Nothing Lasts Forever (and Everywhere): *Fundamental Indexation at the Global Level*

Adam Zaremba and Tomasz Miziołek

Adam Zaremba
is an associate professor at the University of Dubai in Dubai, UAE, and Poznan University of Economics and Business in Poznan, Poland, and a visiting assistant professor in the DeGroote School of Business of the McMaster University in Hamilton, ON, Canada.
adam.zaremba@ue.poznan.pl

Tomasz Miziołek
is an associate professor in the Institute of International Economics at the University of Lodz in Lodz, Poland.
miziolek@uni.lodz.pl

Fundamental indexation has recently become a sort of holy grail of portfolio construction. This relatively new approach to indexing relies on weighting portfolio constituents according to fundamental variables, such as book value, net income, dividends, or employment (Arnott, Hsu, and Moore [2005]). A large number of studies have shown that fundamental indexation produces a risk–return profile that is superior to classical capitalization-weighted portfolios, with only a small increase in turnover and trading costs.[1] Although the first fundamental indexes were put into practice in the 1990s (e.g., by Goldman Sachs and Global Wealth Allocation [GWA]), their popularity really grew during the last decade. Fundamentally indexed portfolios formed the backbone for many investment vehicles, including exchange-traded funds (ETFs) and structured products, in particular.

The seminal study by Arnott, Hsu, and Moore [2005] concluded that investors in the U.S. equity market should weight their portfolio components on some fundamental variables rather than on market values. However, when investors decide to go global, should they do the same? Should they abandon the traditional value-weighting schemes and weight the ETFs or index funds in their portfolios according to the country-level fundamentals? Would this approach be as beneficial as it is at the stock level? These are the major questions that we aim to address in this article.

This study takes a novel approach to fundamental indexation and brings it to the global level, examining whether this concept could be used to form a portfolio of entire countries. In other words, we investigate whether fundamental indexing is a valuable technique for international diversification that can provide risk-adjusted performance superior to that of classic value-weighted portfolios. To this end, we form fundamentally weighted portfolios of country equity indexes based on six fundamental measures: book value; net income; revenues; dividends; earnings before interest, tax, depreciation and amortization (EBITDA); and cash flow. We examine these portfolios with country-level versions of the capital asset pricing model (CAPM; Sharpe [1964]) and the three-factor model of Fama and French [1993]. We conduct our calculations within a sample of 71 equity markets that include developed, emerging, and frontier markets for the years 1995–2017.

Our research aims to contribute in three ways. First, we examine fundamental indexation in a new universe of entire countries instead of stocks. Earlier studies were conducted almost exclusively in the universe of individual equities, confirming the overperformance of fundamental indexation in both developed (e.g., Arnott, Hsu, and Moore

[2005]; Tamura and Shimizu [2005]; Hsu and Campolo [2006]) and emerging (e.g., Walkshäusl and Lobe [2010]) markets. Meanwhile, Angelidis and Tessaromatis [2014] argued that the major international quantitative portfolio strategies, including value, size, or momentum, could be implemented with index futures or country ETFs. Such country-level strategies capture the primary benefits of factor strategies used for individual equities. Angelidis and Tessaromatis [2014] indicated that, given the costs and complex issues involved in factor strategies in stocks, the country-level strategies form a highly practical alternative.[2]

We are aware of only two studies that attempted to apply fundamental weights at the country level: those by Estrada [2008] and Yan and Zhao [2013]. Estrada [2008] examined the use of dividends as weights within a sample of 16 country indexes, representing predominantly developed markets, for the years 1973–2005. He concluded that dividend-based weighting resulted in higher long-run returns than a capitalization-based weighting scheme. Yan and Zhao [2013] extended the geographical scope to 46 countries while restricting the research period to 1998–2010 and included an additional earnings-based strategy. Their results confirmed the earlier findings of Estrada [2008] regarding the superiority of fundamental weighting. In comparison to these studies, our research is markedly more comprehensive regarding the number of weighting variables tested (seven strategies, most of them never before tested), geographical scope (71 markets, including frontier equities), and timeliness of the research period (1995–2017).

Second, we explore whether the country-level fundamental indexation is equally useful in developed, emerging, and frontier markets. Hsu et al. [2007] and Arnott and Shepherd [2010] argued that fundamental weighting has an additional advantage in less-developed markets as a result of low informational efficiency. We believe our article is the first to study this issue in the context of international index-based diversification.

Third, we also contribute by examining the source of the benefits of fundamental indexation at the global level. Although most studies indicate a superior risk–return profile with the fundamental weights versus the capitalization-based weights, some argue that the abnormal performance could be attributed to certain investment styles, including value and size investing (Blitz and Swinkels [2008]).[3] This observation implies that any above-average payoffs result from additional exposure to value and size premiums. Our article may be the first to test whether a parallel explanation could also be formulated at the country level. Both value and size effects are observable in country portfolios—that is, small countries outperform large ones (Keppler and Traub [1993]; Keppler and Encinosa [2011]) and countries with low price-to-fundamental ratios outperform countries with high price-to-fundamental ratios (Macedo [1995]; Kim [2012]). We examine whether these global return patterns can explain the benefits of country-level fundamental indexation.

The primary findings of this article can be summarized as follows: First, we demonstrate the advantages of fundamental indexation at the global level. Indeed, this approach results in superior risk–return performance, but the significant benefits are recorded only in limited market segments (i.e., in emerging and frontier markets) and are highly time varying. The overperformance is robust to adjustment for trading costs. Second, we show that the abnormal returns on the fundamentally indexed portfolios, as well as their time-series variations, are driven almost purely by exposure to country-level value and size effects. After controlling for the contribution of these effects, the fundamentally indexed portfolios display no significant alphas.

The remainder of the article is organized as follows: The next section discusses the data sources and sample preparation; subsequently, we outline the research methods and report the study results; finally, the last section concludes the article.

DATA SOURCES AND SAMPLE PREPARATION

This research is based on international equity markets covered by MSCI [2016]. This approach ensures the practical applicability of this research because most developed and emerging countries are covered by liquid single-country ETFs that track MSCI indexes. The stock market and accounting data are obtained from the Bloomberg database. The study relies on a monthly time series, and the sample period runs from May 1995 to February 2017. To ensure consistent comparison of various portfolio formation strategies, the stock market is included in the sample at month t when it is possible to compute all its characteristics as required to form and evaluate all the fundamentally indexed portfolios. The variables required include total stock market capitalization, book value, and the cumulative 12–month trailing

values of earnings (net income), revenues, dividends, EBITDA, and cash flow from operations.[4] Our final sample is composed of 71 countries, including developed, emerging, and frontier markets. An overview of the sample is presented in the Appendix.

The initial market data are collected in their local currencies and subsequently converted to U.S. dollars to obtain a pooled international sample. To ensure consistency with the U.S. dollar approach, the risk-free rate is the one-month Treasury bill rate sourced from Kenneth R. French's website.[5]

RESEARCH METHODS

We test the performance of seven different fundamentally weighted portfolios of country equity indexes. In other words, the portfolios are formed of entire indexes representing countries, and not of individual stocks. Each month we weight the portfolio returns according to their most recent 1) book value of equity (*Book value*); 2) cumulative 12–month trailing net income (*Earnings*); 3) cash flow from operations (*Cash flow*); 4) EBITDA (*EBITDA*); 5) revenues (*Revenues*); and 6) dividends. Additionally, we weight portfolios based on 7) the average of these six variables (*Average*). Moreover, we build standard capitalization-weighted portfolios that we use as a benchmark for performance evaluation. All portfolios are reformed and rebalanced monthly. Subsequently, we calculate the portfolio returns on a gross basis (i.e., unadjusted for taxes).

One of the important traits of fundamental indexation is the cost efficiency of this approach. Therefore, we also control for the effect of trading costs on performance. First, we calculate the monthly turnover—based on the formula of Cincarini and Kim [2006]—interpreted as the sum of the absolute value of all trades across all available assets necessary to reform the portfolio. The detailed historical data on bid–ask spreads and commissions are not always available, especially in emerging and frontier markets, so we use a simplified approach in style of Balduzzi and Lynch [1999]; Chiyachantana et al. [2004]; DeMiguel, Garlappi, and Uppal [2009]; or Yan and Zhao [2013]. We assume a transaction cost of 50 bps per one-way trading cost and calculate total trading costs as the portfolio turnover multiplied by 0.5%. Finally, we compute the monthly cost-adjusted returns as the raw returns diminished by the trading costs.

We evaluate the performance of the fundamentally weighted portfolios with two-factor pricing models. First, we use the traditional CAPM (Sharpe [1964]), according to which asset returns depend solely on the market portfolio.[6] It is based on the following regression:

$$R_{i,t} = \alpha_{CAPM,i} + \beta_{MKT,i} R_{MKT,t} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ and $R_{MKT,t}$ are returns on the analyzed asset i and the market portfolio in month t, and $\alpha_{CAPM,i}$ and $\beta_{MKT,i}$ are regression parameters. The intercept $\alpha_{CAPM,i}$ (Jensen's alpha) measures the average abnormal return, and $\beta_{MKT,i}$ is the exposure to stock market risk. The returns on the market portfolio $R_{MKT,t}$ are always calculated in a way that is consistent with the formation procedures of the fundamentally indexed portfolio being examined. In other words, we apply monthly rebalancing and adjust for trading costs when we evaluate transaction cost–adjusted payoffs on the fundamental indexation strategies.

The second model we employ is in the style of the Fama and French [1993] three-factor model, which also considers the size and value factors. The motivation for using this model is to check whether the size and value effects are sufficient to explain any potential abnormal returns on fundamentally indexed portfolios. This weighing scheme typically is bent toward small and value stocks. Thus, our second model is represented by the following regression equation:

$$R_{i,t} = \alpha_{3F,i} + \beta_{MKT,i} R_{MKT,t} + \beta_{SMB,i} R_{SMB,t} + \beta_{HML,i} R_{HML,t} + \varepsilon_{i,t} \quad (2)$$

where $\beta_{SMB,i}$ and $\beta_{HML,i}$ are exposures to small minus big (SMB) and high minus low (HML) factors representing the country-level size and value effects, respectively, and $\alpha_{3F,i}$ and $\beta_{MKT,i}$ are the remaining model parameters, where $\beta_{MKT,i}$ is analogous to the CAPM beta in Equation (2) but not equal to it. The return on the SMB factor at time t ($R_{SMB,t}$) is the return on long–short zero-investment portfolios that are long (short) the small (large) markets in terms of capitalization, and the return HML factor ($R_{HML,t}$) is long (short) the high book-to-market (B/M) (low B/M) country indexes. Unlike in most studies, we do not form standard quantile long–short portfolios. Instead, we build zero-investment portfolios weighted according to the value of return predictive variables—a

natural logarithm of the market value for SMB and a B/M ratio for the HML. Specifically, the weight of a country index $i = 1, \ldots, N$ at time t with a corresponding return predictive variable $V_{i,t}$ is given by:

$$w_{i,t}^{V} = c_t \left(V_{i,t} - \frac{\Sigma_{i=1}^{N} V_{i,t}}{N} \right) \tag{3}$$

where the weights across all indexes sum to zero, forming a zero-investment long–short portfolio. The parameter c_t is a scaling factor such that the overall portfolio is scaled to $1 long and $1 short. The return on the factor portfolios is then:

$$R_{i,t}^{V} = \Sigma_{i=1}^{N} w_{i,t}^{V} R_{i,t} \tag{4}$$

where V is the logarithm of the total stock market capitalization of an index and the B/M ratio for the SMB and HML factors, respectively.[7]

We are also interested in whether the results hold for markets at various stages of development. Therefore, we replicate the examinations within the subsamples of the developed, emerging, and frontier markets. For each month, we classify the markets according to the MSCI classification, also considering all the migrations that took place in the study period (MSCI [2016]). Additionally, we test the performance within the subperiods of the full research period.

RESULTS

Exhibit 1 demonstrates the performance of the country-level fundamentally indexed portfolios. The results may seem a bit disappointing. Within the full sample (Exhibit 1, Panel A), no portfolio displays any returns that significantly differ from the value-weighted global portfolio. The Sharpe ratios are essentially the same across all the specifications, and the fundamentally weighted strategies do not deliver positive and significant alphas. Interestingly, these outcomes are inconsistent with the findings of Estrada [2008] and Yan and Zhao [2013], who documented overperformance of portfolios with weights related to earnings and dividends. The source of this discrepancy very likely lies in the different sample periods used, which we will explain in more detail later.

When we consider the outcomes for the developed markets only (Exhibit 1, Panel B), there is still no visible outperformance—the alphas are basically equal to zero. However, the situation changes when we focus on the emerging markets (Exhibit 1, Panel C). In this case, four out of the seven variables used to weight portfolio components—EBITDA, revenues, dividends, and the aggregate valuation measure—produced significant alphas from the CAPM. The abnormal returns range from 0.08 to 0.13, and the best approach is to weight stocks on EBITDA. Interestingly, this observation is consistent with the findings of Gray and Vogel [2012] and Zaremba [2016a], who showed that for both individual stocks and equity indexes, the EBITDA-based multiple wins the horse race for the best return predictor across the valuation ratios. Nevertheless, in the case of the four outperforming weighting variables, although their outperformance in terms of Sharpe ratios is relatively modest (0.52–0.54 versus 0.47 for the value-weighted portfolio), the portfolio turnover is almost identical to that in the classical cap-weighted global portfolio (with the exception of weighting on cash flow, where it is clearly higher). Consequently, the CAPM alphas remain positive and significant, spanning from 0.07 to 0.13 even after accounting for trading costs.

Finally, Panel D of Exhibit 1 reports the results regarding the frontier markets. In this case, the performance of all the fundamentally weighted portfolios is far superior to the standard approach. The Sharpe ratios are at least 50% higher, ranging from 0.51 to 0.61 as compared to only 0.35 for the cap-weighted portfolio, and the alphas vary from 0.33 to 0.51. Importantly, this enhanced-weighting approach not only results in higher profits but also in slightly lower volatility of the payoffs. Furthermore, the portfolio turnover is only marginally higher for the fundamental weighting (only in the case of weighting on cash flow is it definitely higher), so the positive abnormal returns still markedly depart from zero even after adjusting for transaction costs. The post-cost monthly alphas range from 0.30 (cash flow) to 0.50 (revenues).[8]

To summarize, we demonstrate that fundamental weighting in the global setting is beneficial only in the frontier and, to some extent, emerging markets. This observation is consistent with the arguments of Hsu et al. [2007] and Arnott and Shepherd [2010], who suggested that fundamental indexation should work better in less-developed markets. Notably, this finding also indirectly confirms our expectations that the benefits of fundamental weighting are driven by additional

EXHIBIT 1

Performance of Fundamentally Weighted Portfolios of Countries

	Market Cap.	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Panel A: Full Sample								
R	0.61	0.63	0.62	0.65	0.63	0.63	0.61	0.62
Vol	4.60	4.73	4.71	4.75	4.69	4.65	4.71	4.69
SR	0.46	0.46	0.46	0.47	0.47	0.47	0.45	0.46
$\alpha_{CAPM\text{-}R}$		0.01	0.00	0.03	0.02	0.02	–0.01	0.00
		(*0.33*)	(*0.02*)	(*1.08*)	(*0.77*)	(*0.68*)	(*–0.29*)	(*0.05*)
Turn	3.22	4.33	3.99	5.92	3.83	3.63	3.49	3.46
$\alpha_{CAPM\text{-}A}$		0.00	0.00	0.01	0.01	0.02	–0.01	0.00
		(*0.06*)	(*–0.11*)	(*0.50*)	(*0.62*)	(*0.60*)	(*–0.33*)	(*–0.01*)
Panel B: Developed Markets								
R	0.59	0.58	0.57	0.61	0.59	0.60	0.58	0.58
Vol	4.48	4.52	4.54	4.57	4.54	4.53	4.62	4.58
SR	0.46	0.44	0.43	0.46	0.45	0.46	0.43	0.44
$\alpha_{CAPM\text{-}R}$		–0.01	–0.02	0.01	0.00	0.00	–0.03	–0.02
		(*–0.73*)	(*–0.90*)	(*0.28*)	(*–0.26*)	(*0.00*)	(*–1.00*)	(*–0.97*)
Turn	2.51	3.49	3.09	5.00	2.99	3.04	2.90	2.84
$\alpha_{CAPM\text{-}A}$		–0.02	–0.03	–0.01	–0.01	0.00	–0.03	–0.02
		(*–1.05*)	(*–1.03*)	(*–0.37*)	(*–0.40*)	(*–0.10*)	(*–1.06*)	(*–1.04*)
Panel C: Emerging Markets								
R	0.89	0.96	0.96	1.02	1.04	1.03	0.95	0.98
Vol	6.54	6.91	6.70	6.81	6.71	6.72	6.38	6.52
SR	0.47	0.48	0.50	0.52	0.54	0.53	0.52	0.52
$\alpha_{CAPM\text{-}R}$		0.03	0.05	0.10	0.13**	0.12**	0.08**	0.09***
		(*0.56*)	(*1.09*)	(*1.54*)	(*2.41*)	(*2.21*)	(*2.24*)	(*2.66*)
Turn	6.40	7.31	6.50	8.98	6.82	6.24	7.05	6.37
$\alpha_{CAPM\text{-}A}$		0.03	0.05	0.09	0.13**	0.12**	0.07**	0.09***
		(*0.50*)	(*1.12*)	(*1.32*)	(*2.38*)	(*2.26*)	(*2.11*)	(*2.64*)
Panel D: Frontier Markets								
R	0.69	0.95	0.96	0.96	1.06	1.09	1.05	1.04
Vol	6.89	6.37	6.40	6.54	6.35	6.16	6.34	6.28
SR	0.35	0.52	0.52	0.51	0.58	0.61	0.57	0.57
$\alpha_{CAPM\text{-}R}$		0.34**	0.34**	0.33**	0.46***	0.51**	0.44**	0.44**
		(*2.44*)	(*2.27*)	(*1.99*)	(*2.72*)	(*2.36*)	(*2.03*)	(*2.25*)
Turn	4.92	5.61	5.03	8.46	5.46	5.42	5.03	4.90
$\alpha_{CAPM\text{-}A}$		0.33**	0.34**	0.30*	0.45***	0.50**	0.44**	0.44**
		(*2.39*)	(*2.25*)	(*1.79*)	(*2.68*)	(*2.32*)	(*2.01*)	(*2.23*)

Notes: The exhibit reports the performance (unadjusted for trading costs) of portfolios of country equity indexes according to the market capitalization and six alternative fundamental variables: earnings, book value, cash flow, EBITDA, revenues, and dividends. Additionally, Average *is the portfolio formed on the average of these six fundamental variables.* R *is the mean monthly excess return,* Vol *is the standard deviation of monthly excess returns,* SR *is the monthly Sharpe ratio,* Turn *is the average monthly portfolio turnover, and* $\alpha_{CAPM\text{-}R}$ *and* $\alpha_{CAPM\text{-}A}$ *are the intercepts from the CAPM based on raw and trading cost-adjusted excess returns.* Mean, Volatility, Turn, $\alpha_{CAPM\text{-}R}$, *and* α_{CAPM} *are expressed as percentages. The numbers in brackets are Newey–West [1987] adjusted* t*-statistics.*

, **, and * indicate values significantly different from zero at the 10%, 5%, and 1% levels, respectively.*

exposure to the value factor. Zaremba [2016b] showed that the value effect across countries stems almost exclusively from emerging markets. Moreover, also in line with our observations, he found that the phenomena of cross-sectional relations were strongest for the EBITDA and revenue-based multiples.

In Exhibit 2, we additionally report pairwise correlation coefficients between the returns on fundamentally

EXHIBIT 2

Correlation Coefficients between Returns on Fundamentally Weighted Portfolios of Countries

	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Panel A: Full Sample							
Market cap.	0.998	0.995	0.998	0.998	0.997	0.997	0.998
Earnings		0.997	0.997	0.997	0.995	0.998	0.998
Book value			0.997	0.997	0.995	0.997	0.998
Cash flow				0.999	0.998	0.997	0.998
EBITDA					0.999	0.997	0.999
Revenues						0.995	0.997
Dividends							0.999
Panel B: Developed Markets							
Market cap.	0.998	0.996	0.997	0.998	0.996	0.996	0.997
Earnings		0.996	0.996	0.997	0.993	0.997	0.997
Book value			0.997	0.997	0.997	0.997	0.999
Cash flow				0.999	0.997	0.996	0.998
EBITDA					0.999	0.997	0.999
Revenues						0.994	0.997
Dividends							0.999
Panel C: Emerging Markets							
Market cap.	0.980	0.959	0.936	0.966	0.969	0.990	0.985
Earnings		0.979	0.954	0.983	0.980	0.984	0.988
Book value			0.980	0.994	0.992	0.970	0.988
Cash flow				0.977	0.976	0.958	0.974
EBITDA					0.995	0.977	0.992
Revenues						0.980	0.993
Dividends							0.996
Panel D: Frontier Markets							
Market cap.	0.722	0.699	0.687	0.664	0.582	0.688	0.693
Earnings		0.972	0.980	0.972	0.909	0.966	0.978
Book value			0.977	0.969	0.869	0.927	0.950
Cash flow				0.962	0.886	0.941	0.959
EBITDA					0.943	0.956	0.972
Revenues						0.951	0.954
Dividends							0.997

Notes: The exhibit reports the pairwise Pearson-moment correlation coefficients between the returns on portfolios of country equity indexes according to the market capitalization and six alternative fundamental variables: earnings, book value, cash flow, EBITDA, revenues, and dividends. Additionally, Average *is the portfolio formed on the average of these six fundamental variables.*

weighted portfolios. A quick eyeball test reveals that the correlations are very high. Clearly, the portfolios have very similar weights, so they also display strong correlation. The coefficients are particularly elevated in developed markets (Exhibit 2, Panel B), but even in the frontier, they amount on average to 0.88.

Exhibit 3 depicts the benefits of fundamental weighting within two subperiods: January 1995–October 2007 (Exhibit 3, Panel A) and November 2007–February 2017 (Exhibit 3, Panel B). The subperiods were divided by the peak of the bull market on the MSCI World Index in 2007. Our analysis uncovers an interesting pattern: The advantages of fundamental indexation at the country level are limited almost solely to the pre-peak period. In the years 2007–2017, no significant benefits are visible.

The abnormal payoffs on the fundamentally weighted portfolios in years 1995–2007 were particularly notable in the frontier markets. In this geographical segment, all of the examined variables that underlie

EXHIBIT 3

Performance of Fundamentally Weighted Portfolios of Countries within Subperiods

	Market Cap.	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Panel A: January 1995–October 2007								
Full Sample								
R	0.78	0.82	0.84	0.89	0.86	0.85	0.83	0.84
Vol	4.12	4.20	4.21	4.22	4.19	4.21	4.12	4.15
SR	0.66	0.68	0.69	0.73	0.71	0.70	0.70	0.70
α_{CAPM}		0.03	0.05	0.09***	0.07***	0.06*	0.05*	0.06**
		(*1.15*)	(*1.09*)	(*3.98*)	(*3.12*)	(*1.65*)	(*1.77*)	(*2.45*)
Developed Markets								
R	0.73	0.72	0.75	0.79	0.78	0.79	0.76	0.77
Vol	4.09	4.09	4.13	4.13	4.13	4.15	4.09	4.10
SR	0.62	0.61	0.63	0.66	0.65	0.66	0.64	0.65
α_{CAPM}		–0.01	0.01	0.05**	0.04**	0.05	0.03	0.04*
		(*–0.31*)	(*0.37*)	(*2.27*)	(*2.44*)	(*1.27*)	(*1.24*)	(*1.73*)
Emerging Markets								
R	1.54	1.67	1.68	1.79	1.82	1.75	1.62	1.68
Vol	6.05	6.58	6.18	6.23	6.16	6.32	5.83	6.02
SR	0.88	0.88	0.94	1.00	1.02	0.96	0.96	0.97
α_{CAPM}		0.04	0.12**	0.22***	0.27***	0.16*	0.15**	0.15***
		(*0.32*)	(*2.10*)	(*3.64*)	(*3.66*)	(*1.74*)	(*2.14*)	(*3.58*)
Frontier Markets								
R	1.46	2.14	2.19	2.22	2.34	2.57	2.52	2.46
Vol	8.67	7.77	7.64	7.80	7.63	7.53	7.65	7.63
SR	0.58	0.95	0.99	0.99	1.06	1.18	1.14	1.12
α_{CAPM}		0.89***	0.97***	0.98***	1.13***	1.39***	1.31***	1.25***
		(*3.92*)	(*4.16*)	(*4.18*)	(*4.12*)	(*3.55*)	(*3.34*)	(*3.60*)
Panel B: November 2007–February 2017								
Full Sample								
R	0.39	0.39	0.34	0.35	0.34	0.34	0.34	0.34
Vol	5.16	5.33	5.27	5.34	5.26	5.16	5.36	5.30
SR	0.26	0.25	0.22	0.23	0.22	0.23	0.22	0.22
α_{CAPM}		–0.02	–0.06*	–0.06	–0.05*	–0.05	–0.07**	–0.06**
		(*–0.57*)	(*–1.90*)	(*–1.63*)	(*–1.85*)	(*–1.42*)	(*–2.15*)	(*–2.41*)
Developed Markets								
R	0.41	0.41	0.36	0.38	0.36	0.35	0.35	0.35
Vol	4.93	5.02	5.01	5.08	5.01	4.97	5.21	5.12
SR	0.29	0.28	0.25	0.26	0.25	0.24	0.23	0.24
α_{CAPM}		–0.01	–0.06***	–0.04	–0.06**	–0.06**	–0.09**	–0.08***
		(*–0.69*)	(*–2.59*)	(*–1.53*)	(*–2.23*)	(*–2.33*)	(*–2.17*)	(*–2.68*)
Emerging Markets								
R	0.32	0.34	0.33	0.33	0.35	0.39	0.35	0.35
Vol	6.92	7.16	7.10	7.24	7.12	7.01	6.81	6.90
SR	0.16	0.16	0.16	0.16	0.17	0.19	0.18	0.18
α_{CAPM}		0.01	0.00	0.01	0.03	0.07	0.04	0.04
		(*0.17*)	(*0.03*)	(*0.07*)	(*0.40*)	(*1.05*)	(*0.88*)	(*0.90*)

(continued)

EXHIBIT 3 *(continued)*

Performance of Fundamentally Weighted Portfolios of Countries within Subperiods

	Market Cap.	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Frontier Markets								
R	0.29	0.32	0.31	0.29	0.39	0.31	0.27	0.30
Vol	5.74	5.42	5.57	5.69	5.47	5.17	5.42	5.33
SR	0.18	0.20	0.19	0.18	0.25	0.21	0.17	0.19
α_{CAPM}		0.06	0.04	0.02	0.13	0.07	0.01	0.04
		(*0.50*)	(*0.44*)	(*0.17*)	(*1.06*)	(*0.42*)	(*0.13*)	(*0.55*)

Notes: The exhibit reports the performance (unadjusted for trading costs) of portfolios of country equity indexes according to the market capitalization and six alternative fundamental variables: earnings, book value, cash flow, EBITDA, revenues, and dividends. Additionally, Average *is the portfolio formed on the average of these six fundamental variables. The calculations were performed for two separate subperiods: January 1995–October 2007 (Panel A) and November 2007–February 2017 (Panel B).* R *is the mean monthly excess return,* Vol *is the standard deviation of monthly excess returns,* SR *is the monthly Sharpe ratio, and* α_{CAPM} *is the intercept from the CAPM.* Mean, Volatility, *and* α_{CAPM} *are expressed as percentages. The numbers in brackets are Newey–West [1987] adjusted* t*-statistics.*

, **, and * indicate values significantly different from zero at the 10%, 5%, and 1% levels, respectively.*

the fundamental weights delivered significant CAPM alphas, ranging from 0.89 (weighting on earnings) to 1.39 (weighting on revenues). These portfolios had Sharpe ratios almost twice as high as the value-weighted portfolio. However, most of the portfolios in emerging markets, and even three portfolios in developed markets (weighted on cash flows, EBITDA, and the averaged value measure), also revealed positive and significant alphas. In the full sample of all the researched countries, five of the seven portfolios—formed on cash flows, EBITDA, revenues, dividends, and the aggregated measures—showed positive alphas.

The situation in the latter subperiod was completely different. No single portfolio in any of the geographical segments showed positive abnormal returns. Moreover, numerous portfolios in developed markets, and consequently also in the full sample, were characterized by negative abnormal returns. The strategy of fundamental indexation evidently failed in the post–2007 period.[9]

So far, our results demonstrate that fundamental indexation works well only in specific market segments (frontier, emerging markets) and periods (pre-2007 peak). We suppose that this phenomenon may result from varying profits on the underlying risk factors driving the profitability of international fundamental indexation—country-level value and momentum effects. As Zaremba [2016b] found, these factor premiums are largely a compensation for bearing country-specific risk (e.g., political, sovereign, economic) for international investors. Thus, perhaps the pricing of this risk changed in the course of the waves of bull and bear markets in global equities, influencing the profitability of value and size strategies and, consequently, also that of international fundamental indexation. This point of view is consistent with the rich empirical and anecdotal evidence that the factor premiums, including size and value, are not stable, but rather time-varying (Asness et al. [2000]; Cohen, Polk, and Vuolteenaho [2003]; Arnott, Beck, and Kalesnik [2016]).

To test this expectation, we examine the fundamentally weighted portfolios with the three-factor model expressed in Equation (4), which accounts not only for the market risk but also for the size and factor premiums. The monthly returns on the asset pricing factors are reported in Exhibit 4. Additionally, Exhibit 5 illustrates the cumulative returns on these factor portfolios in the years 1995–2017.

Exhibit 4 provides interesting insights, particularly on the performance of value premiums. The HML returns were particularly high and significant in two cases. First, when we consider the time split of the research period, the HML return was exceptionally pronounced in the years 1995–2007 when it amounted to 1.81% per month (t-stat = 3.53). Second, considering the geographical split, the return on the HML factor was remarkably profitable in frontier markets, with the mean return equaling 1.30% per month (t-stat = 2.80), whereas the returns on the HML in developed and emerging markets were not significantly different from zero. These observations are perfectly consistent with

EXHIBIT 4
Returns on the Asset Pricing Factors

Panel A: Subperiods

	January 1995–February 2017			January 1995–October 2007			November 2007–February 2017		
	MKT	**SMB**	**HML**	**MKT**	**SMB**	**HML**	**MKT**	**SMB**	**HML**
R	0.61**	0.01	0.87**	0.78**	0.20	1.81***	0.39	–0.21	–0.31
	(*2.07*)	(*0.22*)	(*2.50*)	(*2.00*)	(*0.52*)	(*3.53*)	(*0.76*)	(*–0.82*)	(*–0.98*)
Vol	4.60	3.92	5.45	4.12	4.71	6.44	5.16	2.61	3.57
	Correlation Coefficients			**Correlation Coefficients**			**Correlation Coefficients**		
MKT		0.07	0.16**		0.00	0.12		0.21**	0.24***
		(*1.16*)	(*2.55*)		(*0.02*)	(*1.43*)		(*2.26*)	(*2.68*)
SMB			0.41***			0.46***			0.20**
			(*7.32*)			(*6.25*)			(*2.22*)

Panel B: Geographical Subsamples

	Developed Markets			Emerging Markets			Frontier Markets		
	MKT	**SMB**	**HML**	**MKT**	**SMB**	**HML**	**MKT**	**SMB**	**HML**
R	0.59**	–0.25	0.19	0.62	0.31	0.65	0.15	0.45	1.30***
	(*2.07*)	(*–0.94*)	(*0.76*)	(*1.41*)	(*0.74*)	(*1.41*)	(*0.19*)	(*0.97*)	(*2.80*)
Vol	4.48	3.64	4.43	6.74	6.44	6.97	6.63	7.03	7.21
	Correlation Coefficients			**Correlation Coefficients**			**Correlation Coefficients**		
MKT		0.30***	0.20***		–0.22***	0.18***		–0.60***	–0.04
		(*5.05*)	(*3.35*)		(*–3.50*)	(*2.94*)		(*–9.48*)	(*–0.48*)
SMB			0.57***			0.34***			0.12
			(*11.24*)			(*5.79*)			(*1.47*)

Notes: The exhibit reports the returns on asset pricing factors used in this study: MKT (market excess return), SMB (small minus big), and HML (high minus low). R *is the mean monthly excess return, and* Vol *is the standard deviation of monthly excess returns.* Mean *and* Volatility *are expressed as percentages. The exhibit also shows the Pearson's pairwise correlation coefficients. The numbers in brackets are* t*-statistics. Panel A reports the results for the full study period and two subperiods, and Panel B for the geographical subsamples.*

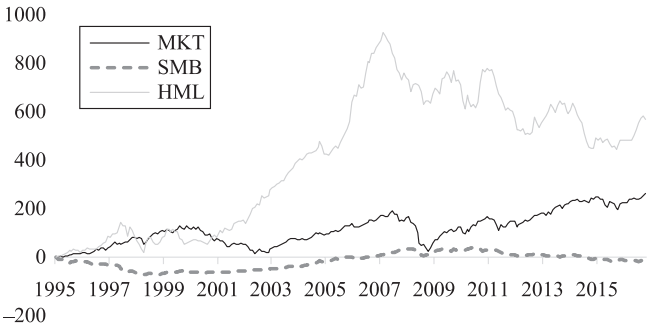
, **, and * indicate values significantly different from zero at the 10%, 5%, and 1% levels, respectively.*

our earlier findings on fundamental indexation, which proved to work well in precisely the same subperiods and subsamples.

Exhibit 6 shows the results of the examinations of the fundamentally weighted portfolios within the full sample (Panel A) as well as in the developed (Panel B), emerging (Panel C), and frontier (Panel D) markets. The results directly confirm our expectation about exposure to the value and size factors, as well as the effect of their time-varying profitability.

Nearly all the portfolios in all the geographical segments shown in Exhibit 6 display significant HML and SMB betas, which translate into substantial exposure to the value and size factors. Furthermore, after controlling for the influence of these factors, hardly any portfolio displayed significant alphas. Only one portfolio of

EXHIBIT 5
Cumulative Returns on Asset Pricing Factors



Notes: The exhibit presents cumulative returns (expressed in %) on asset pricing factors used in this study: MKT (market excess return), SMB (small minus big), and HML (high minus low).

EXHIBIT 6

Examination of the Fundamentally Weighted Portfolios with the Three-Factor Model

	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Panel A: Full Sample							
α_{3F}	0.00	–0.01	0.01	0.00	0.00	–0.01	–0.01
	(*0.06*)	(*–0.54*)	(*0.57*)	(*–0.04*)	(*0.18*)	(*–0.56*)	(*–0.43*)
β_{MKT}	1.02***	1.01***	1.02***	1.01***	1.00***	1.02***	1.01***
	(*159.27*)	(*217.81*)	(*177.91*)	(*220.17*)	(*143.06*)	(*236.23*)	(*280.33*)
β_{SMB}	0.03***	0.05***	0.02***	0.00	–0.01	0.04***	0.03***
	(*5.91*)	(*8.27*)	(*2.69*)	(*0.14*)	(*–1.36*)	(*7.72*)	(*6.72*)
β_{HML}	0.01*	0.02***	0.02***	0.02***	0.02***	0.01	0.01**
	(*1.86*)	(*3.55*)	(*2.98*)	(*4.02*)	(*3.13*)	(*1.05*)	(*1.97*)
Panel B: Developed Markets							
α_{3F}	0.00	0.00	0.01	–0.01	–0.01	0.00	0.00
	(*–0.05*)	(*–0.18*)	(*0.68*)	(*–0.63*)	(*–0.25*)	(*0.08*)	(*–0.17*)
β_{MKT}	1.00***	0.99***	1.01***	1.01***	1.00***	1.01***	1.01***
	(*243.39*)	(*266.45*)	(*159.76*)	(*305.00*)	(*159.97*)	(*209.72*)	(*314.44*)
β_{SMB}	0.03***	0.05***	0.02**	0.00	–0.01	0.07***	0.05***
	(*5.54*)	(*11.66*)	(*2.20*)	(*–1.00*)	(*–1.45*)	(*8.35*)	(*7.89*)
β_{HML}	0.00	0.03***	0.02***	0.03***	0.03***	0.01	0.02***
	(*0.15*)	(*5.84*)	(*3.76*)	(*5.72*)	(*4.24*)	(*1.31*)	(*3.11*)
Panel C: Emerging Markets							
α_{3F}	0.03	0.00	0.06	0.08**	0.08*	0.04	0.05**
	(*0.58*)	(*0.10*)	(*1.27*)	(*2.12*)	(*1.89*)	(*1.41*)	(*2.00*)
β_{MKT}	1.03***	1.01***	1.02***	1.01***	1.01***	0.98***	1.00***
	(*58.99*)	(*143.16*)	(*119.95*)	(*142.33*)	(*138.09*)	(*189.71*)	(*202.84*)
β_{SMB}	–0.01	0.03**	0.00	0.03**	0.02*	0.04***	0.03***
	(*–0.45*)	(*2.35*)	(*–0.21*)	(*2.13*)	(*1.69*)	(*4.01*)	(*3.85*)
β_{HML}	0.04***	0.07***	0.06***	0.06***	0.05***	0.01*	0.03***
	(*2.80*)	(*5.52*)	(*3.55*)	(*6.20*)	(*6.39*)	(*1.90*)	(*5.57*)
Panel D: Frontier Markets							
α_{3F}	0.06	0.07	0.04	0.13	0.11	0.15	0.14*
	(*0.60*)	(*0.69*)	(*0.39*)	(*1.31*)	(*1.10*)	(*1.56*)	(*1.79*)
β_{MKT}	0.96***	0.98***	0.99***	0.96***	0.92***	0.93***	0.93***
	(*28.88*)	(*25.32*)	(*27.62*)	(*37.40*)	(*28.47*)	(*28.48*)	(*32.72*)
β_{SMB}	0.13***	0.15***	0.15***	0.17***	0.16***	0.10***	0.12***
	(*3.75*)	(*3.78*)	(*3.57*)	(*4.93*)	(*5.57*)	(*2.61*)	(*2.98*)
β_{HML}	0.13***	0.12***	0.14***	0.16***	0.20***	0.15***	0.15***
	(*4.79*)	(*4.63*)	(*5.25*)	(*6.01*)	(*6.74*)	(*4.43*)	(*4.95*)

Notes: The exhibit reports the results of the examination of the fundamentally indexed portfolios with the three-factor model. The portfolios are weighted according to six alternative fundamental variables: earnings, book value, cash flow, EBITDA, revenues, and dividends. Additionally, Average *is the portfolio formed on the average of these six fundamental variables.* α_{3F} *is the intercept from the three-factor model.* β_{MKT}, β_{SMB}, *and* β_{HML} *are exposures to MKT (market excess return), SMB (small minus big), and HML (high minus low) factors, respectively.* α_{3F} *is expressed as a percentage. The numbers in brackets are Newey–West [1987] adjusted* t*-statistics.*

, **, and * indicate values significantly different from zero at the 10%, 5%, and 1% levels, respectively.*

frontier equities and three portfolios of emerging equities recorded modest, although significant, intercepts from the CAPM. In other words, the results in Exhibit 6 demonstrate that the exposures to the country-level value and size effects, as well as their time-varying payoffs, almost entirely explain the benefits of fundamental indexation.

Exhibit 7 provides additional insights into the application of the three-factor model to the fundamentally

EXHIBIT 7
Alphas from the Three-Factor Model within Subperiods

	Earnings	Book Value	Cash Flow	EBITDA	Revenues	Dividends	Aggregate
Panel A: January 1995–October 2007							
Full sample	0.01	0.02	0.08***	0.05**	0.06	0.04	0.04**
	(*0.68*)	(*0.62*)	(*3.32*)	(*2.08*)	(*1.37*)	(*1.43*)	(*1.96*)
Developed markets	–0.01	0.00	0.04*	0.02	0.03	0.03*	0.03**
	(*–0.46*)	(*–0.10*)	(*1.93*)	(*1.55*)	(*0.74*)	(*1.86*)	(*2.05*)
Emerging markets	–0.01	0.01	0.14**	0.11	0.04	0.04	0.04
	(*–0.09*)	(*0.17*)	(*2.04*)	(*1.24*)	(*0.40*)	(*0.80*)	(*1.03*)
Frontier markets	–0.25	–0.22	–0.24	–0.15	–0.04	0.02	–0.03
	(*–1.15*)	(*–1.02*)	(*–1.22*)	(*–0.75*)	(*–0.21*)	(*0.15*)	(*–0.15*)
Panel B: November 2007–February 2017							
Full sample	0.00	–0.04	–0.03	–0.04	–0.04	–0.05*	–0.04**
	(*0.05*)	(*–1.43*)	(*–0.88*)	(*–1.48*)	(*–1.50*)	(*–1.90*)	(*–2.05*)
Developed markets	0.00	0.00	0.02	–0.01	–0.01	0.00	–0.01
	(*–0.34*)	(*–0.18*)	(*0.86*)	(*–0.36*)	(*–0.39*)	(*–0.24*)	(*–0.52*)
Emerging markets	0.02	0.01	0.02	0.03	0.08**	0.03	0.04
	(*0.43*)	(*0.19*)	(*0.21*)	(*0.68*)	(*2.01*)	(*0.79*)	(*1.18*)
Frontier markets	0.03	0.00	–0.02	0.09	0.02	–0.02	0.01
	(*0.35*)	(*0.02*)	(*–0.22*)	(*0.87*)	(*0.16*)	(*–0.27*)	(*0.09*)

Notes: The exhibit reports the results of the examination of the fundamentally indexed portfolios with the three-factor model. The portfolios are weighted according to six alternative fundamental variables: earnings, book value, cash flow, EBITDA, revenues, and dividends. Additionally, Average *is the portfolio formed on the average of these six fundamental variables.* α_{3F} *is the intercept from the three-factor model. The numbers in brackets are Newey–West [1987] adjusted* t*-statistics. The calculations were performed for two separate subperiods: January 1995–October 2007 (Panel A) and November 2007–February 2017 (Panel B).*

, **, and * indicate values significantly different from zero at the 10%, 5%, and 1% levels, respectively.*

indexed portfolios. In particular, it presents the three-factor model alphas within the two subperiods that we have already discussed: 1995–2007 and 2007–2017. The results in Exhibit 7 confirm the explanatory power of the value and size factors. Adjusting the returns with the three-factor model leaves hardly any significant abnormal profits on the portfolios. Only a few alphas in the first subperiod and one alpha (out of 28) in the latter subperiod significantly and positively differ from zero. Notably, even in the case of frontier markets in the years 1995–2007, which exhibited such impressive performance in Exhibit 3, no significant return is recorded. Again, these findings confirm that the time-varying profits related to value and size factors at the country level are crucial drivers of the benefits of fundamental indexation.

CONCLUDING REMARKS

The present study examines the applicability of the concept of fundamental indexation to international equity allocation. We show that fundamental indexation at the global level is beneficial only in limited market segments (frontier and some emerging markets) and time periods (1995–2007). This variation derives from variation in pricing of country-specific risk. We demonstrate that the exposure of the fundamentally weighted portfolios to the country-level value and size factors, which compensate for country risk, explains the abnormal payoffs from fundamental indexation. The time-series and cross-sectionally varying value premium is the primary driver of the benefits from the fundamental indexation.

Our research results not only provide new insights into asset pricing in global equity markets, but they also have clear implications for investment managers with international investment mandates. We show how fundamental indexation could be employed for international asset allocation, while also outlining its major pitfalls. This may be especially useful for investment managers who are considering limiting benchmarking based on cap-weighted indexes and, instead, opting for

increasingly popular alternatively weighted indexes. Our study may also be relevant in the context of so-called *collared weighting*, a hybrid approach to weighting that combines some of the benefits of market-cap and fundamental indexing and reduces some of their disadvantages.

Future studies on the issues discussed in this article could be pursued in at least three main directions. First, it would be valuable to extend the investigations to industries and possibly other asset classes, including government and corporate bonds. Second, it would be worth investigating the potential effects of introducing additional criteria or constraints—such as short sales or maximum weights—on fundamental indexation. Third, we have found that the returns on the fundamentally indexed portfolios have deteriorated in recent years and attributed this underperformance to the time-varying value and size premiums. However, alternative points of view might suggest that the cross-country factor premiums disappeared because of investor learning and improved liquidity (Schwert [2003]; Chordia, Roll, and Subrahmanyam [2011]; McLean and Pontiff [2015]) or were a result of data snooping (Evans and Schmitz [2015]). Resolving which of these hypotheses is right would help us to understand the puzzle of recent poor returns on the fundamentally indexed portfolios: whether it is a structural change or only prolonged period of underperformance.

Appendix

Exhibit A1
Research Sample

Country	R	Vol	SR	Skew	Kurt	N	Cap	BM
Argentina	0.57	12.39	0.16	0.24	2.38	177	20.1	1.32
Australia	0.90	6.37	0.49	–0.52	1.43	201	747.0	0.47
Austria	0.65	8.05	0.28	–0.86	3.83	178	61.0	0.85
Bahrain	–1.39	7.51	–0.64	–0.65	2.00	100	5.5	0.84
Bangladesh	0.02	7.55	0.01	–0.70	2.47	76	8.5	0.36
Belgium	0.85	5.25	0.56	–0.27	0.85	177	207.4	0.53
Brazil	1.19	10.35	0.40	–0.14	0.60	202	561.1	0.67
Bulgaria	–0.27	8.14	–0.11	1.01	3.99	85	0.5	2.31
Canada	0.55	5.92	0.32	–0.57	2.27	201	1,046.3	0.48
Chile	0.76	6.23	0.42	–0.30	1.69	218	94.9	0.57
China	0.51	9.70	0.18	0.53	3.38	251	707.3	0.69
Colombia	2.08	8.97	0.80	–0.16	0.32	163	52.1	0.74
Croatia	0.88	6.32	0.48	1.26	3.28	99	9.4	0.99
Czech Republic	1.17	7.57	0.54	–0.23	1.14	173	33.0	0.63
Denmark	0.67	6.04	0.38	–0.76	2.44	170	136.6	0.40
Egypt	1.26	9.98	0.44	0.30	1.58	169	24.1	0.48
Estonia	1.40	9.06	0.54	1.59	7.29	99	1.0	1.24
Finland	0.14	9.02	0.05	–0.07	1.81	193	157.8	0.43
France	0.29	6.01	0.17	–0.47	0.75	206	1,388.7	0.57
Germany	0.27	7.06	0.13	–0.41	1.45	179	1,043.0	0.62
Greece	–0.70	12.05	–0.20	0.05	0.00	50	41.0	0.95
Hong Kong	0.67	7.00	0.33	0.09	3.04	250	387.6	0.73
Hungary	0.84	10.00	0.29	–0.51	1.97	188	19.9	0.67
India	0.85	8.59	0.34	0.08	0.85	259	402.6	0.36
Indonesia	1.56	9.84	0.55	–0.05	2.41	187	131.9	0.36
Ireland	0.14	6.94	0.07	–0.97	1.64	176	60.6	0.56
Israel	0.60	6.68	0.31	–0.15	1.32	215	77.6	0.51
Italy	–0.50	6.77	–0.26	–0.36	0.80	138	507.5	0.68
Japan	0.17	4.79	0.12	–0.13	0.19	177	2,972.1	0.72
Jordan	0.36	6.14	0.20	–0.64	3.39	89	12.3	0.64
Kazakhstan	–0.17	8.16	–0.07	0.47	2.07	77	11.9	1.07
Kenya	1.15	6.87	0.58	–0.22	2.11	99	9.7	0.34
Korea	0.93	8.43	0.38	0.09	0.74	202	569.5	0.86
Kuwait	–0.17	6.39	–0.09	–0.31	0.63	124	70.7	0.59
Latvia	0.76	5.51	0.48	0.55	0.49	48	1.0	1.66
Lebanon	0.70	5.83	0.42	2.61	9.76	42	7.3	0.89
Lithuania	1.10	6.87	0.55	3.48	21.37	97	0.9	0.47
Malaysia	0.71	5.97	0.41	1.01	7.38	207	189.5	0.53
Mexico	0.84	6.62	0.44	–0.58	1.96	201	206.3	0.40
Morocco	0.72	5.50	0.45	0.29	1.47	193	26.2	0.38
Netherlands	0.19	6.03	0.11	–0.99	2.59	150	409.0	0.48
New Zealand	0.81	6.38	0.44	–0.40	0.81	185	18.4	0.61
Nigeria	0.20	7.76	0.09	–0.73	1.27	48	45.9	0.50
Norway	0.90	7.87	0.40	–0.67	2.33	199	149.0	0.63
Oman	–0.07	5.84	–0.04	–1.20	4.59	127	10.5	0.58
Pakistan	1.66	8.49	0.68	–1.20	7.50	177	19.9	0.49
Peru	1.67	8.66	0.67	–0.35	1.50	171	26.4	0.73
Philippines	0.86	7.05	0.42	–0.07	0.82	207	61.7	0.52
Poland	0.85	9.38	0.31	–0.04	0.79	196	77.4	0.66
Portugal	0.05	6.53	0.03	–0.50	1.03	200	48.5	0.56
Qatar	0.75	7.85	0.33	–0.49	1.99	128	86.2	0.48
Romania	1.59	9.70	0.57	0.39	2.27	86	11.1	0.95
Russia	1.10	9.60	0.40	–0.23	0.99	189	432.7	1.11
Saudi Arabia	–1.33	12.13	–0.38	–0.01	–0.94	27	350.7	0.06
Serbia	–0.15	7.20	–0.07	–0.26	0.78	64	1.5	1.58

(continued)

EXHIBIT A1 *(continued)*
Research Sample

Country	R	Vol	SR	Skew	Kurt	N	Cap	BM
Singapore	0.41	7.29	0.19	–0.16	2.43	261	179.8	0.64
Slovenia	–0.01	6.48	–0.01	0.51	2.27	99	4.7	1.44
South Africa	1.00	7.43	0.47	–0.33	0.16	218	256.0	0.43
Spain	0.24	6.98	0.12	–0.18	0.68	188	449.2	0.56
Sri Lanka	0.83	8.92	0.32	2.04	12.20	158	2.9	0.55
Sweden	0.52	7.39	0.24	–0.24	1.81	190	345.3	0.47
Switzerland	0.72	4.80	0.52	–0.57	0.31	152	913.1	0.40
Taiwan	0.55	7.51	0.25	0.19	0.89	218	411.3	0.53
Thailand	1.29	7.72	0.58	–0.11	2.35	186	145.0	0.49
Trinidad and Tobago	0.75	2.89	0.90	0.36	0.87	71	3.1	0.66
Turkey	1.67	14.10	0.41	0.56	3.33	185	103.2	0.56
Ukraine	–1.22	12.16	–0.35	0.18	0.76	82	2.9	1.68
United Arab Emirates	–0.53	9.82	–0.19	–0.50	0.73	108	86.3	0.72
United Kingdom	0.45	4.41	0.35	–0.43	1.74	251	2,051.9	0.45
United States	0.64	4.34	0.51	–0.64	1.05	261	11,288.0	0.35
Vietnam	0.38	7.39	0.18	–0.03	0.74	96	19.3	0.40
Average	0.56	7.64	0.27	–0.03	2.38	154	422.8	0.69

Notes: The exhibit presents the sample of country equity markets examined in this study. R *is the mean monthly excess return,* Vol *is the standard deviation of monthly excess returns,* SR *is the monthly Sharpe ratio,* Skew *is the skewness,* Kurt *is the kurtosis,* N *is the number of monthly observations,* Cap *is the average market capitalization of the index portfolios, and* BM *is the average B/M ratio of an index portfolio.*

ENDNOTES

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[1]See Arnott, Hsu, and Moore [2005]; Tamura and Shimizu [2005]; Hsu and Campolo [2006]; Walkshäusl and Lobe [2010]; and Zaremba and Miziołek [2017]. For comprehensive literature surveys, see Chow et al. [2011]; Amenc, Goltz, and Lodh [2012]; and Bolognesi and Pividori [2016].

[2]A similar argument was put forward by de Boer, Campagna, and Norman [2014], who examined low-volatility strategies in an international setting. Although this is a different type of strategy, the conclusions are almost identical. These authors argued that the low-volatility anomaly can be largely attributed to country and sector selection and showed that a country-sector selection approach mitigates many of the implementation difficulties associated with the stock selection portfolio. They indicated that country-level strategies are a more practical method than individual stock selection for capturing the benefits of low-volatility investing.

[3]See also Asness [2006]; Jun and Malkiel [2008]; Asness et al. [2015]; Perold [2007]; Tabner [2012]; and Fisher, Shah, and Titman [2015]. Furthermore, Bolognesi and Pividori [2016] provide additional literature review.

[4]To avoid look-ahead bias, we use capitalizations and dividends calculated as of the end of month $t - 1$ and accounting data from the end of month $t - 5$. The index-level accounting data were sourced directly from Bloomberg. The Bloomberg calculation procedure assumes that the accounting data of constituent companies are weighted according to the index methodology.

[5]See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[6]We do not consider a more sophisticated multifactor model for two reasons: 1) We are only interested in the outperformance of the standard capitalization-weighted index, and 2) the cross-sectional multifactor models do not consider any cost drags.

[7]Although our approach is not the usual one, it has three primary benefits over the most common quantile portfolio approach. First, it allocates weights of portfolio components based on the expected returns, capturing the return predictive ability more precisely. Second, it includes all of the companies in the sample. The standard long approach of long–short quantile portfolios focuses on the companies in the most extreme quantiles, thus losing information on the behavior of the companies in the middle. Third, our factor approach does not require any arbitrary methodological choices, which are characteristic of the standard quantile portfolios, including breakpoints and weighting methods. Nonetheless, for robustness, we also checked some alternative factor portfolio construction methods, including value-weighted and equal-weighted long–short portfolios; these tests bring no qualitative differences in results.

[8]Although the trading costs do not significantly affect the performance, their influence could be diminished even further with some cost mitigation techniques, like infrequent rebalancing. An interesting review and examination of cost-mitigation techniques is provided by Novy-Marx and Velikov [2016].

[9]The analogous subperiod analysis based on the trading cost-adjusted returns produced results that were perfectly

consistent with the analysis based on unadjusted returns; the conclusions are unaffected by the influence of transaction costs. For brevity, we do not report these results.

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