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Outperformance in Equal-Weight Indices

“It is vain to do with more what can be done with less.”

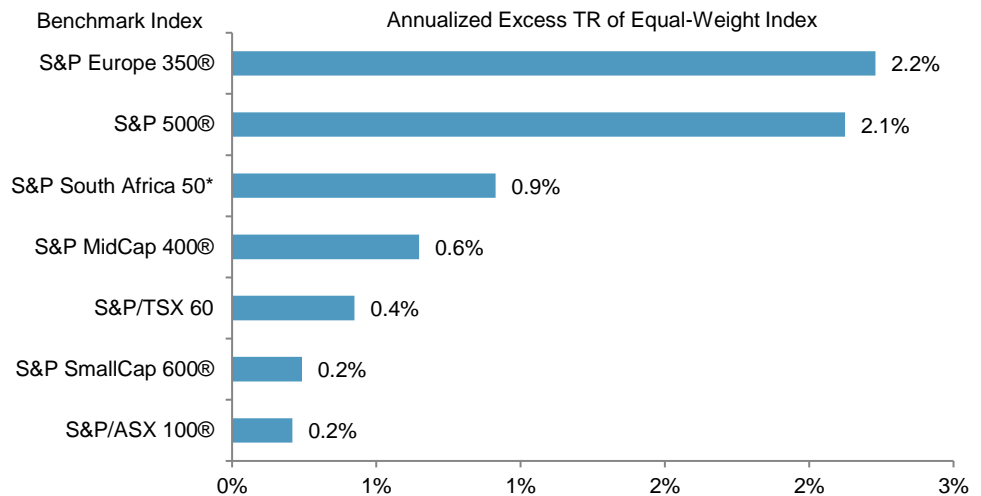
- William of Occam

INTRODUCTION

Equal-weight indices were among the first non-capitalization-weighted indices to emerge as templates for passive investments, or as benchmarks for the evaluation of active managers.¹ Since their introduction, the concept has been extended to a wide range of markets and market segments, while products tracking equal-weight indices have attracted significant assets.

Exhibit 1 demonstrates one of the drivers of interest in equal-weight indices, namely their outperformance over their capitalization-weighted equivalents in a significant number of global equity markets.

Exhibit 1: Annual Outperformance of Equal-Weight Indices



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2017. Statistics based on 15 years of total returns in local currency, annualized, except for the *S&P South Africa 50, which is based on 10-year data. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

¹ For a timeline of the early index-based products utilizing alternative weightings, see Zeng, Liyu and Frank Luo, “[10 Years Later: Where in the World Is Equal Weight Indexing Now?](#)” April 2013.

This paper examines the sources of equal-weight index outperformance from various perspectives, including sectoral, factor-based, and constituent-level analyses, and provides a guide to the potential applications of equal-weighted investment strategies in a portfolio context. Highlights include the following.

This paper examines the sources of equal-weight index outperformance from various perspectives, including sectors, factors and constituent level analyses.

- We show how small size and (anti-) momentum biases typically arise in equal-weight equity indices, and we outline their respective impact on performance.
- From a sectoral perspective, we show that—at least in the case of the [S&P 500](#)—a majority of historical outperformance was due to equal weighting *within* sectors, as opposed to differences in sector exposures.
- We articulate an argument for equal weighting as a theoretically optimal strategy for return-seeking investors possessing limited stock-picking skills, and we examine the consequences of this perspective for active equity funds.
- We illustrate the potential portfolio applications of equal-weight investments, particularly to complement either low-volatility or momentum-based strategies, or as a replacement for active funds.

SECTION 1: DEFINING EQUAL-WEIGHT INDICES

The methodologies defining S&P Dow Jones' equal-weight indices are reassuringly simple: given a particular universe of constituents (typically provided by a “parent” benchmark), **an equal-weight index is defined by a rebalancing schedule** specifying the frequency at which constituents should be rebalanced to equal weights. The [S&P 500 Equal Weight Index](#), for example, includes all S&P 500 constituents, rebalanced quarterly. Between rebalance dates, equal-weight indices track the returns of the portfolio formed at the most recent rebalance; between rebalances, stock weights obviously deviate from perfect equality.

Given a particular universe of constituents, an equal-weight index is defined by a rebalancing schedule. Between rebalance dates, weights may deviate from perfect equality.

Exhibit 2 illustrates the performance of a selection of equal-weight indices, together with their annualized total return, their out- or underperformance (“alpha”) over the benchmark, and various other statistics. Exhibit 2 is not exhaustive; for example there are also equal-weight indices available for each of the U.S. equity sectors (see Section 3). The data are shown for a 15-year period for each index (except for the [S&P South Africa 50](#), where only 10-year performance statistics are available).

Exhibit 2: Equal-Weight Indices in Various Global Equity Markets

BENCHMARK/ PARENT INDEX	EQUAL- WEIGHT INDEX ANN. TR (%)	EQUAL- WEIGHT INDEX "ALPHA" (%)	EQUAL- WEIGHT INDEX VOLATILITY (%)	PARENT INDEX VOLATILITY (%)	BETA TO PARENT	ANN. TRACKING ERROR (%)
S&P 500	12.0	2.1	15.7	13.2	1.16	4.3
S&P MidCap 400	12.7	0.6	17.3	15.9	1.08	3.0
S&P SmallCap 600	12.5	0.2	19.7	17.5	1.11	3.6
S&P Europe 350	9.9	2.2	16.2	13.9	1.14	4.2
S&P/ASX 100	9.8	0.2	14.4	12.6	1.06	5.5
S&P/TSX 60	9.7	0.4	12.9	12.2	1.00	4.1
S&P South Africa 50*	11.4	0.9	14.1	15.4	0.83	6.6

Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2017. Statistics based on 15 years of total returns in local currency, annualized, except for the *S&P South Africa 50, which is based on 10-year data. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Equal-weight indices have demonstrated long-term outperformance (positive "alpha") in a number of global markets.

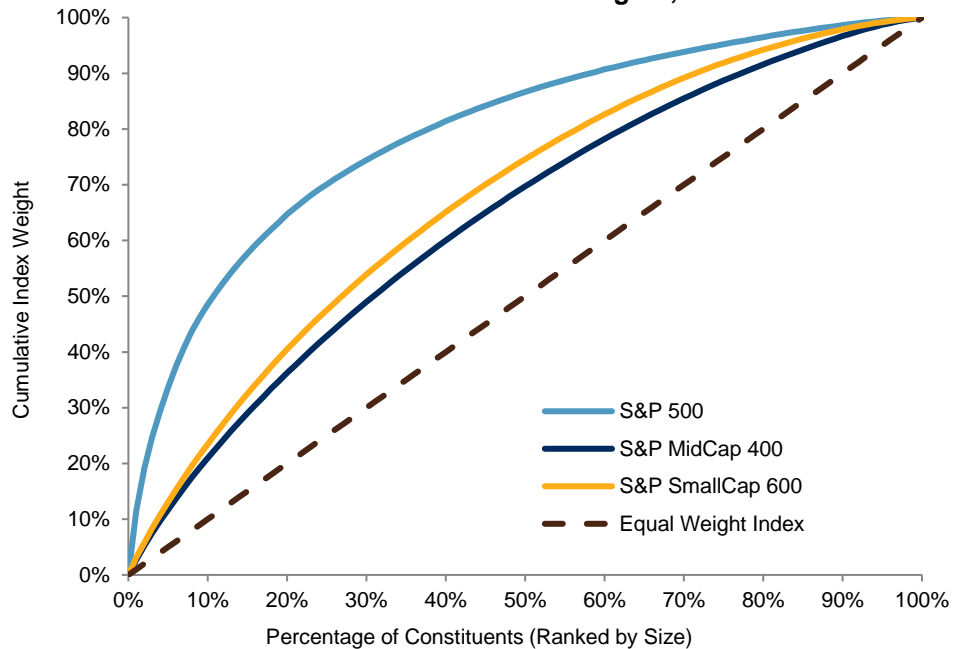
As Exhibit 2 shows, equal-weight indices have demonstrated long-term outperformance (positive "alpha") in a number of global markets. The typically higher beta and higher volatility of equal-weight indices compared to their capitalization-weighted parents provides the first qualifying perspective on their historic outperformance. A higher return is to be expected, given their higher risk, particularly when measured over a period of significant gains in global equity markets.

Equal-weight indices typically display other characteristics that distinguish their performance from capitalization-weighted benchmarks, the most obvious of which is a greater participation in the performance of smaller companies.

SECTION 2: SIZE EFFECTS IN EQUAL-WEIGHT INDICES

Exhibit 3 shows the cumulative proportion of the total index weight represented by companies of various sizes within each of the S&P 500, [S&P MidCap 400](#) and [S&P SmallCap 600](#), as of Dec. 31, 2017. Each series was produced by ranking each index's constituents in order of market capitalization, and then calculating the total index weight represented by the largest 1% of constituents (by capitalization), the largest 2%, and so on up to 100%. The allocation an equal-weight index would make at rebalance is shown for purposes of comparison.

Exhibit 3: Constituent Sizes and Cumulative Weights, U.S. Indices



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 3 shows the relative concentration of the S&P 500 into the largest stocks: just 10% of the names account for nearly one-half of the index’s total weight; the largest 30% of stocks account for around 75%. Conversely, the smallest 40% stocks in the S&P 500 compose just 10% of its total weight. Naturally, these stocks represent 10%, 30%, and 40% respectively, of an equal-weight index (assuming it has just rebalanced).

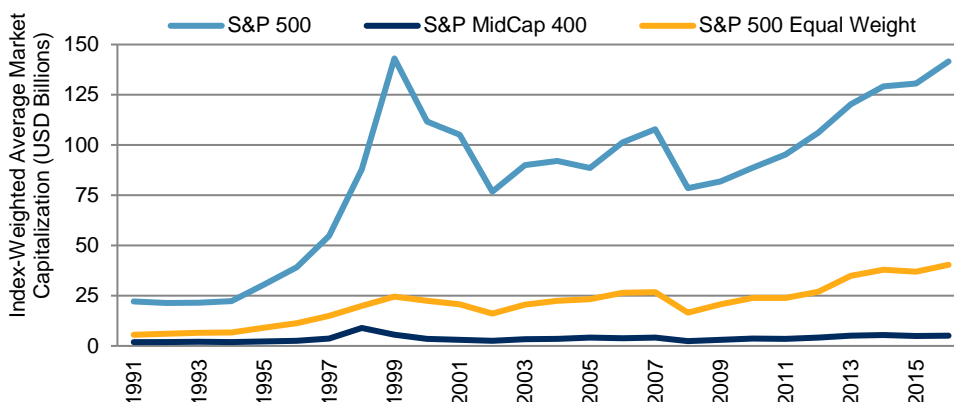
Typically, the extent to which equal-weight indices underweight the largest stocks (or overweight the smallest stocks) is **more significant in large-cap indices**. Exhibit 3 demonstrates this for U.S. stocks; it is nonetheless a more general phenomenon. As a result, **the potential impact of equal weighting is likely to be greater in large-cap indices** than in other capitalization ranges.

In fact, the weighted average holding size within the S&P 500 Equal Weight Index is closer to that of the S&P MidCap 400 than to that of the (capitalization-weighted) S&P 500. Evidencing this observation, Exhibit 4 shows the index-weighted average market capitalization of constituents in each of the three indices, as they have evolved since 1991.²

The weighted average holding size within the S&P 500 Equal Weight Index is closer to that of the S&P MidCap 400 than to that of the (capitalization-weighted) S&P 500

² The weighted average size is calculated as the sum of the products of constituent weights and constituent market capitalizations.

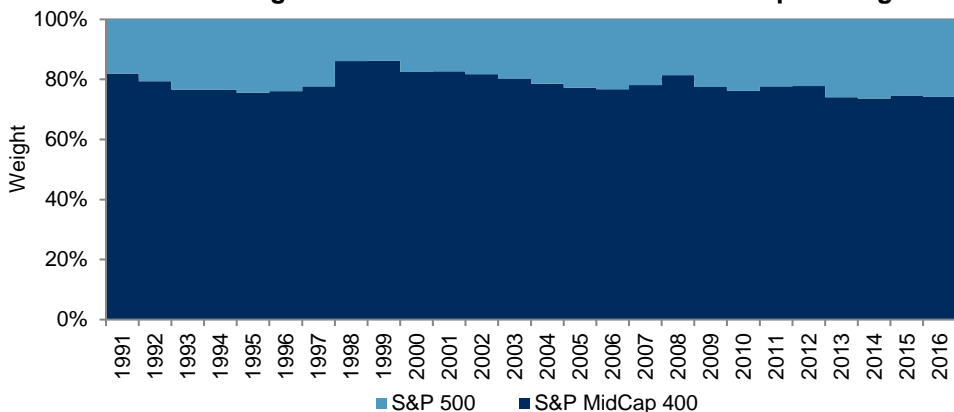
Exhibit 4: Index-Weighted Average Constituent Market Capitalization



Source: S&P Dow Jones Indices LLC. Annual data from December 1991 to December 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

In order to assess the extent to which size bias alone explains the S&P 500 Equal Weight Index’s performance we can, based on the data of Exhibit 4, calculate **the particular combination of the S&P 500 and S&P MidCap 400 that would have resulted in the same index-weighted-average size** as the S&P 500 Equal Weight Index. The resulting weights (as calculated at the end of each calendar year) are shown in Exhibit 5; typically an allocation of around 79% in the mid-cap index would have been required.

Exhibit 5: Annual Weights to Match “Size Bias” of S&P 500 Equal Weight



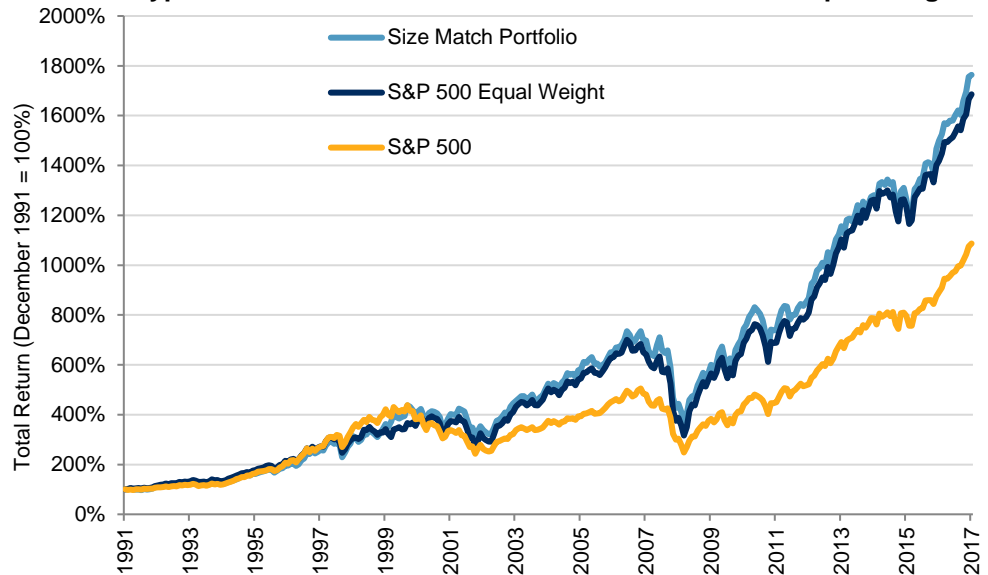
We can calculate the particular combination of the S&P 500 and S&P MidCap 400 that would have resulted in the same index-weighted-average size as the S&P 500 Equal Weight Index.

Source: S&P Dow Jones Indices LLC. Annual data from 1991 to 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 6 shows the hypothetical total returns of the resulting portfolio—which we call the **“Size Match” portfolio**—calculated and rebalanced annually to the allocations shown in Exhibit 5. The total returns of the S&P 500 Equal Weight Index and the S&P 500 are shown for purposes of comparison.

Although the hypothetical returns for the Size Match portfolio and the S&P 500 Equal Weight Index are not identical, the graphs of two series are remarkably similar.

Exhibit 6: Hypothetical “Size Match” Portfolio Versus S&P 500 Equal Weight



Source: S&P Dow Jones Indices LLC. Data from December 1991 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Size Match portfolio is hypothetical.

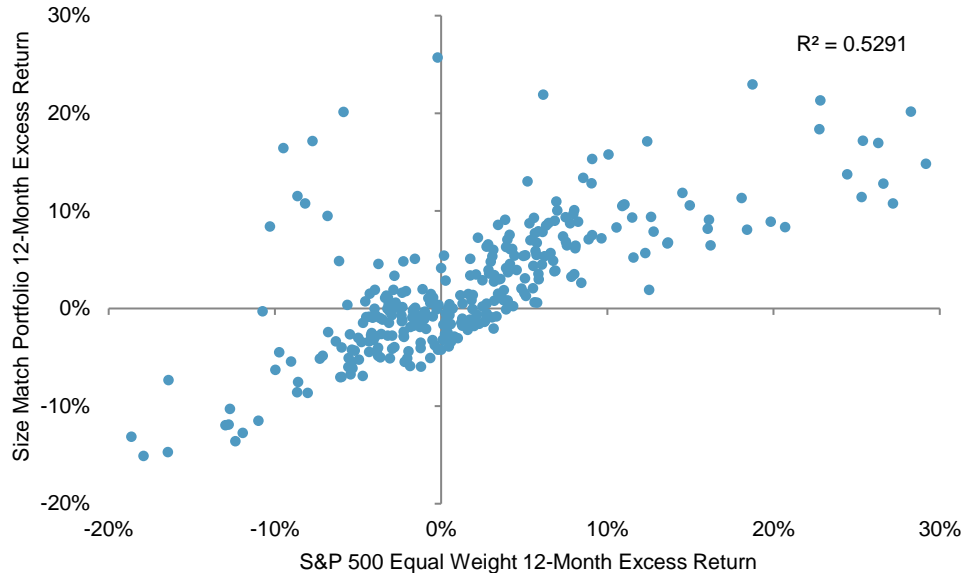
Although the hypothetical returns for the Size Match portfolio and the S&P 500 Equal Weight Index are not identical, the graphs of two series are remarkably similar. In other words, Exhibit 6 suggests that **size exposure alone explains a considerable portion of the S&P 500 Equal Weight Index’s long-term returns.**

Approximately one-half of the variation in excess returns may be attributed to an exposure to smaller stocks.

Exhibit 7 provides a shorter-term, relative perspective on the same data set, comparing the 12-month rolling *relative* total returns—in excess of the S&P 500—of the S&P 500 Equal Weight Index and the Size Match portfolio. (A positive figure on either axis means that the corresponding returns were higher than the S&P 500’s.)

We may infer from the R^2 value of 0.53 for the two series in Exhibit 7 that approximately one-half of the variation in the S&P 500 Equal Weight Index’s 12-month excess returns may be attributed to its exposure to smaller stocks (or more formally, attributed to a correlation with the excess return of the Size Match portfolio).

Exhibit 7: Size Match Portfolio and S&P 500 Equal Weight 12-Month Excess Returns



Source: S&P Dow Jones Indices LLC. Data from December 1991 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Size Match portfolio is hypothetical.

Exhibit 7 demonstrates that **a size bias is not sufficient to explain all the relative outperformance of equal-weight indices**. Recall that the methodology of equal-weight indices requires two features: first equally weighting each constituent and, second, *rebalancing on a regular schedule*. The second condition generates a pattern of returns that is related to momentum effects, as we shall now examine in more detail.

SECTION 3: MOMENTUM EFFECTS IN EQUAL-WEIGHT INDICES

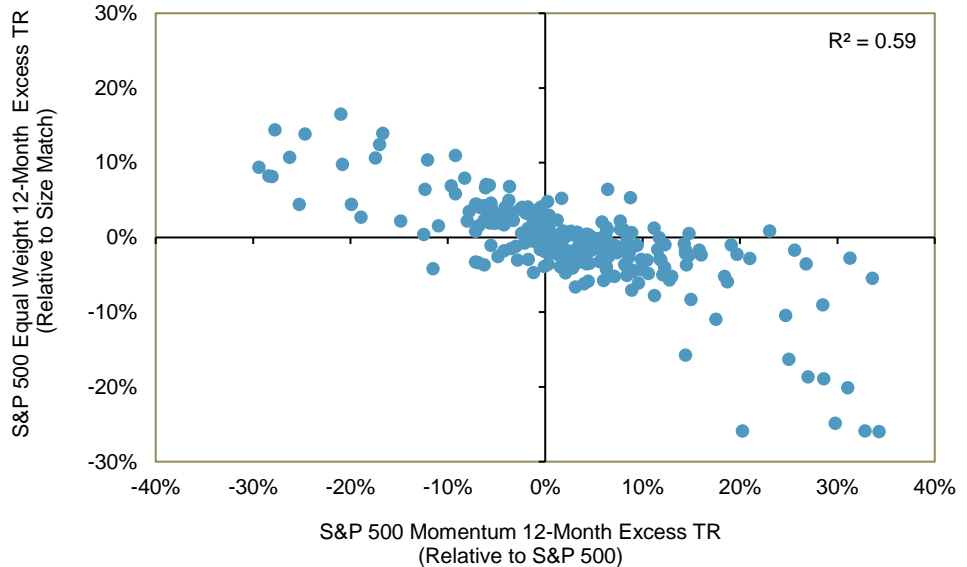
The simple arithmetic of rebalancing connects equally weighted indices to momentum effects. If the price of a constituent increases by more than the average of its peers, then its weight in the portfolio will increase and the position will necessarily be trimmed at the next rebalance as the portfolio returns to equal weights. Conversely, if a stock falls by more than the average of its peers, its weighting will fall too—and more must be purchased at the next rebalance to return to equal weight. Thus, **equal-weight indices sell relative winners and purchase relative losers at each rebalance**. Momentum-based strategies typically follow the opposite pattern—buying winners and selling losers—which suggests the potential for a connection in their performance.

A size bias is not sufficient to explain all the relative outperformance of equal-weight indices, the act of rebalancing also connects equally weighted indices to momentum effects.

The [S&P 500 Momentum Index](#)³ reflects the performance of a rules-based strategy that selects those constituents of the S&P 500 demonstrating relatively high medium-term relative momentum. Its performance, relative to that of the S&P 500, provides **an indication of how “momentum” is faring**, in general terms.

Exhibit 8 compares the rolling 12-month relative return of the S&P 500 Momentum Index (versus the S&P 500) to the rolling 12-month return differential between the S&P 500 Equal Weight Index and the Size Match portfolio.

Exhibit 8: Correlation of Momentum and Equal-Weight Excess Returns



Source: S&P Dow Jones Indices LLC. Data from November 1994 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Size Match portfolio is hypothetical.

More quantitatively, we saw that size biases may be seen to account for around one-half of the excess return in the S&P 500 Equal Weight Index relative to the S&P 500.

If we interpret the difference between the returns of the S&P 500 Equal Weight Index and the Size Match portfolio as the portion of the former’s performance that is *not* simply attributable to its bias toward smaller stocks, Exhibit 8 demonstrates that **this “unexplained” performance may largely be attributed to a negative association to momentum.**

More quantitatively, we saw that size biases seem to account for about one-half of the variance in excess returns of the S&P 500 Equal Weight Index relative to the S&P 500. The R² figure of 0.59 of Exhibit 8 suggests that an “anti-momentum” bias may explain more than half of what remains.

Exhibit 9 shows comparable statistics for a majority of the indices introduced in Exhibit 1. To construct Exhibit 9, for each equal-weight index

³ See Preston, Hamish, [“Momentum: A Practitioner’s Guide.”](#) January 2017.

we selected (where possible) an appropriate pair of comparison indices to estimate the significance of the size and momentum effects—analogueous to the S&P MidCap 400 and the S&P 500 Momentum pair’s use in examining the S&P 500 Equal Weight Index. For purposes of brevity, Exhibit 9 only presents the summary results of our analysis; the interested reader can find the details in Appendix B.

In most cases once market, small-size, and anti-momentum biases have been accounted for, a significant proportion of the relative performance of equal-weight indices is well-understood.

Exhibit 9: Summary of Size and Momentum Effects in Equal-Weight Indices

BENCHMARK OF EQUAL-WEIGHT INDEX	“SIZE MATCH” AVERAGE ALLOCATIONS (%)		R ² STATISTICS	
	BENCHMARK	SMALLER SIZE	SIZE BIAS	MOMENTUM RESIDUAL
S&P 500	21	79	0.53	0.60
S&P MidCap 400	58	42	0.30	0.49
S&P Europe 350	44	56	0.62	0.36
S&P/ASX 100	21	79	0.83	0.04
S&P/TSX 60	46	54	0.45	N/A
S&P South Africa 50	40	60	0.34	0.20 ⁽⁺⁾

Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2017. Relative return taken over different periods for each index, as available, see Appendix B for more details on dates and indices chosen to represent size and momentum effects. (+) Denotes positive correlation to momentum. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

From Exhibit 9, we might conclude that in most cases **once market, small-size, and anti-momentum biases have been accounted for, a significant proportion of the relative performance of equal-weight indices is well-understood**. For purposes of completion, we report the impact of other factors such as value, as well as a discussion of the extent to which these factors naturally overlap, in Appendix A. For current purposes, it is sufficient to note that value in particular also plays a role in equal-weight returns, but its importance is related to the existing biases of momentum and size.

Having accounted for the factors of size and momentum in equal-weight indices, we now turn our attention to sectoral exposures, which can provide a complementary perspective on historical performances.

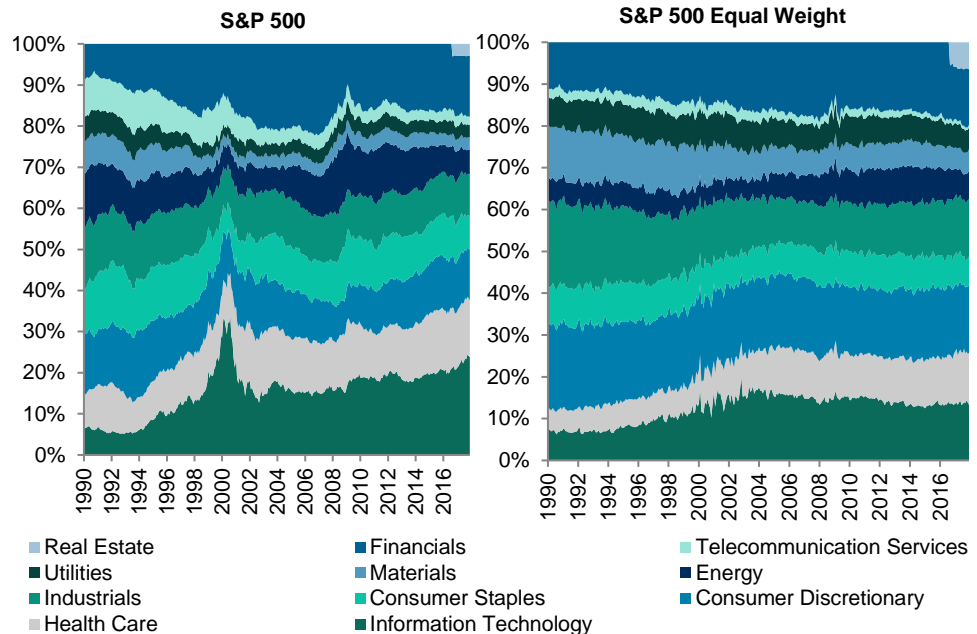
SECTION 4: SECTOR EFFECTS IN EQUAL-WEIGHT INDICES

In a capitalization-weighted index, each sector is weighted in proportion to the market capitalization of stocks in that sector. However, **an equal-weight index effectively allocates to each sector in proportion to the number of stocks held in the sector**. This may not necessarily result in an equal weight in each sector, but it does tend to limit sector concentrations in comparison to capitalization-weighted indices.

Exhibit 10 highlights the differences in sector weights that equal weighting can provide, comparing the historical sector weightings of the S&P 500 and the S&P 500 Equal Weight Index.

Exhibit 10: Sector Weightings of the S&P 500 and S&P 500 Equal Weight

An equal-weight index effectively allocates to each sector in proportion to the number of stocks held in each sector.



Source: S&P Dow Jones Indices LLC. Quarterly data from March 1990 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

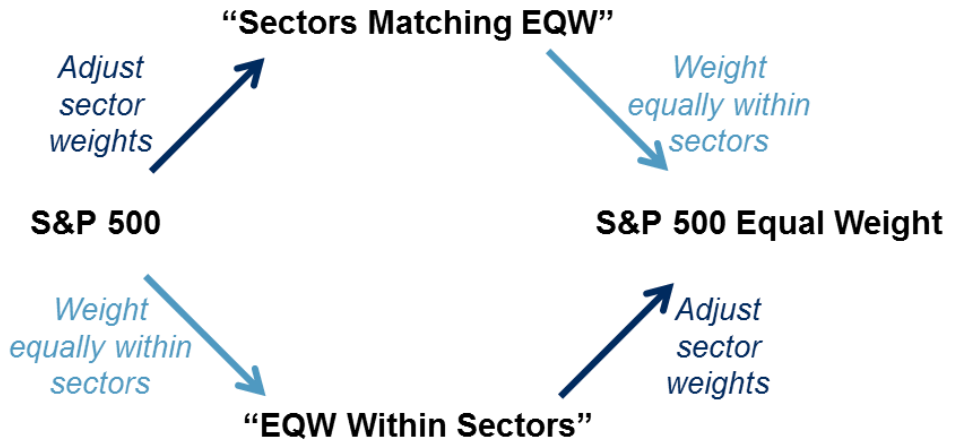
As Exhibit 10 demonstrates, the S&P 500 Equal Weight Index at times displayed materially different sectoral allocations than the S&P 500; the rapid increase and subsequent decline in the weight of the information technology sector in the S&P 500 between 1996 and 2002 is a particularly distinguishing feature. Measuring the importance of these differences in sector weightings may be broken down into two, distinct questions. First, how much of the performance of equal-weight indices comes from their **sectoral allocations alone**? Second, what are the consequences of then applying an **equal-weight strategy within each sector**?

To approach these questions, **we examine the performance of two hypothetical portfolios**, formed on a monthly basis. The first, which we call the **“Sectors Matching EQW”** portfolio, is formed by combining the *capitalization-weighted* S&P 500 single-sector indices in proportions that match the sectoral exposures of the S&P 500 Equal Weight Index. The second hypothetical portfolio, which we call the **“EQW Within Sectors”** portfolio, is formed by combining the *equal-weighted* S&P 500 single-sector indices in proportions that match the sectoral exposures of the S&P 500.

Exhibit 11 illustrates how **the two hypothetical portfolios represent “halfway” points** between the cap-weighted and equal-weighted indices.

Exhibit 11: Sectors Matching EQW and EW Within Sectors Schematic

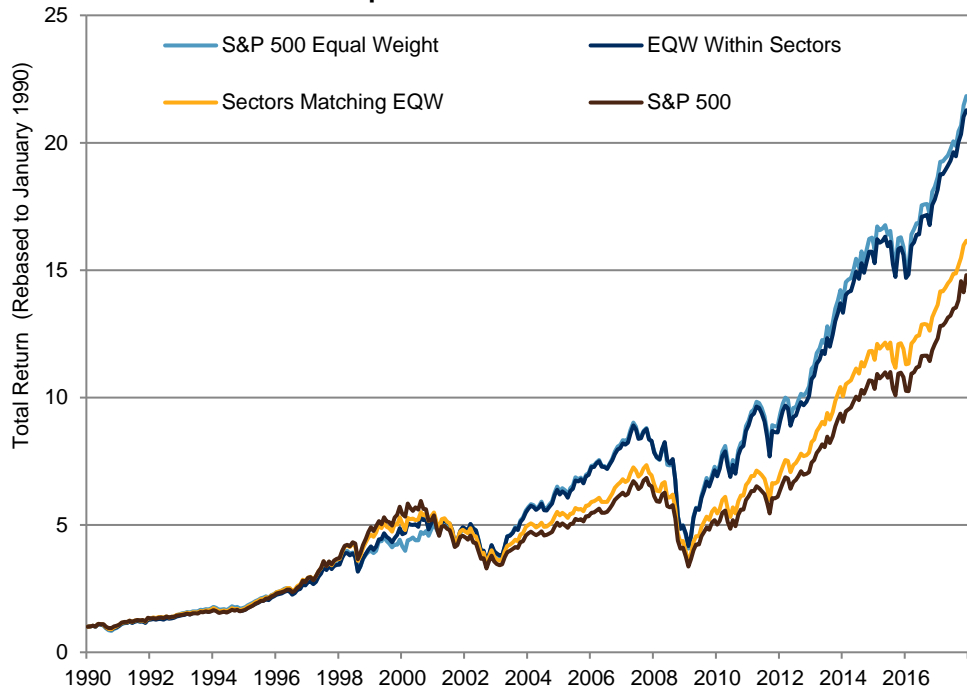
The two hypothetical portfolios represent “halfway” points between the cap-weighted and equal-weighted indices



Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes. Sectors Matching EQW and EQW Within Sectors are hypothetical portfolios.

Exhibit 12 shows the cumulative total returns of these two hypothetical comparison portfolios and the two indices.

Exhibit 12: Total Return Comparison



Source: S&P Dow Jones Indices LLC. Data from January 1990 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Sector Match and EW Sectors are hypothetical portfolios.

Over the period studied, the S&P 500 Equal Weight Index showed the highest returns, followed by the EQW Within Sectors portfolio, then the Sectors Matching EQW portfolio, and finally the S&P 500. From this ordering, we might first conclude that *both* the sectoral weightings of the

Both the sectoral weightings of the equal-weight index and the strategy of equally weighting within sectors added to the long-term returns of the S&P 500 Equal Weight Index, but equal weighting *within* sectors was a more significant driver of returns.

equal-weight index *and* the strategy of equally weighting within sectors added to the long-term returns of the S&P 500 Equal Weight Index.

More importantly, the four indices depicted in Exhibit 12 fall into two obvious groups: the cap-weighted S&P 500 and the Sectors Matching EQW portfolio are quite close, suggesting that as long as stock allocations within sectors are cap weighted, the effect on portfolio results is relatively small. Similarly, the S&P 500 Equal Weight Index and the EQW Within Sectors portfolio are also quite close. This suggests that **equally weighting *within* sectors was a much more significant driver of relative returns.**

A broad, if somewhat speculative, explanation might be offered for the latter, positing the existence of unique challenges faced from time to time by the largest stocks in each sector. In particular, if a company reaches a dominant position in its industry, additional frictions may arise through increased regulatory scrutiny or anti-competitive action. In order to examine this hypothesis, we apply a measure of sectoral concentration known as the Herfindahl-Hirschman Index (HHI),⁴ chosen in part because this measure is applied by the U.S. Department of Justice in evaluating the competitiveness of markets and in framing decisions on antitrust concerns. It therefore provides a measure that might be indicative of regulatory frictions.

Exhibit 13 shows the results of comparing the changing levels of the HHI measure for each sector with the *subsequent* 12-month relative performance of the equal-weight sector index, compared to its capitalization-weighted counterpart. **In 8 of the 10 reported sectors, we find a positive correlation between higher HHI measures and the subsequent relative performance of equally weighted sector indices.** Note that, due to its more recent introduction as a top-level sector, we exclude the real estate sector from our analysis.⁵

⁴ The Herfindahl-Hirschman Index value is computed by adding the squared constituent weights. Constituent weights, for HHI purposes, are stated as decimal numbers, not percentages (e.g., 1% weight = 1.00). The HHI value for a 100 stock equal weight portfolio is therefore 100, while the HHI value of a 10 stock equal weighted portfolio is 1,000. Other things equal, greater concentration leads to higher HHI values.

⁵ Real estate was established as its own GICS® sector in September 2016. Prior to that, Real Estate was included as a subset of the Financials sector.

Exhibit 13: Concentration and Equal-Weight Sector Outperformance				
S&P 500 SECTOR	AVERAGE HHI	RANGE OF HHI	ANNUALIZED RELATIVE PERFORMANCE OF EQW	12-MONTH ROLLING CORRELATION
Materials	593	378 - 947	1.80%	0.58
Financials	356	234 - 496	2.54%	0.54
Energy	1413	891 - 2,767	-0.67%	0.52
Consumer Discretionary	376	255 - 707	-0.15%	0.45
Information Technology	792	420 - 2,667	1.32%	0.43
Utilities	437	335 - 622	1.47%	0.31
Industrials	746	305 - 2,258	0.66%	0.29
Consumer Staples	697	552 - 1,004	1.23%	0.22
Health Care	656	391 - 939	2.64%	-0.05
Telecom. Services	2369	888 - 4,703	1.86%	-0.17

Source: S&P Dow Jones Indices LLC. Based on the monthly total returns in U.S. dollars of the S&P 500 single-sector and S&P 500 equal-weight single sector indices. Data from January 1990 to December 2017. Past performance is no guarantee of future performance. Table is provided for illustrative purposes.

It is perhaps interesting that the most concentrated sector historically (telecommunication services) is the only one for which the correlation shown in Exhibit 13 is significantly negative, while the least concentrated sectors generally show higher degrees of correlation. Thus, the concentration *relative to usual* may be the more useful statistic, rather than the *absolute* level of concentration in a sector. In any case, Exhibits 12 and 13 together suggest that—whatever the sector allocations—an equal-weight approach *within* each sector may offer more attractive returns, **particularly if that sector is presently displaying an unusually high level of concentration compared to usual.**

The concentration relative to usual may be the more useful statistic, rather than the absolute level of concentration in a sector.

An alternative explanation for the greater impact of equally weighting at the constituent (opposed to sectoral) level is provided in the next section, which examines whether a fundamental source of return of equal-weight indices might not simply derive from purely constituent-level phenomena.

SECTION 5: SINGLE-STOCK EFFECTS IN EQUAL-WEIGHT INDICES

In advance of the next few exhibits, consider the following thought experiment, in which a lottery is being held and the expected outcome from participating is positive.⁶ Suppose that there are 10 million different possible lottery tickets, all for sale for USD 1 (to as many people as wish to buy them), and that the prize for a winning ticket is USD 11 million. Thus, a single ticket purchase is *expected* to return USD 1.10—or 10% more than its purchase value—but nearly all the lottery tickets will win nothing at all.

⁶ This is possible through what some real-world lotteries call a “roll over,” where the current jackpot includes a previously unclaimed prize.

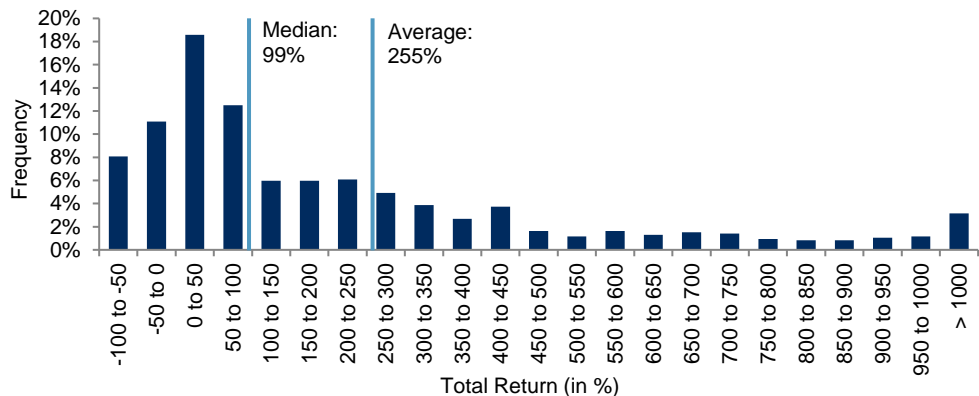
In this thought experiment, it is not hard to see that **the optimal strategy is to purchase all the lottery numbers in equal proportion**: this guarantees the 10% expected return on investment, and with zero volatility.

For our purposes, the key features of this thought experiment are first, **a wide selection of possible purchases**, second, **a lack of foreknowledge as to the optimal selection**, third, **a positive expected return**, and finally **a large positive skew in potential outcomes**. As we shall see, the point of the thought experiment is that constituents of broad-based equity indices can display remarkably similar characteristics.

Exhibit 14 displays the positive historical skew observed in the total returns of S&P 500 constituents.⁷ To produce Exhibit 14, we first identified all the constituents that were included at any point in the benchmark from March 2003 to December 2017, and then calculated the total return of each constituent for the period(s) that it was included in the benchmark. Exhibit 14 provides a histogram of these constituent total returns, highlighting the distribution’s average and median values.

The point of the thought experiment is that constituents of broad-based equity indices can display remarkably similar characteristics.

Exhibit 14: Distribution of Cumulative Returns for S&P 500 Constituents



Source: S&P Dow Jones LLC. Data as of Dec. 29, 2017. Past performance is not a guarantee of future performance. Chart provided for illustrative purposes only.

As Exhibit 14 shows, there was a **strong positive skew in the distribution of equity returns**. The average constituent return was significantly higher than the median and, moreover, **two-thirds of constituents underperformed the average total return of 255%**. Some stocks declined by more than 50%, while a rare few stocks offered returns in excess of a 10x multiple. This is not, we might add, a feature of the particular length or extremes of the time period chosen: in fact, the average return exceeded the median return among S&P 500 constituents in 22 of the 26 calendar years between 1991 and 2016, while similar results have been observed for U.S. stocks over a period ranging back to the 1920s.⁸

⁷ A version of this chart appears in a somewhat different context in our earlier work. See Edwards, Tim and Craig J. Lazzara, “[Fooled by Conviction](#),” July 2016.

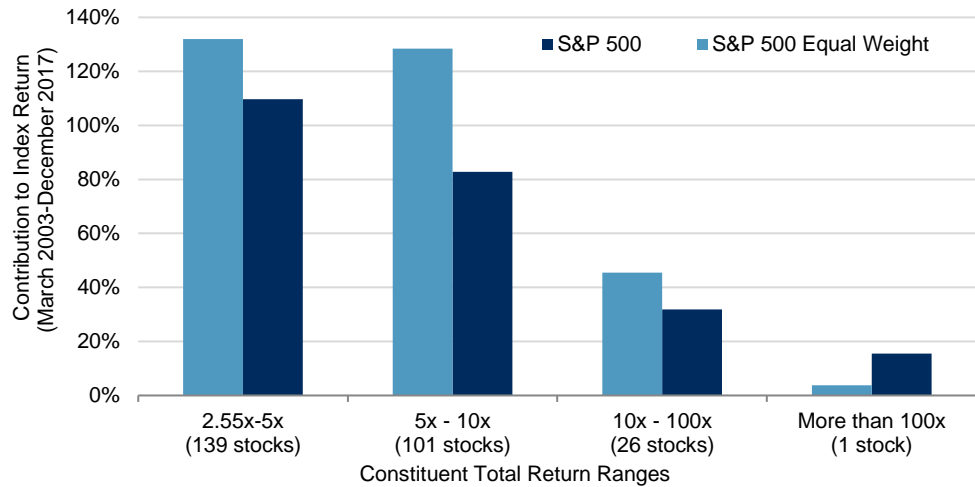
⁸ Bessembinder, Hendrik, “[Do Stocks Outperform Treasury Bills?](#)” November 2017.

Given this positive skew in equity returns, **could our thought experiment help to explain the market-beating performance of equal-weighted indices?** More specifically, did the approach of equally weighting constituents mean that the S&P 500 Equal Weight Index simply captured a greater share of returns in those few stocks that achieved significantly above-average returns? Exhibit 14 suggests that this might be the case; Exhibit 15 provides further—although somewhat qualified—evidence in support.

In every category excluding the rightmost, and in total, the S&P 500 Equal Weight Index captured a greater share of the performances of above-average constituents.

In particular, Exhibit 15 displays the results of calculating the *contribution* of each constituent with above-average total returns to the S&P 500 and S&P 500 Equal Weight Index's total return over the full period. Over the full period, the S&P 500 recorded a 326% total return and the S&P 500 Equal Weight Index recorded a 476% total return. The exhibit shows the contribution to each index's return arising from stocks with a total return that was between 255% and 500% (2.55X-5X), a total return between 500% and 1,000% (5x-10x), a total return between 1,000% and 10,000% (10x-100x) and finally the single stock that recorded a total return greater than 10,000%.⁹

Exhibit 15: Constituent Contributions to Indices



Source: S&P Dow Jones LLC. Data from March 2003 to December 2017. Past performance is not a guarantee of future performance. Chart provided for illustrative purposes only.

As the exhibit demonstrates, in every category excluding the rightmost, and in total, the S&P 500 Equal Weight Index captured a greater share of the performances of above-average constituents.

Thus, we might offer a final perspective on the performance of equal-weight indices. Suppose we must select among alternative holdings with three conditions:

- The alternatives, as a group, have a positive return expectation

⁹ Which the reader may not be surprised to discover was Apple Inc.

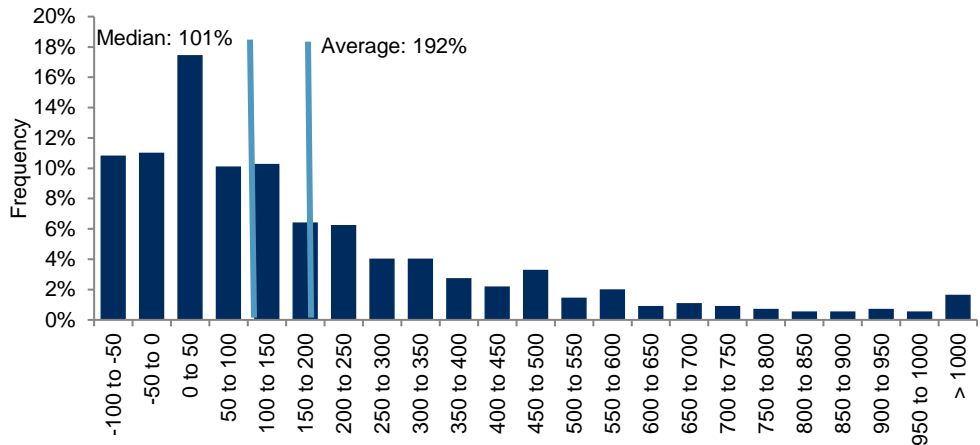
- The alternatives are expected to exhibit a high degree of positive skew in returns
- We have no ability to predict which of the alternatives is likely to outperform

In these circumstances, **equally weighting among the alternative constituents offers the maximum expected participation in the relatively small number of outperforming stocks.**

Such positive skew among equity returns is not simply a U.S. phenomenon. Similar distributions in equity returns may be observed elsewhere, indeed in most markets.¹⁰ Exhibits 16 and 17 provide two international examples, showing the frequency distribution of total returns among [S&P Europe 350](#) constituents from August 2002 to December 2017, and for the [S&P/ASX 100](#) from December 2002 to December 2017.

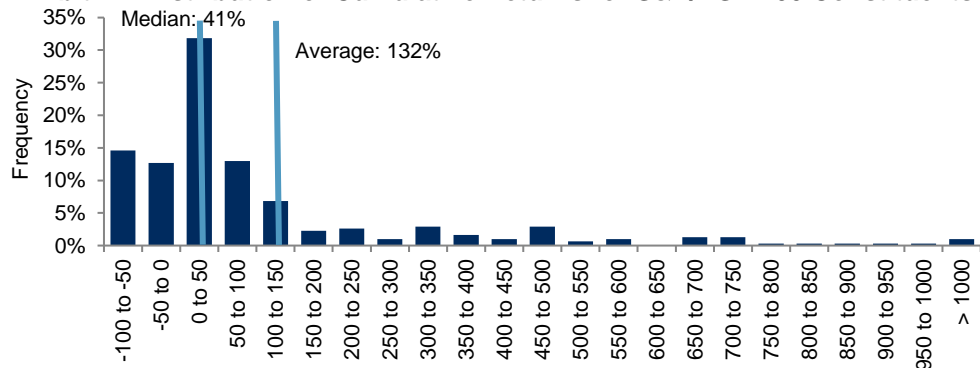
Rather than simply being a U.S. phenomenon, similarly positive skew in equity returns may be observed elsewhere, indeed in most markets.

Exhibit 16: Distribution of Cumulative Returns for S&P Europe 350 Constituents



Source: S&P Dow Jones Indices LLC. Data from August 2002 to August 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 17: Distribution of Cumulative Returns for S&P/ASX 100 Constituents



Source: S&P Dow Jones Indices LLC. Data from August 2000 to August 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

¹⁰ Edwards & Lazzara, *op.cit.*

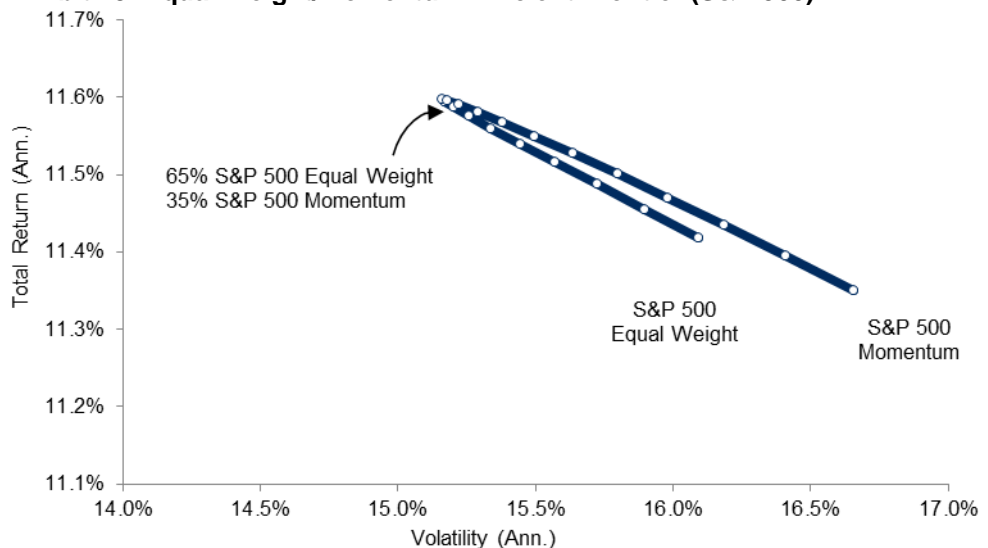
SECTION 6: EQUAL-WEIGHT INDICES IN PORTFOLIOS

Given their “anti-momentum” aspects, equal-weight indices can offer a natural complement to investments otherwise looking to outperform by engaging positively with momentum effects.

The previous sections provide perspectives on the sources of performance in equal-weight indices. The next two sections examine the potential portfolio applications of investments tracking equal-weight indices—with particular focus on their combinations with momentum or low volatility strategies, or as a potential replacement for “stock-picking” active funds.

Given their “anti-momentum” aspects, equal-weight indices can offer a natural complement to “trend-following” or “relative strength” strategies, which aim to benefit from persistent trends.¹¹ Illustrating the potential portfolio benefits of combining equal-weight indices with relative momentum strategies, Exhibit 18 provides the historical risk/return profiles of hypothetical portfolios created from combinations of the S&P 500 Equal Weight Index and S&P 500 Momentum Index, ranging in 5% increments, and assuming a rebalance to fixed weights on a monthly basis.¹²

Exhibit 18: Equal Weight/Momentum Efficient Frontier (S&P 500)



Source: S&P Dow Jones Indices LLC. Annualized data from September 1994 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Portfolios shown are hypothetical.

Exhibit 18 shows that combinations of these two indices could have generated higher return at lower risk than either in isolation. We might suppose more generally that an investment tracking the S&P 500 Equal Weight Index might have offered attractive diversification properties for portfolios that otherwise maintained biases toward relative winners (or against relative losers).

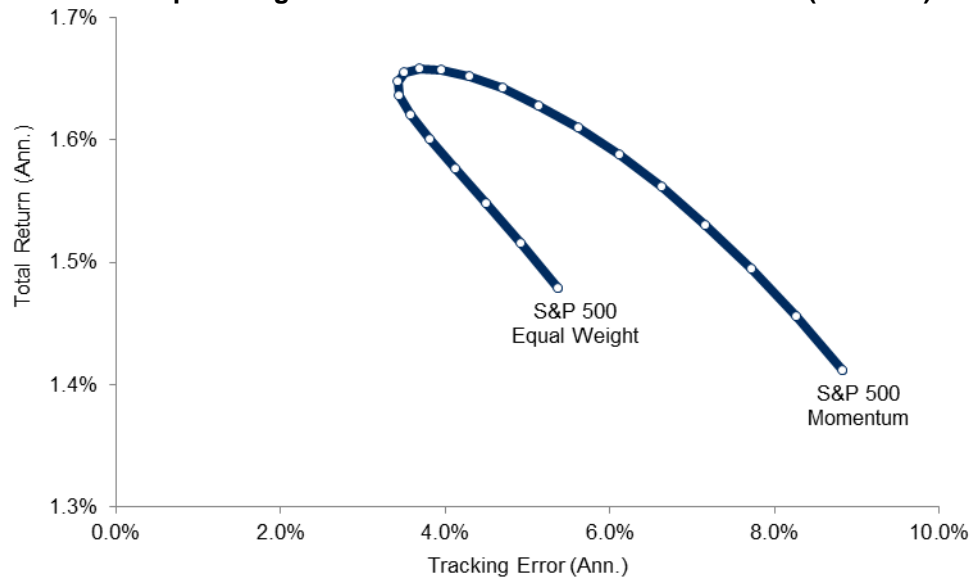
¹¹ Note the important qualifier that equal-weight indices have an exposure to *relative*, as opposed to absolute, momentum trends. Investments tracking equal-weight indices will buy recent “winners” at rebalance, even if they are *relative* losers.

¹² For similar analysis on a range of single-factor combinations, see Chan, Fei Mei and Craig J. Lazzara, “[The Sum of the Parts](#),” May 2017.

An investment tracking the S&P 500 Equal Weight Index might have offered attractive diversification properties for portfolios with biases toward relative winners (or against relative losers).

Note that the overall reduction in volatility shown in the combinations of Exhibit 18 is not huge—achieving little over a 1% reduction in volatility at the optimal point of a 65-35 portfolio split, compared to the average of the two original indices. But the negative correlation between the two indices operates on a *relative*, not absolute, basis. Their diversification properties are therefore stronger in relative terms. Accordingly, Exhibit 19 shows how the tracking error (to the S&P 500) of the two separate strategies would have been significantly mitigated by their combination. (Note the change of scale in the horizontal axis.)

Exhibit 19: Equal Weight/Momentum Information Ratio Frontier (S&P 500)



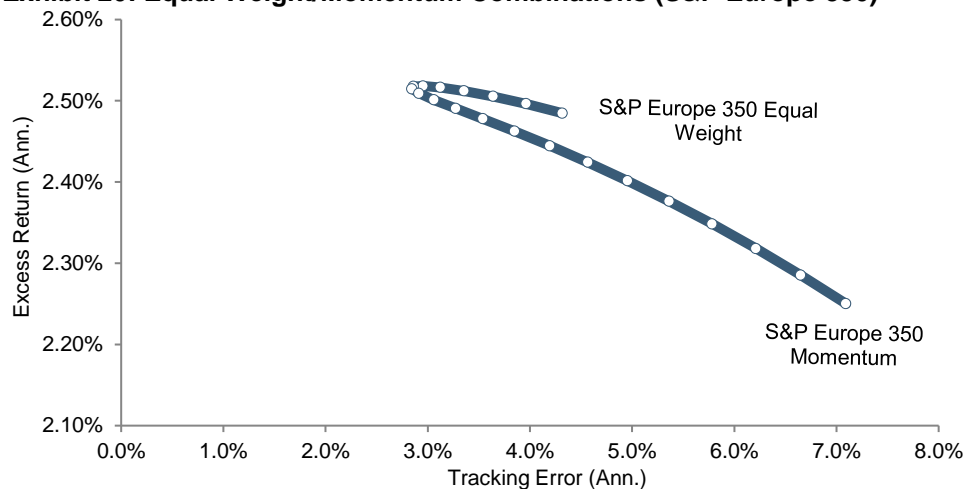
Source: S&P Dow Jones Indices LLC. Annualized data from September 1994 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Equal-weight strategies may limit the potentially high tracking error of trend-following (or relative strength) investment strategies.

As Exhibit 19 demonstrates, the tracking error of some of the potential combinations reached as low as one-half of the average tracking error of the original indices. We might conclude that, while equal-weight strategies offer a degree of diversification in general terms, they may be a particularly useful tool to limit the potentially high tracking error of trend-following (or relative strength) investment strategies.

For completion, Exhibit 20 shows the equivalent graph for combinations of the [S&P Europe 350 Momentum Index](#) and the [S&P Europe 350 Equal Weight Index](#) with respect to the S&P Europe 350. The results are similar.

Exhibit 20: Equal Weight/Momentum Combinations (S&P Europe 350)



Source: S&P Dow Jones Indices LLC. Chart based on monthly total returns in euros. Data from September 2001 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Beyond a pattern of returns that may be complementary to momentum strategies, equal-weight indices may also offer the potential for return enhancement, particularly when combined with more defensive strategies. The second combination we shall examine in detail is as a complement to one of the more popular defensive-based index strategies: the [S&P 500 Low Volatility Index](#).¹³

Beyond a pattern of returns that may be complementary to momentum strategies, equal-weight indices also offer the potential for return enhancement, particularly when combined with more defensive strategies.

As shown in Exhibit 21, for an investor considering a 100% allocation to either the S&P 500 Low Volatility Index or the S&P 500 Equal Weight Index, the former might be preferred on the basis of its historical risk/return profile. Indeed, on a risk/return basis, a 100% allocation to the more defensive strategy is unmatched by any combination of the two. However, while the long-term risk/return profile accounts for a significant proportion of investor interest in low volatility strategies, we highlight the potential short-term underperformance risks: in more than 53% of quarters, an investor tracking the S&P 500 Low Volatility Index would have underperformed an equivalent investment tracking the S&P 500.

Such short-term underperformance can provide challenges to money managers with impatient clients; it is in any case frustrating for any investor. This is where a putative combination may be attractive: in the final rows of Exhibit 21, we show how the addition of S&P 500 Equal Weight Index (or better yet, a combination that also includes the S&P 500 Momentum Index) can limit the risk of such short-term underperformance, while largely maintaining the S&P 500 Low Volatility Index's long-term risk/return profile.

¹³ The S&P 500 Low Volatility Index seeks to track the performance of the 100 least volatile stocks in the S&P 500, with the least volatile constituents carrying the highest weighting.

Exhibit 21: Combining Equal Weight and Momentum With Low Volatility

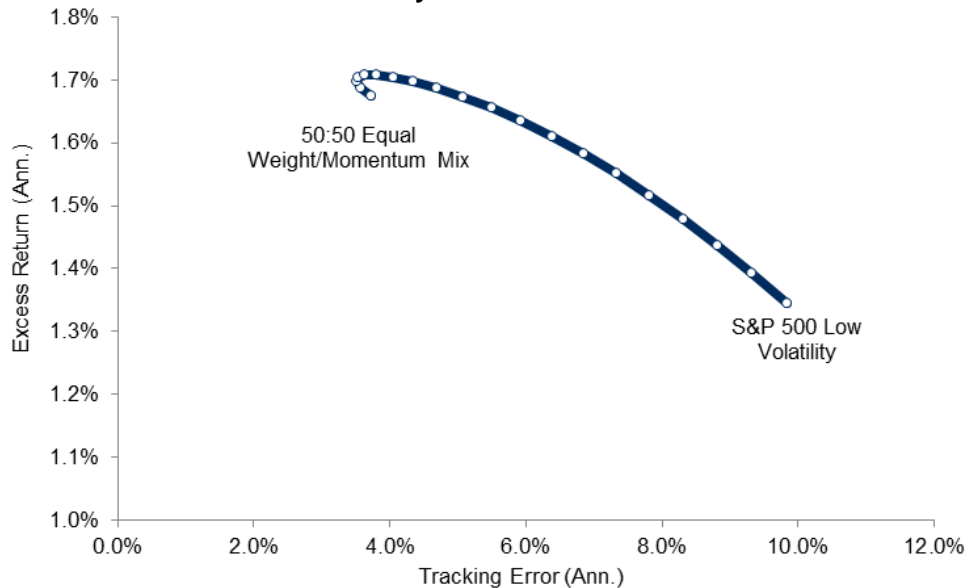
INDICES	ANN. RETURN (%)	ANN. VOLATILITY (%)	RETURN/RISK	3-MONTH LAG FREQUENCY (%)
S&P 500	9.9	14.5	0.69	N/A
S&P 500 Low Volatility	11.3	11.1	1.02	53
S&P 500 Equal Weight	11.2	16.1	0.71	47
S&P 500 Momentum	11.4	16.7	0.68	43
COMBINATIONS				
25% Equal Weight/75% Low Vol.	11.4	11.7	0.98	49
50% Equal Weight/50% Low Vol.	11.5	12.8	0.89	47
25% Equal Weight / 25% Momentum/50% Low Vol.	11.6	12.1	0.96	45

Source: S&P Dow Jones Indices LLC. Data from September 1994 to December 2017. "Lag Frequency" calculates the percentage of times that the three-month trailing total return is lower than that of the S&P 500. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The final exhibit of this section provides an example of how the combination of equal weight and momentum strategies might significantly improve the information ratio characteristics of low volatility strategies.

The final exhibit of this section shows how combining equal weight *and* momentum with a low volatility strategy can offer a significant improvement to the information ratio. Exhibit 22 plots the tracking error and excess return of portfolios formed from allocations to the S&P 500 Low Volatility Index (ranging as before in 5% increments from 0 to 100%), with the remainder split equally between the S&P 500 Equal Weight Index and the S&P 500 Momentum Index.

Exhibit 22: S&P 500 Low Volatility Combinations



Source: S&P Dow Jones Indices LLC. Chart based on monthly total returns in U.S. dollars from September 1994 to December 2017. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

As Exhibit 22 demonstrates, even a small allocation to an equal weight/momentum mix could have considerably diminished the high tracking error sometimes demonstrated by defensive strategies such as low volatility—and at no historical cost to returns (indeed, providing a mild improvement).

EQUAL WEIGHT AND “STOCK PICKER” PERFORMANCE

The laws of probability tell us that the expected return of a randomly constructed portfolio of stocks will be approximated by the average return among possible choices, assuming that each has an equal chance of being selected. Hence, comparisons between active managers (or indeed any stock-selection strategy) and equal-weight indices can prove insightful—since skillful stock pickers might be expected to outperform equal weighting.¹⁴

As well as offering a potentially more appropriate benchmark of stock-picking performance, investments linked to equal-weight indices may also offer the prospect of replacing an actively managed section of a portfolio that has otherwise disappointed.

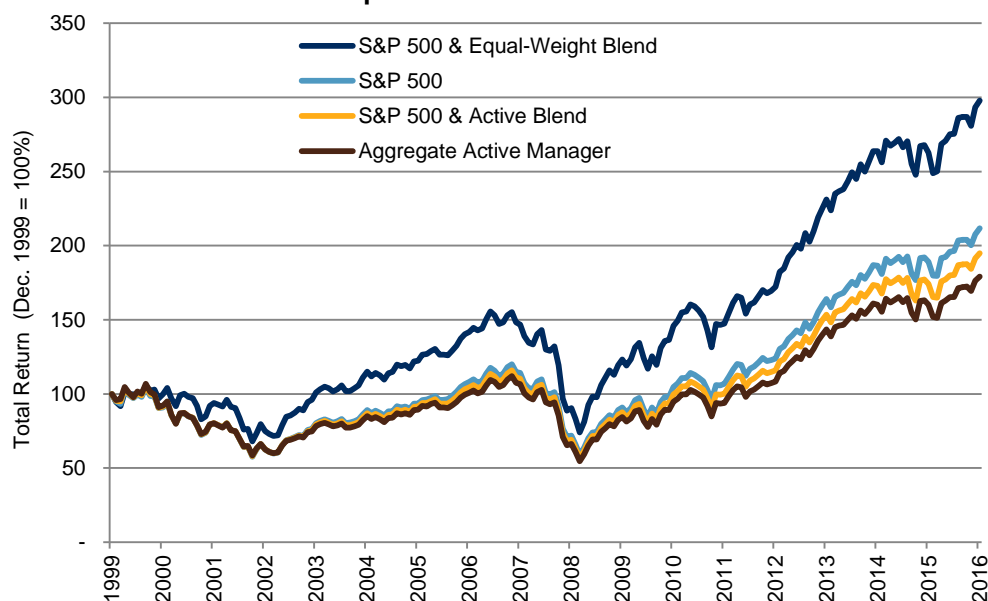
Investments linked to equal-weight indices also offer the prospect of replacing an actively managed section of a portfolio that has disappointed. To examine this, we created two hypothetical portfolios; the first is constructed with a 50% allocation to an investment vehicle tracking the S&P 500 and 50% to a hypothetical position in the “average” actively managed large-cap U.S. fund.¹⁵ The second portfolio substitutes the S&P 500 Equal Weight Index for the allocation to active funds.

Using monthly performance data, the total returns of these portfolios are compared in Exhibit 23, with their average annual returns and volatilities in Exhibit 24. We see that active management offers the lowest average annual return of any of the portfolios, while the combination of a passive position with an equal-weight component results in a significantly higher annual return for only a fractionally higher level of risk than its passive or active counterpart.

¹⁴ See Edwards, Tim and Craig J. Lazzara, “[Equal-Weight Benchmarking: Raising the Monkey Bars](#),” June 2014 and Lazzara, Craig, “[Even Worse Than You Think](#),” June 19, 2014.

¹⁵ We use the asset-weighted average return of active managers as defined and analyzed within the large-cap broad U.S. equity category of S&P Dow Jones Indices’ [SPIVA® U.S. Scorecards](#).

Exhibit 23: Total Return Comparison



Source: S&P Dow Jones Indices LLC. Data from January 2000 to December 2016. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Equal-weight indices may have the potential to replace, or enhance the returns of, components of equity portfolios that are currently actively managed.

Exhibit 24: Risk/Return Comparison

METRIC	S&P 500	ACTIVE MANAGERS	S&P 500 EQUAL WEIGHT	S&P 500/ ACTIVE BLEND	S&P 500/ S&P 500 EQUAL WEIGHT BLEND
Annual Return (%)	4.8%	3.7%	9.3%	4.3%	7.1%
Annualized Volatility (%)	14.8	14.7	17.1	14.8	15.8
Return / Volatility	0.32	0.25	0.54	0.29	0.45

Source: S&P Dow Jones Indices LLC. Data from January 2000 to December 2016. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Therefore, as well as offering potentially complementary exposures to other systematic strategies, we note finally that **equal-weight indices may have the potential to replace, or enhance the returns of, components of equity portfolios that are currently actively managed.**

CONCLUSIONS

Contrasted against some of the more remarkable properties attributed to so-called “smart beta” strategies by their more excitable advocates, **the case for equal-weight indexing is an intrinsically humbler, yet perhaps more logically convincing, proposition.** In its simplest expression, the argument for equal-weight indexing is that since the historical gains in equity markets have been attributable to relatively few stocks, and in the absence of any particular insight as to which stocks these might be in the future, **an attractive strategy is to allocate equally to all of them.**

Investors who are already using single-sector-based vehicles might productively consider equal-weight alternatives to diversify their portfolios or take tactical sector positions.

Historically, equal-weight indices have outperformed their capitalization-weighted counterparts with slightly higher volatility. In part, this is due to their natural bias toward smaller companies, which have tended to outperform larger companies (particularly during bull markets), while demonstrating higher risk. Moreover, the requirement to rebalance regularly adds a contrarian aspect to equal-weight strategies. Accordingly, **equal-weight indices may offer diversification to portfolios that otherwise maintain large-cap, defensive, or momentum biases.**

From a sectoral perspective, it appears that equal-weight indices derive a **larger proportion of their historical outperformance from equally weighting *within* sectors**, rather than from the particular sector weights they maintained. Thus, investors who are already using single-sector-based vehicles might productively consider equal-weight alternatives to diversify their portfolios or take tactical sector positions.

We hope that the perspectives provided in this paper prove useful in improving their outcomes for investors considering the use of equal weight indices in a benchmarking or investment context.

APPENDIX A: OTHER FACTORS IN EQUAL-WEIGHT INDICES

While not intending to be universal, Exhibit A1 provides a list of various popular equity factors or investment styles, together with a representative index whose performance might be taken to be indicative of that factor's returns and the observed correlation between the excess returns of each factor index and the S&P 500 Equal Weight Index, relative to the S&P 500. The magnitude of the correlation statistic indicates the degree to which the equal-weight index's excess returns are related to that factor. Exhibit A2 shows the same for the S&P Europe 350 Equal Weight Index, noting that slightly fewer comparisons are available for the latter.

Exhibit A1: S&P 500 Equal Weight Excess Return Correlations		
FACTOR	REPRESENTATIVE INDEX	ER CORRELATION
Mid-Caps	S&P MidCap 400	0.71
Beta	S&P 500 High Beta	0.70
Value	S&P 500 Value	0.43
Dividends	S&P 500 High Dividend	0.39
Quality	S&P 500 Quality	-0.18
Minimum Volatility	S&P 500 Minimum Volatility	-0.23
Momentum	S&P 500 Momentum	-0.24
Low Volatility	S&P 500 Low Volatility	-0.35
Growth	S&P 500 Growth	-0.42
Mega-Caps	S&P 100	-0.71

Source: S&P Dow Jones Indices LLC. Data based on monthly excess total returns (versus the S&P 500) in U.S. dollars, from December 2001 to December 2017. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit A2: S&P Europe 350 Equal Weight Excess Return Correlations		
FACTOR	REPRESENTATIVE INDEX	ER CORRELATION
Mid-Caps	S&P Europe MidCap BMI	0.61
Dividends	S&P Europe Dividend Opportunities	0.57
Value	S&P Europe LargeCap Value	0.10
Low Volatility	S&P Europe 350 Low Volatility	-0.17
Quality	S&P Europe 350 Quality	-0.29
Momentum	S&P Europe 350 Momentum	-0.41
Low Beta	S&P Low Beta Europe	-0.53
Growth	S&P Europe LargeCap Growth	-0.61

Source: S&P Dow Jones Indices LLC. Data based on monthly excess total returns (versus the S&P Europe 350) in euros, during the period January 2002 to December 2017. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Beyond the already examined biases toward higher-beta (or away from less-volatile) stocks, toward smaller stocks or away from the largest, and away from momentum, Exhibits A1 and A2 suggest that the equal-weight indices had meaningful additional biases toward value and higher dividends, as well as a mild bias against quality.

From Exhibit A1, one might conclude perhaps that value is an important factor in the returns of the S&P 500 Equal Weight Index, despite the fact that we have focused our attention almost exclusively on size and momentum. However, these factors are not *independent*.

Consider “value,” as measured by the [S&P 500 Value](#) (or however the reader prefers). Typically, larger stocks with otherwise similar characteristics tend to display higher valuations than smaller stocks. Moreover, stocks that have fallen in price more than their peers often will display more and more attractive valuations as their prices further fall. Thus, there is an *implied* expectation that equal-weight indices will demonstrate a bias toward “cheaper” companies, but **the value bias of equal-weight indices arises at least in part from size and momentum effects.**

This problem (lack of independence) is frequently circumvented in academic studies by constructing an “independent” series of factor returns to regress on, typically at the cost of creating more frequently rebalanced, long or short, and highly abstract portfolios that represent structurally independent representations of size, momentum, etc. While no doubt useful, these pure factor portfolios are not *investable* in any realistic sense. Nor, arguably, do they truly represent the factors they purport to manifest (since the real world characteristics of value, momentum, etc. are *not* independent, but instead overlap in several important ways).

It is ultimately a matter of taste which attribution is preferred; fortunately, the problem is **not acute in the case of equal-weight indices** where—in light of the methodology—**size and momentum are the preeminent candidates** for understanding performance. Conveniently, these two factors also account for a significant majority of excess performance. In other words, we *expect* to see the effects of size and momentum, we do, and they appear to offer a sufficiently comprehensive degree of explanatory power. **For those reasons, we favor their selection as the primary drivers of return** even if—as explained in this section—other factors certainly may be seen to play a role.

APPENDIX B: DETAILS OF INDICES & DATES USED IN COMPILING EXHIBIT 9

This section provides a summary of the indices representing stocks of smaller capitalization that were combined with the benchmark index in order to create the “Size Match” portfolio for each index, and the index that was used in order to provide a “momentum” factor to compare excess returns. Where there was an obvious choice available, it was used, otherwise representative proxies were used instead. In the case of momentum in Canadian stocks (as indicated by “N/A”), no representative proxy was available.

Where a representative proxy was used for the momentum comparison, the excess return of the momentum index used was the excess total return of the momentum index over its benchmark. Exhibits B1 and B2 provide the periods for which the analysis was applied in each case, as well as the indices used for purposes of comparison.

Exhibit B1: Comparison Indices Used to Construct Exhibit 9		
EQUAL WEIGHT PARENT	“SMALLER” INDEX USED TO CONSTRUCT SIZE MATCH PORTFOLIO	MOMENTUM REPRESENTATIVE INDEX
S&P 500	S&P MidCap 400	S&P 500 Momentum
S&P MidCap 400	S&P SmallCap 600	S&P MidCap 400 Momentum
S&P Europe 350	S&P Europe MidCap BMI	S&P Europe 350 Momentum
S&P/ASX 100	S&P/ASX MidCap 50	S&P/ASX 200 Momentum*
S&P/TSX 60	S&P/TSX Completion Index	N/A
S&P South Africa 50	S&P South Africa Completion Index	S&P Momentum South Africa*

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes. (*) indicates a momentum index with a different benchmark than the equal weight index.

Exhibit B2: Analysis Periods Used to Construct Exhibit 9	
EQUAL WEIGHT PARENT	ANALYSIS PERIOD
S&P 500	Dec. 1991 – Dec. 2017 (26 years)
S&P MidCap 400	Dec. 1994 – Dec. 2017 (23 years)
S&P Europe 350	Dec. 2001 – Dec. 2017 (16 years)
S&P/ASX 100	Dec. 2000 – Dec. 2017 (17 years)
S&P/TSX 60	Dec. 2001 – Dec. 2017 (16 years)
S&P South Africa 50	Dec. 2008 – Dec. 2017 (8 years)

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

For a description of the currently available S&P Momentum Indices (as of December 2017) and their respective benchmark indices, see the [S&P Momentum Indices Methodology](#).

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PERFORMANCE DISCLOSURE

The S&P SmallCap 600 was launched on October 28, 1994. The S&P MidCap 400 was launched on June 19, 1991. The S&P 500 Equal Weight Index was launched on January 8, 2003. The S&P MidCap 400 Equal Weight Index and the S&P SmallCap 600 Equal Weight Index were launched on August 23, 2010. The S&P/ASX 100 Equal Weight Index was launched on August 15, 2011. The S&P South Africa 50 and the S&P South Africa 50 Equal Weight Index were launched on February 6, 2014. The S&P/TSX 60 Equal Weight Index was launched on June 7, 2010. The S&P 500 Momentum was launched on November 18, 2014. The S&P Europe 350 Momentum Index was launched on November 18, 2014. The S&P Europe 350 Equal Weight Index was launched on January 21, 2014. The S&P 500 Low Volatility Index was launched on April 4, 2011. The S&P 500 High Dividend Index was launched on September 21, 2015. The S&P 500 Minimum Volatility Index was launched on November 9, 2012. The S&P 500 High Beta Index was launched on April 4, 2011. The S&P 500 Quality Index was launched on July 8, 2014. The S&P Europe Dividend Opportunities Index was launched on December 10, 2009. The S&P Europe 350 Low Volatility Index was launched on July 9, 2012. The S&P Quality Europe 350 was launched on July 8, 2014. The S&P Low Beta Europe Index was launched on May 8, 2014. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the Index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

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