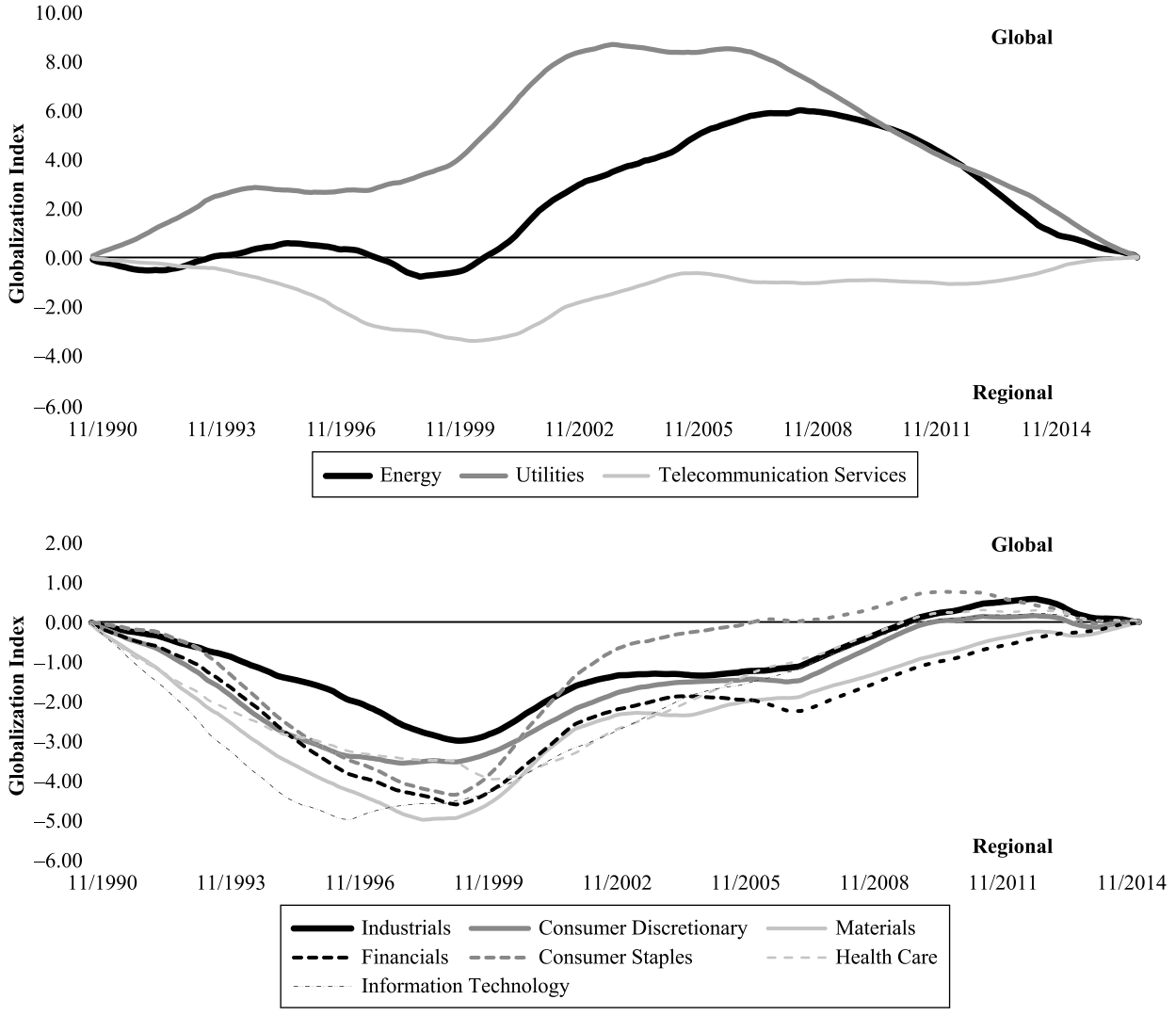


(energy, telecommunication services, and utilities) displayed their global characteristics. Exhibit 2 also indicates globalization trends starting at the end of the 20th century and leveling or declining since 2008 until the recent period. Exhibits 1 and 2 do not provide any concrete evidence of the globalization trend. However, the globalization trend, based on the CUSUM technique designed to detect small changes in a data series, is shown in Exhibit 3. The CUSUM technique does show globalization trends from the end of the 20th century until the global financial crisis of 2008. Since the crisis, the globalization trend also continued for all sectors that were found to be regional.

Smart Beta Backtest Results

Exhibit 4 shows the backtest results of the 130 factors listed in the Appendix C group as valuation, company management, market behavior, and company specific for the research universe. We found evidence that ranking our research universe by factors produced attractive buy value added (BVA) and torpedo avoidance value (TAV) for most sectors. On average, selecting from the cheapest valuation quintile resulted in 421 bps of outperformance versus the research, whereas avoiding the most expensive valuation quintile resulted in 387 bps of outperformance versus the research universe. Company management,

EXHIBIT 3
Globalization Index Trend—CUSUM



market behavior, and company specific also delivered attractive BVA and TAV values for most sectors, albeit not as strong as valuation. Exhibits 5 and 6 show the results of the same backtests, but factors were ranked within regions and sectors, respectively. The intraregion relative ranking results in Exhibit 5 are inferior to the research relative ranking shown in Exhibit 4 across all factor groups for most sectors. On the other hand, the intrasector relative ranking results in Exhibit 6 showed improved BVA and TAV for valuation and company management factors, in particular those sectors that were found to be global. The results are consistent with our expectation that intrasector results should be superior for those sectors that are found to be global. Appendixes D and E show region and sector results in excess of the research universe, respectively.

CONCLUSION

In this study, we examined the impact of globalization on global equity investors by evaluating the importance of regions and sectors. Applying the globalization index equation to the global equity universe with a minimum market capitalization of $250 million, we found that most sectors are not global (i.e., regional influence is larger than the sector effect); however, more

EXHIBIT 4

Factor Performance—Relative to Research Universe

			Quintile 1			Quintile 5		
	BVA	TAV	PHR	DPHR	HR	PHR	DPHR	HR
Valuation (43 Factors)								
Consumer Discretionary	3.13	2.87	57.47	63.23	48.93	36.09	24.59	40.81
Consumer Staples	3.76	5.08	67.40	88.06	53.64	37.51	56.17	40.89
Energy	3.76	3.61	61.14	62.57	54.90	42.75	35.36	43.92
Financials	4.28	3.05	61.44	59.88	52.68	36.61	27.11	43.33
Health Care	5.81	4.81	69.74	80.44	59.05	41.60	50.73	42.54
Industrials	4.91	4.37	66.39	53.28	50.59	27.94	8.98	38.42
Information Technology	3.53	1.95	53.49	37.62	47.70	44.58	25.68	41.52
Materials	5.43	4.04	61.20	56.12	50.87	37.77	32.09	39.27
Telecommunication Services	4.18	4.57	65.51	61.82	53.89	44.78	29.71	43.70
Utilities	3.34	4.35	63.62	76.19	55.36	39.51	44.90	43.42
Company Management (46 Factors)								
Consumer Discretionary	0.91	1.44	49.83	53.57	45.58	39.35	34.89	42.79
Consumer Staples	0.94	1.96	59.74	87.99	50.23	48.69	73.55	46.07
Energy	0.08	1.33	53.83	55.19	49.70	48.94	48.14	47.87
Financials	1.02	1.42	54.22	56.46	48.41	44.87	40.90	45.58
Health Care	2.11	2.26	61.80	80.41	53.10	49.38	63.32	47.45
Industrials	1.24	1.75	53.84	44.68	46.44	37.45	21.65	42.08
Information Technology	1.67	1.90	54.67	43.52	46.12	44.34	25.31	42.44
Materials	0.91	1.15	48.82	48.92	45.77	44.13	38.98	42.53
Telecommunication Services	0.07	1.85	57.64	55.02	49.56	49.92	40.10	46.65
Utilities	–0.24	0.92	57.48	75.90	50.99	52.23	65.81	48.96
Market Behavior (41 Factors)								
Consumer Discretionary	2.01	0.96	56.08	59.98	47.03	36.85	33.20	43.20
Consumer Staples	1.36	0.76	62.58	80.85	50.76	50.35	74.13	47.23
Energy	1.33	0.83	54.27	49.03	49.66	50.91	49.10	48.72
Financials	1.24	1.08	52.81	48.62	48.42	43.84	30.00	45.10
Health Care	2.04	0.88	60.59	70.49	52.60	53.54	64.64	49.10
Industrials	1.74	0.49	55.08	38.50	46.86	42.24	25.07	43.52
Information Technology	1.73	0.41	54.14	38.25	45.58	46.26	24.93	43.71
Materials	1.07	–0.63	49.03	42.48	45.50	48.36	41.67	44.97
Telecommunication Services	1.73	0.41	54.14	38.25	45.58	46.26	24.93	43.71
Utilities	1.02	0.92	58.03	64.59	50.65	50.49	55.19	48.91
Company Specific (5 Factors)								
Consumer Discretionary	1.67	0.99	55.61	72.82	48.58	41.18	37.14	42.97
Consumer Staples	1.01	1.61	57.36	83.74	52.31	50.66	72.57	45.89
Energy	0.98	0.41	56.27	66.75	53.43	52.48	52.18	47.90
Financials	2.28	2.03	60.68	74.51	50.66	43.15	35.19	43.10
Health Care	1.81	1.25	60.35	73.79	54.66	51.97	62.62	47.14
Industrials	2.16	2.11	63.27	72.82	49.87	35.50	23.30	40.64
Information Technology	2.18	1.88	57.10	49.76	49.24	45.07	24.51	42.51
Materials	2.21	1.93	55.83	67.48	49.25	41.25	38.11	41.32
Telecommunication Services	–2.09	0.12	54.09	56.55	48.83	50.71	39.32	47.78
Utilities	–2.16	1.28	51.92	76.21	48.84	48.83	55.83	47.34

Notes: BVA and TAV in annualized percentage terms. Data as presented based on backtest results for the period December 31, 1987 to June 30, 2016. See Appendix C for a complete list of factors.

Sources: Compustat, FactSet Research Systems Inc.

EXHIBIT 5

Factor Performance—Relative to Region

			Quintile 1			Quintile 5		
	BVA	TAV	PHR	DPHR	HR	PHR	DPHR	HR
Valuation (43 Factors)								
Consumer Discretionary	1.79	1.60	50.71	53.83	46.85	39.04	27.45	42.62
Consumer Staples	1.85	3.24	62.16	84.20	50.47	44.43	64.39	44.23
Energy	3.07	2.88	60.18	61.09	53.39	44.46	39.61	45.59
Financials	3.19	2.33	58.02	56.75	51.27	39.02	30.95	44.36
Health Care	3.56	2.70	64.07	75.95	55.94	47.46	55.73	45.84
Industrials	3.87	3.27	61.29	44.37	48.88	29.68	10.15	39.91
Information Technology	2.41	0.37	50.29	31.04	46.38	48.02	30.66	43.26
Materials	4.13	2.68	54.73	47.31	48.97	39.89	34.37	41.14
Telecommunication Services	3.81	3.14	63.90	58.20	52.76	48.08	32.50	45.44
Utilities	2.51	2.92	63.36	78.59	54.29	43.48	51.72	45.30
Company Management (46 Factors)								
Consumer Discretionary	0.69	1.05	49.05	52.28	45.15	40.79	37.84	43.35
Consumer Staples	0.36	1.59	58.25	87.72	49.06	52.03	77.92	46.73
Energy	0.16	1.18	53.50	54.77	49.63	49.49	49.54	48.29
Financials	0.59	0.86	52.89	54.43	48.02	46.87	44.24	46.28
Health Care	1.79	1.80	61.62	80.18	52.58	51.46	65.58	48.15
Industrials	0.92	1.63	50.66	39.87	45.60	36.01	19.23	42.14
Information Technology	1.40	1.47	54.79	43.14	45.89	45.95	27.04	43.00
Materials	0.64	0.95	47.06	46.75	45.32	44.14	39.40	42.83
Telecommunication Services	0.14	1.70	56.88	54.01	49.18	51.45	41.75	46.99
Utilities	0.72	0.75	58.29	76.07	51.42	52.70	68.34	49.21
Market Behavior (41 Factors)								
Consumer Discretionary	1.59	0.82	54.41	57.77	46.29	37.56	34.37	43.62
Consumer Staples	1.31	0.62	62.17	80.83	50.76	50.66	79.64	47.65
Energy	1.49	0.42	54.33	50.00	50.18	52.23	51.58	49.59
Financials	1.08	1.00	53.36	48.64	47.71	42.93	30.63	45.26
Health Care	1.95	1.14	60.10	70.10	52.48	52.81	68.06	48.77
Industrials	1.08	0.42	50.62	32.33	45.66	41.45	27.74	43.67
Information Technology	1.59	0.40	53.28	36.92	45.19	48.27	28.08	44.20
Materials	0.84	–0.62	47.87	39.27	45.04	47.34	42.06	45.11
Telecommunication Services	2.14	0.98	60.27	46.82	51.08	49.79	44.25	47.64
Utilities	0.91	0.32	57.84	64.83	50.52	52.47	58.28	50.21
Company Specific (5 Factors)								
Consumer Discretionary	0.68	0.49	48.54	63.59	46.61	44.31	41.99	43.53
Consumer Staples	–0.11	1.12	54.93	83.01	49.66	50.29	75.24	46.78
Energy	0.67	–0.17	55.01	65.78	53.16	52.55	52.43	49.01
Financials	1.10	1.29	56.35	67.96	48.34	44.39	35.68	44.60
Health Care	1.30	0.60	60.42	75.49	53.45	54.74	63.11	48.37
Industrials	1.10	1.78	54.81	61.65	47.06	35.93	23.30	41.09
Information Technology	0.63	0.21	52.10	43.45	46.36	49.42	31.80	43.92
Materials	1.52	1.12	53.21	63.83	47.66	41.62	41.26	42.87
Telecommunication Services	–4.62	–0.42	51.72	53.16	44.92	53.43	40.05	48.28
Utilities	–2.97	0.73	51.84	74.76	48.05	48.91	58.25	48.58

Notes: BVA and TAV in annualized percentage terms. Data as presented based on backtest results for the period December 31, 1987 to June 30, 2016. See Appendix C for a complete list of factors.

Sources: Compustat, FactSet Research Systems Inc.

EXHIBIT 6

Factor Performance—Relative to Sector

			Quintile 1			Quintile 5		
	BVA	TAV	PHR	DPHR	HR	PHR	DPHR	HR
Valuation (43 Factors)								
Consumer Discretionary	3.09	2.67	58.04	62.77	49.00	36.39	26.72	41.07
Consumer Staples	3.62	4.21	69.51	93.96	54.16	40.56	65.87	42.36
Energy	4.20	3.84	61.66	59.66	54.96	42.62	36.97	44.38
Financials	4.17	3.17	61.19	60.92	52.35	36.40	30.51	43.38
Health Care	4.91	5.75	71.39	87.52	58.18	41.35	47.48	40.66
Industrials	4.73	3.88	66.67	54.44	50.51	28.47	11.09	39.04
Information Technology	3.07	2.20	53.29	35.51	47.59	43.95	24.13	41.24
Materials	5.98	3.74	61.05	56.09	51.13	38.63	35.12	39.56
Telecommunication Services	5.16	4.14	67.94	61.97	54.84	46.28	31.67	44.22
Utilities	3.57	3.44	62.91	74.37	55.48	41.93	48.50	44.65
Company Management (46 Factors)								
Consumer Discretionary	1.02	1.20	50.53	55.32	45.76	40.52	36.77	43.10
Consumer Staples	1.10	1.66	61.46	92.36	50.60	50.17	79.53	46.35
Energy	0.38	1.48	54.35	56.90	50.16	48.56	48.10	47.58
Financials	1.21	1.68	54.21	58.51	48.32	44.09	40.31	44.84
Health Care	1.93	2.32	61.58	80.29	52.86	50.46	64.73	47.36
Industrials	1.34	1.70	54.96	45.97	46.49	37.22	21.42	42.07
Information Technology	1.67	1.45	54.98	43.67	46.12	46.09	26.78	43.00
Materials	0.84	1.25	48.93	48.78	45.65	44.02	39.02	42.36
Telecommunication Services	0.67	1.43	57.67	57.66	49.82	51.96	43.01	47.47
Utilities	0.82	0.59	59.14	78.45	51.47	53.28	68.66	49.75
Market Behavior (41 Factors)								
Consumer Discretionary	1.98	1.10	55.78	59.61	46.93	36.32	31.84	42.95
Consumer Staples	1.78	0.80	63.59	84.44	51.34	51.13	78.40	47.28
Energy	1.19	0.81	53.78	47.04	49.64	51.29	48.20	49.02
Financials	1.79	0.82	54.29	53.18	49.12	44.31	31.55	45.32
Health Care	1.77	1.07	59.47	68.28	51.87	53.97	66.53	48.81
Industrials	1.86	0.39	55.09	39.00	46.87	42.43	25.12	43.57
Information Technology	1.51	0.15	53.02	36.75	45.11	46.89	25.56	43.95
Materials	1.19	–0.62	49.06	44.88	45.39	48.97	42.52	44.96
Telecommunication Services	2.13	1.54	60.79	46.26	50.84	48.73	42.91	46.99
Utilities	0.83	1.13	60.64	72.35	51.57	49.75	57.72	48.84
Company Specific (5 Factors)								
Consumer Discretionary	1.54	0.79	55.25	71.60	48.17	40.60	33.74	42.95
Consumer Staples	2.02	1.87	60.42	91.02	53.00	48.83	74.51	45.46
Energy	0.65	–0.05	54.81	64.56	53.27	54.37	52.67	48.27
Financials	2.45	2.38	61.44	76.21	51.41	42.64	32.04	42.72
Health Care	2.01	2.29	61.66	79.61	55.24	51.24	62.86	46.18
Industrials	2.08	1.69	63.34	71.36	49.49	37.17	24.27	40.94
Information Technology	1.13	0.11	53.13	46.60	47.24	50.80	32.04	43.48
Materials	2.15	1.43	56.27	66.50	48.87	42.86	40.78	41.98
Telecommunication Services	–0.11	0.42	55.61	57.77	50.52	52.11	38.35	48.17
Utilities	0.51	0.97	57.14	83.25	53.28	50.87	60.44	47.56

Notes: BVA and TAV in annualized percentage terms. Data as presented based on backtest results for the period December 31, 1987 to June 30, 2016. See Appendix C for a complete list of factors.

Sources: Compustat, FactSet Research Systems Inc.

sectors are becoming global. Segregating the global equity universe in 10 regions (Asia Pacific Ex Japan, Canada, Developed Europe, Emerging Asia Pacific, Emerging Europe, Israel, Japan, Latin America, Mideast Africa, and United States), we found that 7 of the 10 sectors are more regional in nature (consumer discretionary, consumer staples, financials, health care, industrials, information technology, and materials), where, on average, returns are influenced by regions rather than sectors. The remaining three sectors (energy, telecommunication services, and utilities) are more global in nature, where, on average, returns are influenced by sectors rather than regions. Using the CUSUM technique designed to detect small changes in a data series, we found that all seven of the sectors found to be regional have been showing a trend toward globalization since the end of the 20th century. We also investigated the impact of globalization on the implementation of smart beta strategies. Should smart beta strategies be employed intraregion or intrasector? We found that intraregion relative ranking results are inferior to the global relative ranking, whereas intrasector relative ranking showed improved performance for some of the smart beta strategies—valuation and company management in particular—especially in those sectors that were found to be global. The results are consistent with our expectation that intrasector results should be superior for those sectors that are found to be global.

Appendix A

Exhibit A1

A List of Region and Sector Indexes

Region	Sector
Asia Pacific Ex Japan	Consumer Discretionary
Canada	Consumer Staples
Developed Europe	Energy
Emerging Asia Pacific	Financials
Emerging Europe	Health Care
Israel	Industrials
Japan	Information Technology
Latin America	Materials
Mideast Africa	Telecommunication Services
United States	Utilities

Note: Sector classification is based on the Global Industry Classification Syatem (GICS®).

Sources: FactSet Research Systems, Inc.

Appendix B

MEASUREMENT STATISTICS TO EVALUATE A FACTOR SELECTION

1. *BVA* is defined as the spread of Quintile 1's average return to the model's investable universe's average return. A positive *BVA* indicates that the model is providing value, whereas a negative *BVA* indicates that the model is detracting value. *BVA* also allows for new relevant information to be captured by the model at each model update within any measurement period.

$$BVA = \frac{\sum_1^n R_{u(Q1)}}{n} - \frac{\sum_1^u R_{u(Universe)}}{u}$$

where R is returns; n is the total number of stocks in Quintile 1; and u is the total number of stocks in the model universe.

2. *TAV* is defined as the spread of the model universe's average return to Quintile 5's average return. A positive *TAV* indicates the model's torpedo countermeasures were effective in avoiding negative returns.

$$TAV = \frac{\sum_1^u R_{u(Universe)}}{u} - \frac{\sum_1^x R_{x(Q5)}}{x}$$

where R is returns; u is the total number of stocks in the model universe; and x is the total number of stocks in Quintile 5.

3. *Persistent hit rate* (*PHR*) is defined as the total number of periods in which the selected quintile outperforms the universe as a percentage of the total number of periods. For example, if the equally-weighted returns of Quintile 1 outperform the equally-weighted returns of the universe for 20 out of 30 monthly periods, the persistent hit rate is 20 divided by 30 (66.67%).

$$PHR = \frac{B}{P}$$

where B is the total number of stock-ranking periods in which $BVA > 0$; and P is the total number of stock-ranking periods.

4. *Downside persistent hit date* (*DPHR*) is defined as PHR calculated for only those time periods in which the universe performance is negative.

$$DPHR = \frac{b}{p}$$

where b is the total number of stock-ranking periods in which $BVA > 0$, given $p > 0$; and p is the total number of stock-ranking periods in which model universe returns are <0.

5. *Hit rate* (*HR*) is defined as the percentage of stocks in any selected quintile that outperforms the universe's average return. For example, if 60 out of 100 stocks in Quintile 1 outperform the universe average, the HR will be 60%. To properly evaluate HR, one should also calculate the HR for the entire model universe—the percentage of stocks that actually beat the universe. A quintile's HR must be compared to the universe HR.

APPENDIX C

EXHIBIT C1

Factor List

Factor Name	Factor Description	Factor Name	Factor Description
Valuation		EBIT to Price FY0	EBIT Per Share/Month End Price
Book to Price	Book Value Per Share/Month End Price	EBIT to EV FY0	EBIT/Enterprise Value
Book to EV	Book Value Per Share/Enterprise Value	EBIT to Price LTM	EBIT Per Share/Month End Price
EPS to Price FY0	FY0 Earning Per Share/Month End Price	EBIT to EV LTM	EBIT/Enterprise Value
EPS to EV FY0	FY0 Earning Per Share/Enterprise Value	GrahamDodd PE FY0	[Avg last 5 years FY0 Earning Per Share]/ Month End Price
EPS to Price LTM	LTM Earning Per Share/Month End Price		
EPS to EV LTM	LTM Earning Per Share/Enterprise Value	Dividend Yield	FY0 Dividend/Month End Price
EPS to Price NTM	NTM Earning Per Share/Month End Price	**Company Management**	
EPS to EV NTM	NTM Earning Per Share/Enterprise Value	Net Income to EBT	Net Income/Pre-Tax Income (EBT)
EPS to Price FY1	FY1 Earning Per Share/Month End Price	EBT to EBIT	Pre-Tax Income/Earnings before Interest and Taxes (EBIT)
EPS to EV FY1	FY1 Earning Per Share/Enterprise Value		
EPS to Price FY2	FY2 Earning Per Share/Month End Price	EBIT Margin	Earnings before Interest and Taxes (EBIT)/Sales
EPS to EV FY2	FY2 Earning Per Share/Enterprise Value	Asset Turnover	Sales/Avg last 2 years [Assets]
EPS to Price FY3	FY3 Earning Per Share/Month End Price	Asset to Total Equity	Assets/Total Equity
EPS to EV FY3	FY3 Earning Per Share/Enterprise Value	ROE	Net Income/Avg last 2 years [Total Equity]
GCF to Price FY0	Gross Cash Flow Per Share/Month End Price	Dividend Payout	DPS/EPS
		Cash to Mkt Cap	Cash/Market Cap
GCF to EV FY0	Gross Cash Flow/Enterprise Value	Change in CFO	Year over Year Change in CFO
GCF to Price LTM	Gross Cash Flow Per Share/Month End Price	Change in FCF	Year over Year Change in FCF
		Dividend Growth	Year over Year Dividend Growth
GCF to EV LTM	Gross Cash Flow/Enterprise Value	Depreciation to CapEx	Depreciation Expense/Capital Expenditures
CFO to Price FY0	Cash Flow form Operation Per Share/ Month End Price	Sales to CapEx	Sales/Capital Expenditure
		LTM EPS Stability	AVG last 5 Yr EPS/Standard Deviation last 5 Yr EPS
CFO to EV FY0	Cash Flow from Operation/Enterprise Value		
CFO to Price LTM	Cash Flow form Operation Per Share/ Month End Price	Sales to CapEx Trend	(Current Sales/CapEx)/(Avg prior 3 Yr Sales/ CapEx)
CFO to EV LTM	Cash Flow from Operation/Enterprise Value	[R] Above Trend CapEx	(CapEx/Sales)/(Avg prior 3 Yr CapEx/Sales)
FCF to Price FY0	Free Cash Flow Per Share/Month End Price	[R] Change in Debt to Capital	Change in LT Debt/Previous LT Capital
FCF to EV FY0	Free Cash Flow/Enterprise Value		
FCF to Price LTM	Free Cash Flow Per Share/Month End Price	[R] Change in Shares Out	Year over Year Change in Shares Outstanding
FCF to EV LTM	Free Cash Flow/Enterprise Value	[R] Change in Working Capital to Average Assets	[WorkCap (Current) –WorkCap (–1 Year)]/ (Avg Total Assets)
EBITDA to Price FY0	EBITDA Per Share/Month End Price		
EBITDA to EV FY0	EBITDA/Enterprise Value	[R] Change NCOA to Asset	Change in Non-Current Operating Assets
EBITDA to Price LTM	EBITDA Per Share/Month End Price	[R] Deferred Tax to Average Assets	Deferred Tax/(Avg Total Assets)
EBITDA to EV LTM	EBITDA/Enterprise Value		
Sales to Price FY0	Sales Per Share/Month End Price	Sloan Earnings Quality	(LTM Net Income –Accruals)/Avg Total Assets
Sales to EV FY0	Sales/Enterprise Value	Serial Grower	Change in Total Assets
Sales to Price LTM	Sales Per Share/Month End Price	ROA	Net Income/Avg last 2 years [Total Assets]
Sales to EV LTM	Sales/Enterprise Value		

(continued)

EXHIBIT C1 *(continued)*

Factor List

Factor Name	Factor Description	Factor Name	Factor Description
Cash to EV	Cash/Enterprise Value	Price Momentum 9MX	Price Returns over a trailing 9 months excluding the current month
Total Yield	Dividend Yield –% Change in Common Shares Outstanding	Risk Adjusted Price Momentum 12M	Price Returns over a trailing 12 months adjusted for risk
R&D to Sales	R&D Expense/Sales	Risk Adjusted Price Momentum 12MX	Price Returns over a trailing 12 months excluding the current month adjusted for risk
[R] Net Change in Debt to Total Equity	Change in Total Debt/Total Equity Ratio	Risk Adjusted Price Momentum 3M	Price Returns over a trailing 3 months adjusted for risk
[R] Net Change in Debt to Total Capital	Change in Total Debt/Total Capital Ratio	Risk Adjusted Price Momentum 3MX	Price Returns over a trailing 3 months excluding the current month adjusted for risk
LTM EPS Trend	Slope last 5 Yr EPS/Standard Deviation last 5 Yr EPS	Risk Adjusted Price Momentum 6M	Price Returns over a trailing 6 months adjusted for risk
Change in FCF Margin	Change in the FCF/Sales Ratio	Risk Adjusted Price Momentum 6MX	Price Returns over a trailing 6 months excluding the current month adjusted for risk
Gross Margin	Gross Income/Sales	Risk Adjusted Price Momentum 9M	Price Returns over a trailing 9 months adjusted for risk
[R] SGA to Sales	Selling, General, and Administrative Expenses/Sales	Risk Adjusted Price Momentum 9MX	Price Returns over a trailing 9 months excluding the current month adjusted for risk
Earnings Certainty	Correlation of last 3 Yr EPS/Standard Error of last 3 Yr EPS	Trading Volume 12M	12 Month Trading Volume Turnover
FCF to Net Income	Free Cash Flow/Net Income	Trading Volume 3M	3 Month Trading Volume Turnover
CFO to Net Income	Cash Flow form Operation/Net income	Trading Volume 6M	6 Month Trading Volume Turnover
GCF to Net Income	Gross Cash Flow/Net Income	Trading Volume 9M	9 Month Trading Volume Turnover
FCF to Sales	Free Cash Flow/Sales	50DMA to 200DMA 6 Mth Lag	50 to 200 Day Moving Average Price (Lag 6 Months)
CFO to Sales	Cash Flow form Operation/Sales	50DMA to 200DMA 3 Mth Lag	50 to 200 Day Moving Average Price (Lag 3 Months)
GCF to Sales	Gross Cash Flow/Sales	Current Price to 30 Day AVG	Current Price/Avg (30 Day Price)
FCF to Operating Income	Free Cash Flow/Operating Income	3 Month Change in FY1 EPS	Change in FY1 EPS (current –3 month ago)/ FY1 EPS 3 months ago
CFO to Operating Income	Cash Flow form Operation/Operating Income	3 Month Change in NTM EPS	Change in NTM EPS (current –3 month ago)/ NTM EPS 3 months ago
GCF to Operating Income	Gross Cash Flow/Operating Income	Price Trend 3MX	Last 3 month Avg return excl. current month
Tax to Pre Tax Income	Income Tax Paid/Pre-Tax Income	Price Trend 6MX	Last 6 month Avg return excl. current month
Net Income Certainty	Correlation last 3 Yr Net Income/Standard Deviation last 3 Yr Net Income	Price Trend 9MX	Last 9 month Avg return excl. current month
Org_Rate	Dividend Payout Ratio * ROE	FY1 Earning Diffusion	(# of estimates Up –# of estimates Down)/ Total # of Estimates
Market Behavior		Risk Adjusted Price Trend 9MX	Last 9 month Avg return excl. current month/ Last 9 month Std Dev. returns excl. current month
Revision Breadth	(# of estimates Up –# of estimates Down)/ Total # of Estimates	[R] Estimate Dispersion	Std. Dev FY1 EPS/Median FY1 EPS
Revision Magnitude to Price	Revision Magnitude to Price	Price Trend 12MX	Last 12 month Avg return excl. current month
Estimated CAGR	Estimated Long-term Compounded Annual Growth Rate	Risk Adjusted Price Trend 12MX	Last 12 month Avg return excl. current month/ Last 12 month Std Dev. returns excl. current month
Growth to PE	Growth to PE	**Company Specific**	
SUD	Standardized Unexpected Difference	[R] Residual Volatility	Last 3 year volatility of stock specific error
SUE	Standardized Unexpected Earnings	Merton Bankruptcy Risk	Merton Model Bankruptcy Risk
50DAVG to 200DAVG	50 to 200 Day Moving Average Price	Beta	Slope
Price Momentum 12M	Price Returns over a trailing 12 months	[R] Residual	Stock Specific Error
Price Momentum 12MX	Price Returns over a trailing 12 months excluding the current month		
Price Momentum 3M	Price Returns over a trailing 3 months		
Price Momentum 3MX	Price Returns over a trailing 3 months excluding the current month		
Price Momentum 6M	Price Returns over a trailing 6 months		
Price Momentum 6MX	Price Returns over a trailing 6 months excluding the current month		
Price Momentum 9M	Price Returns over a trailing 9 months		

APPENDIX D

EXHIBIT D1

Region Excess vs. Research Universe

			Quintile 1			Quintile 5		
	BVA	TAV	PHR	DPHR	HR	PHR	DPHR	HR
Valuation (43 Factors)								
Consumer Discretionary	–1.33	–1.27	–6.76	–9.39	–2.08	2.95	2.86	1.81
Consumer Staples	–1.92	–1.84	–5.24	–3.86	–3.17	6.92	8.23	3.34
Energy	–0.69	–0.73	–0.96	–1.48	–1.51	1.71	4.25	1.68
Financials	–1.09	–0.73	–3.43	–3.13	–1.41	2.42	3.83	1.03
Health Care	–2.25	–2.12	–5.67	–4.49	–3.11	5.86	5.00	3.30
Industrials	–1.04	–1.10	–5.09	–8.91	–1.71	1.74	1.17	1.49
Information Technology	–1.12	–1.57	–3.20	–6.58	–1.32	3.44	4.98	1.74
Materials	–1.30	–1.36	–6.46	–8.81	–1.90	2.12	2.28	1.87
Telecommunication Services	–0.37	–1.43	–1.61	–3.62	–1.13	3.30	2.79	1.73
Utilities	–0.83	–1.43	–0.26	2.40	–1.07	3.97	6.82	1.88
Company Management (46 Factors)								
Consumer Discretionary	–0.21	–0.39	–0.78	–1.29	–0.43	1.44	2.95	0.56
Consumer Staples	–0.58	–0.37	–1.49	–0.27	–1.17	3.34	4.37	0.66
Energy	0.09	–0.15	–0.33	–0.42	–0.07	0.56	1.39	0.42
Financials	–0.43	–0.57	–1.33	–2.03	–0.39	1.99	3.33	0.70
Health Care	–0.33	–0.46	–0.19	–0.23	–0.52	2.09	2.26	0.70
Industrials	–0.32	–0.12	–3.18	–4.81	–0.84	–1.44	–2.43	0.06
Information Technology	–0.26	–0.43	0.13	–0.38	–0.24	1.61	1.73	0.56
Materials	–0.27	–0.20	–1.76	–2.17	–0.45	0.00	0.42	0.30
Telecommunication Services	0.08	–0.15	–0.76	–1.01	–0.38	1.54	1.65	0.34
Utilities	0.97	–0.17	0.81	0.17	0.43	0.47	2.53	0.25
Market Behavior (41 Factors)								
Consumer Discretionary	–0.42	–0.14	–1.67	–2.21	–0.74	0.71	1.17	0.42
Consumer Staples	–0.05	–0.14	–0.41	–0.02	0.00	0.31	5.51	0.42
Energy	0.16	–0.41	0.06	0.97	0.53	1.32	2.48	0.87
Financials	–0.16	–0.07	0.55	0.02	–0.71	–0.91	0.63	0.17
Health Care	–0.09	0.26	–0.49	–0.39	–0.12	–0.73	3.42	–0.33
Industrials	–0.66	–0.07	–4.46	–6.17	–1.20	–0.79	2.67	0.15
Information Technology	–0.14	0.00	–0.86	–1.33	–0.39	2.01	3.16	0.49
Materials	–0.23	0.01	–1.15	–3.20	–0.46	–1.03	0.39	0.14
Telecommunication Services	–0.06	–0.30	0.24	1.09	0.44	0.99	1.82	0.44
Utilities	–0.11	–0.60	–0.19	0.24	–0.13	1.98	3.08	1.31
Company Specific (5 Factors)								
Consumer Discretionary	–0.99	–0.50	–7.07	–9.22	–1.97	3.13	4.85	0.57
Consumer Staples	–1.13	–0.49	–2.43	–0.73	–2.64	–0.36	2.67	0.88
Energy	–0.30	–0.58	–1.26	–0.97	–0.27	0.07	0.24	1.11
Financials	–1.19	–0.73	–4.33	–6.55	–2.32	1.24	0.49	1.50
Health Care	–0.50	–0.65	0.07	1.70	–1.21	2.77	0.49	1.23
Industrials	–1.06	–0.33	–8.45	–11.17	–2.81	0.44	0.00	0.45
Information Technology	–1.55	–1.67	–5.00	–6.31	–2.88	4.35	7.28	1.40
Materials	–0.68	–0.81	–2.62	–3.64	–1.59	0.36	3.16	1.55
Telecommunication Services	–2.52	–0.54	–2.38	–3.40	–3.91	2.72	0.73	0.50
Utilities	–0.80	–0.55	–0.08	–1.46	–0.79	0.07	2.43	1.23

Notes: BVA and TAV in annualized percentage terms. Data as presented based on backtest results for the period December 31, 1987 to June 30, 2016. See Appendix C for a complete list of factors.

Sources: Compustat, FactSet Research Systems Inc.

APPENDIX E

EXHIBIT E1

Sector Excess vs. Research Universe

			Quintile 1			Quintile 5		
	BVA	TAV	PHR	DPHR	HR	PHR	DPHR	HR
Valuation (43 Factors)								
Consumer Discretionary	–0.04	–0.21	0.57	–0.46	0.06	0.31	2.14	0.26
Consumer Staples	–0.14	–0.88	2.11	5.90	0.52	3.05	9.71	1.46
Energy	0.44	0.23	0.52	–2.91	0.06	–0.13	1.60	0.46
Financials	–0.11	0.12	–0.26	1.04	–0.33	–0.21	3.40	0.05
Health Care	–0.90	0.94	1.65	7.09	–0.87	–0.25	–3.25	–1.88
Industrials	–0.18	–0.48	0.28	1.17	–0.08	0.54	2.11	0.62
Information Technology	–0.46	0.26	–0.20	–2.11	–0.11	–0.63	–1.55	–0.27
Materials	0.55	–0.29	–0.14	–0.02	0.26	0.87	3.03	0.28
Telecommunication Services	0.98	–0.43	2.42	0.15	0.95	1.50	1.97	0.52
Utilities	0.22	–0.91	–0.71	–1.82	0.12	2.42	3.59	1.24
Company Management (46 Factors)								
Consumer Discretionary	0.11	–0.24	0.70	1.75	0.18	1.17	1.88	0.31
Consumer Staples	0.16	–0.30	1.72	4.37	0.37	1.48	5.97	0.28
Energy	0.30	0.15	0.51	1.71	0.47	–0.37	–0.04	–0.29
Financials	0.19	0.26	–0.01	2.05	–0.09	–0.78	–0.59	–0.74
Health Care	–0.19	0.06	–0.22	–0.13	–0.24	1.09	1.41	–0.09
Industrials	0.10	–0.05	1.12	1.29	0.05	–0.24	–0.23	–0.01
Information Technology	0.01	–0.45	0.31	0.15	0.00	1.75	1.48	0.56
Materials	–0.07	0.10	0.11	–0.15	–0.13	–0.12	0.04	–0.18
Telecommunication Services	0.60	–0.42	0.03	2.64	0.26	2.04	2.91	0.82
Utilities	1.07	–0.32	1.66	2.55	0.48	1.05	2.85	0.79
Market Behavior (41 Factors)								
Consumer Discretionary	–0.03	0.14	–0.30	–0.36	–0.10	–0.52	–1.36	–0.25
Consumer Staples	0.42	0.04	1.01	3.59	0.59	0.78	4.27	0.05
Energy	–0.14	–0.02	–0.48	–1.99	–0.02	0.37	–0.90	0.30
Financials	0.54	–0.25	1.48	4.56	0.70	0.47	1.55	0.22
Health Care	–0.27	0.19	–1.12	–2.21	–0.73	0.44	1.89	–0.29
Industrials	0.11	–0.09	0.02	0.51	0.00	0.19	0.05	0.04
Information Technology	–0.22	–0.25	–1.12	–1.50	–0.47	0.63	0.63	0.24
Materials	0.12	0.01	0.04	2.40	–0.12	0.60	0.85	–0.01
Telecommunication Services	–0.07	0.27	0.76	0.53	0.19	–0.06	0.49	–0.21
Utilities	–0.18	0.21	2.62	7.77	0.92	–0.74	2.52	–0.06
Company Specific (5 Factors)								
Consumer Discretionary	–0.14	–0.21	–0.36	–1.21	–0.41	–0.58	–3.40	–0.01
Consumer Staples	1.01	0.25	3.06	7.28	0.69	–1.82	1.94	–0.43
Energy	–0.32	–0.46	–1.46	–2.18	–0.16	1.90	0.49	0.36
Financials	0.17	0.35	0.76	1.70	0.75	–0.51	–3.16	–0.38
Health Care	0.21	1.04	1.31	5.83	0.58	–0.73	0.24	–0.96
Industrials	–0.08	–0.42	0.07	–1.46	–0.38	1.68	0.97	0.30
Information Technology	–1.05	–1.76	–3.96	–3.16	–2.00	5.74	7.52	0.97
Materials	–0.06	–0.50	0.44	–0.97	–0.38	1.60	2.67	0.66
Telecommunication Services	1.98	0.30	1.52	1.21	1.69	1.40	–0.97	0.39
Utilities	2.67	–0.30	5.23	7.04	4.44	2.04	4.61	0.21

Notes: BVA and TAV in annualized percentage terms. Data as presented based on backtest results for the period December 31, 1987 to June 30, 2016. See Appendix C for a complete list of factors.

Sources: Compustat, FactSet Research Systems Inc.

ENDNOTE

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