S&P Dow Jones Indices

A Division of S&P Global

Index Investment Strategy

Sector Effects in the S&P 500®

The Role of Sectors in Risk, Pricing, and Active Returns

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"You can afford to pick some stocks and be wrong about a few of them. To keep your job, you cannot take the risk of being seen to be wrong about the 'big picture' for very long."

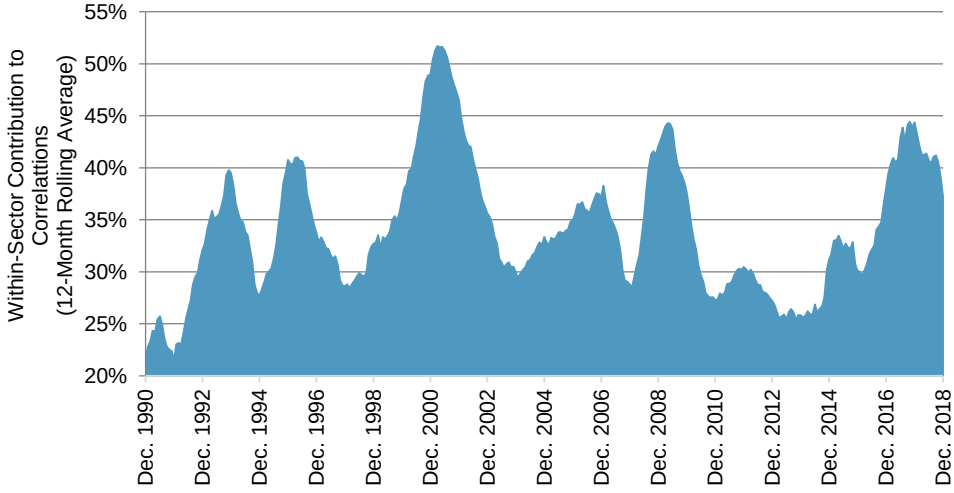
- Jeremy Grantham, *Money* (June 2012)

Sometimes, the sector composition of an equity portfolio is of primary importance. At other times, single-stock risks are more prominent. In this paper, we shall:

- Assess the relative importance of sectors in determining the performance of the S&P 500 and its constituents;
- Compare the potential of active strategies based on sectors to those based on single stocks;
- Discuss the role that sector-based products can play in generating active returns; and
- Identify periods when sector selection was particularly important.

This perspective is particularly timely; Exhibit 1 illustrates the increasing strength of sector-level effects in the S&P 500 over the past five years.

Exhibit 1: Sector-Level Effects Have Increased in the Last Five Years



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes. See Section 5, Exhibit 11 for more details.

1. INTRODUCTION

A company's prospects are linked to its sector and the overall market.

Consider an active manager who has identified a certain stock in the Utilities sector[1] as relatively attractive. He anticipates an excess return from a concentrated position in that stock, compared to a diversified position in the sector. However, a concentrated position in any stock is exposed not only to the specific prospects of that company, but to a sector and to the market. **Which exposure is more important?**

To illustrate the relative importance of sectoral and stock-level return drivers, consider that the average annualized dispersion of constituent returns in the S&P 500 Utilities sector over the 10 years ending in December 2018 was 10%.[2] Thus, a better-performing stock in the Utilities sector might be expected to offer a one-year excess return over its sector of around 10%. However, over the same 10-year period, the average difference between the one-year return of the S&P 500 Utilities and S&P 500 indices was *also* 10%. **In other words, a stock being one of the *best* Utilities stocks may be less important than being a *Utilities* stock**.[3]

…owning one of the best stocks in a sector may be less important than exposure to its sector.

Of course, even if a chosen stock outperforms its sector, and even if that sector doesn't significantly underperform the market, the risk of a loss remains. (The S&P 500 Utilities outperformed the S&P 500 by 18% in 2008, but even the best-performing Utilities stock still had a negative total return for the year.) A manager selecting which securities to avoid faces equal and opposite difficulties; an Energy stock with poor prospects relative to its competitors might soar in price if there were a sudden shortage of crude oil.

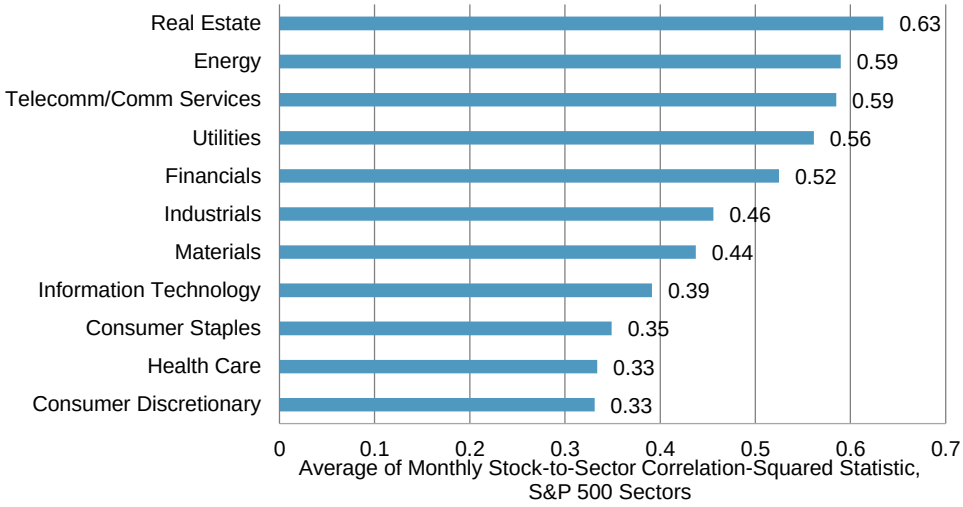
The extent to which sector-level effects can drive stock returns is the subject of Exhibit 2. It shows the average statistical coefficient of determination (R-squared) between the daily price changes in S&P 500 constituents and their respective sectoral index, based on capitalization-weighted averages of monthly calculations over the 15-year period from January 2004 to December 2018.

[1] Throughout this paper, we rely on the GICS® classification system of stocks into their sectors. For more information, see the Global Industry Classification Standard Methodology.

[2] Statistics on this page are sourced from S&P Dow Jones Indices as of January 2019.

[3] See Bennett, Chris and Craig J. Lazzara, "Some Implications of Sector Dispersion," April 2015.

Exhibit 2: Sectors Could Explain Up to Half of Stock Price Variance



Source: S&P Dow Jones Indices LLC. See Appendix for notes on how each series is calculated, and remarks on the sectoral changes in the Financials, Real Estate, Telecommunication Services, and Communication Services sectors. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

In most sectors, around half of daily variation in stock prices could be attributed to changes in sector prices.

It should be noted that **Exhibit 2 incorporates market-level effects in its analysis of sector importance**. By measuring correlations of stock returns to sector returns (instead of *excess* returns over the benchmark), we might overestimate sectoral importance by including the explanatory power of market trends in sector returns. We shall return to the problem of disentangling sector from market effects in Section 5.

…we shall return to the problem of disentangling sector from market effects in subsequent sections.

That said, in most sectors around half of all the daily variation in stock prices *might* be attributed to changes in sector prices, as we can see in Exhibit 2. This has consequences for price discovery in equity markets, particularly with the development of tradeable products that enable investors to manage their sectoral exposures.

2. SECTOR-BASED PRICING AND TRADING

How can a skillful stock picker ensure his skills are rewarded?

If sector-level effects can be as important as—or even more important than—stock-level effects, **how can a skillful stock picker ensure that his skills are rewarded?** If he were able to take a short position in an instrument linked to the performance of a Utilities sector index *as well as* a position in his favored constituent, his return (ignoring costs) would be entirely determined by the *relative* return of his pick.[4] Conversely, a manager bearish on a particular Energy stock might replace that position—if she owned it—with one in a broad-based sectoral index, potentially combined with an outright short position in the stock. In either case, **the availability of sector-based exposures provides a more predictable link between a manager's skill and the subsequent return**.

[4] It is impossible to invest directly in an index, either long or short. Index-linked products such as futures and ETFs involve other practicalities such as potential costs or fees that are not considered in this hypothetical example.

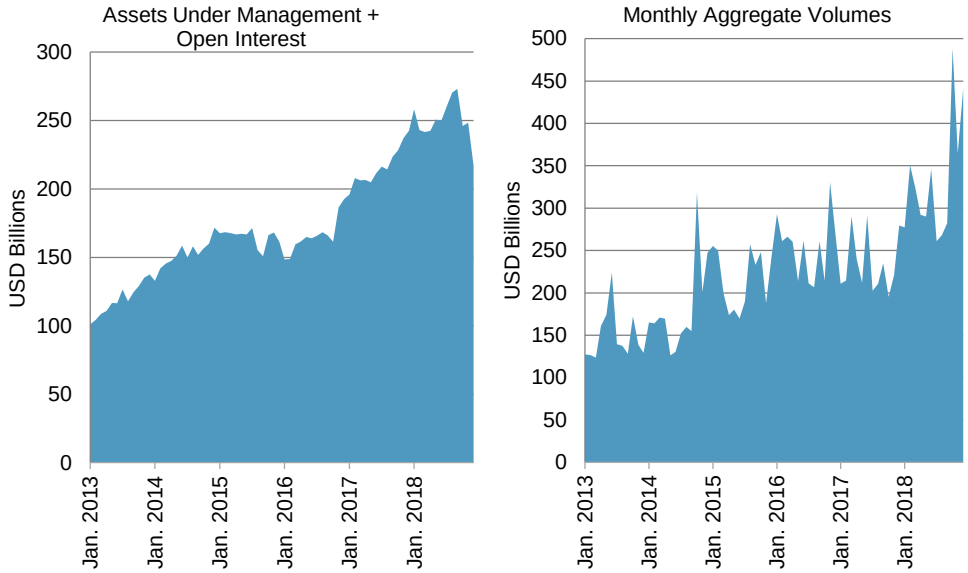
Sector-based exposures provide a more predictable link between a manager's skill and subsequent return.

Tradeable sector-based investment tools are not new. Products such as exchange-traded funds (ETFs) based on sector indices have existed since at least the late 1990s. However, **interest in these products has grown materially**. As Exhibit 3 shows, the assets, open interest, and trading volume associated with certain index-based sector products has more than doubled in the past five years.

The left-hand chart in Exhibit 3 shows, for U.S. sector and industry indices offered by S&P Dow Jones Indices, the aggregate assets under management of ETFs (listed on either European or U.S. exchanges), plus the aggregate open interest in listed futures tracking those indices.[5] The right-hand chart shows the aggregate trailing average daily volume each month in the same instruments.

Interest in sector-based futures and ETFs has grown in recent years.

Exhibit 3: Increasing Adoption of U.S. Sector- and Industry-Linked Products



Sources: Bloomberg LLP, S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. See Appendix for the list of products used in order to construct this exhibit and remarks on consolidated volume calculations for European-listed ETFs. Charts are provided for illustrative purposes.

Greater liquidity in sector-based instruments should allow for more efficient price discovery.

The aggregate volumes illustrated in Exhibit 3 amounted to **$4.0 trillion in traded value during 2018**. This is equivalent to more than 10 times the average amount traded each day in *all* stocks listed anywhere in the U.S. and, alternatively, equivalent to about one-third of the value of trading that year in the constituents of the S&P 500.[6]

Greater trading in diversified baskets of stocks representing certain markets, or with certain characteristics, should improve the ease with which

[5] Although every futures contract necessarily requires one participant who is "long" and another who is "short," we include futures open interest in the same series as aggregate assets in ETFs in order to illustrate the magnitude of sector positioning by market participants.

[6] Comparisons based on the average daily traded value of $358 billion for U.S.-listed equities in 2018 provided by SIFMA, and $12.0 trillion of trading in the constituents included in the S&P 500 in 2018 according to Bloomberg LLP. See also https://www.sifma.org/resources/research/us-equity-stats/.

Sector-based trading tools can help both "bottom-up" and "top-down" investors express their views.

one might benchmark or hedge their common factors. In particular, **sector-based trading allows market participants with a top-down approach to express their viewpoints regarding sectors more easily, and hence improve market efficiency**. This point is important because some critics have claimed that a rise in the use of index-linked products could *diminish* price efficiency.[7]

This enhancement of market efficiency is not limited to a top-down perspective. The bottom-up perspective would also suggest an improvement. If it is simpler to implement a view on a stock *relative* to a sector, then investors can more easily arbitrage away discrepancies between sectoral peers. **From both top-down and bottom-up perspectives, greater liquidity in sector-based instruments should allow for more efficient price discovery**.

The increasing adoption of sector-based products offers evidence for sectors' rising importance.

In the light of these observations, the increasing adoption of sector-based index-linked products offers evidence of a rising importance of sectors to equity returns.

3. ACTIVE OPPORTUNITIES IN SECTORS AND STOCKS

Sector-based products may help investors to express their views, but the question remains: is stock-picking or sector-picking superior? It's not a question we can answer definitively since different skills may be required. **However, we can compare the potential *rewards* to those skills**.

Active opportunity is defined by the size of positions, and their excess returns.

Two characteristics define the opportunity set for active selection: the potential size of positions, and the potential magnitude of excess return from each position.[8]

Scaling the size of positions may depend on each manager's circumstances. Small portfolios without diversification requirements might never be constrained by issues of capacity. For larger funds, or those with diversification requirements, capacity constraints are more likely. Moreover, for long-only managers whose performance is compared to a benchmark, the benchmark weight of each component defines the maximum possible *under*weight.

Capitalizations offer a useful proxy for investment capacity.

Benchmark weights offer a useful proxy, even while capacity varies from manager to manager. **They indicate the aggregate capacity for *all* investors and reflect the degree of underweighting that is possible for many managers**.

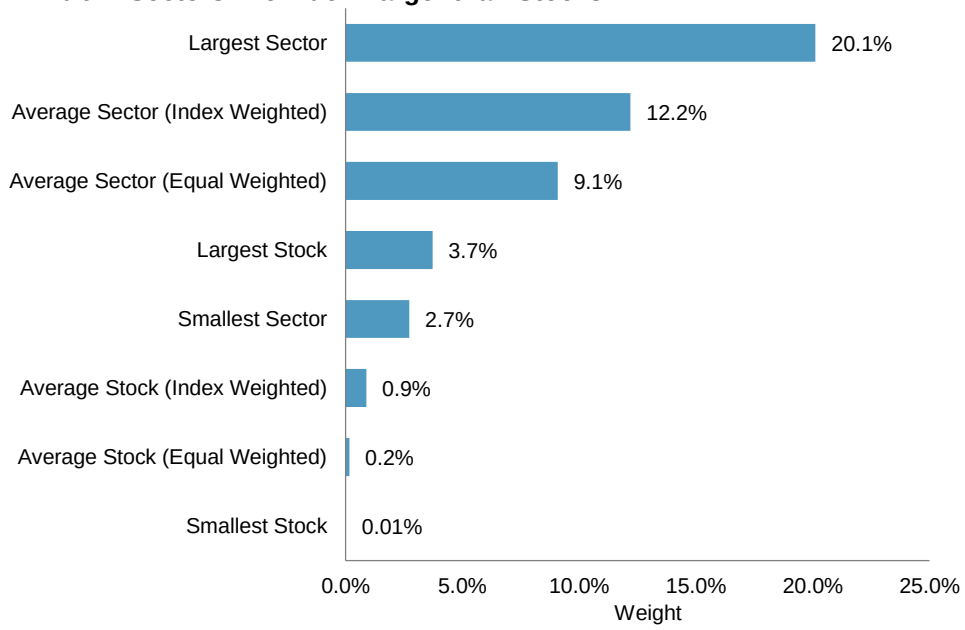
[7] See Ganti, Anu R. and Craig J. Lazzara, "The Slings and Arrows of Passive Fortune," *S&P Dow Jones Indices LLC*, April 2018.

[8] See Edwards, Tim, Anu R. Ganti, Craig J. Lazzara, and Hamish Preston, "The Value of Research: Skill, Capacity, and Opportunity," *S&P Dow Jones Indices LLC* October 2018.

Sector capitalizations were an order of magnitude greater than constituent capitalizations as of year-end 2018, as Exhibit 4 illustrates.

The average size of each sector is around 10 times larger than the average stock capitalization.

Exhibit 4: Sectors Are Much Larger than Stocks



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Chart is provided for illustrative purposes. Dual share classes combined for the purposes of average stock weights.

We can compute average capitalizations by taking either a simple or an index-weighted average of component capitalizations; both alternatives are shown in Exhibit 4. We view the index-weighted option as preferable since, for example, the addition of multiple new constituents at near-zero weight will not significantly alter the average. In either case, the average S&P 500 *sector* had a free-float capitalization that was more than 10 times larger than the average S&P 500 *stock*.

When trying to generate performance through skill, the outcome depends on the level of dispersion among returns.

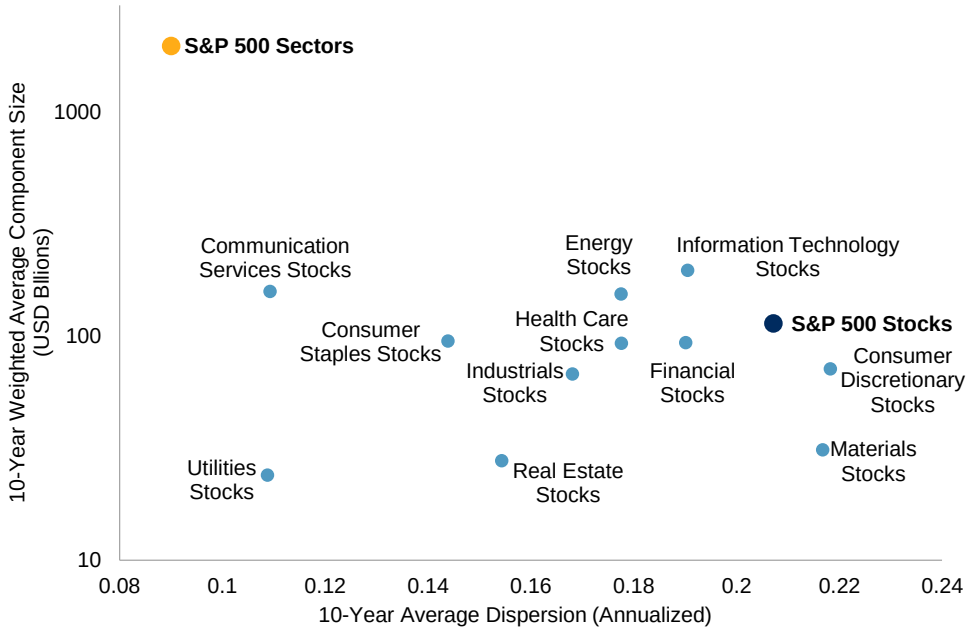
Beyond capacity, the value of a manager's ability to generate performance depends largely on the level of *dispersion* among constituent returns. We can calculate dispersion via a weighted, cross-sectional standard deviation among returns in each period.[9]

Combining measures of capacity and dispersion helps assess the potential value of insightful stock- or sector-selection. The trade-off between capacity for investment and dispersion between stocks and sectors is shown in Exhibit 5. It plots the weighted average free-float capitalization and monthly dispersion, averaged over the past 10 years for S&P 500 sectors (the bolded yellow top left point), the constituents of each sectoral index, and the constituents of the benchmark S&P 500 (the bolded dark blue point). Note that the y-axis of average capitalizations is in logarithmic scale.

[9] See Edwards, Tim and Craig J. Lazzara, "Dispersion: Measuring Market Opportunity," *S&P Dow Jones Indices LLC*, December 2013. We shall return to the topic of stock and sector dispersions in Section 6.

Combining measures of capacity and dispersion can help assess the value of insightful stock- or sector-selection.

Exhibit 5: Sectors Offer a Trade-off between Capacity and Dispersion



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 5 illustrates the trade-off between capacity for investment and dispersion between stocks and sectors.

Sectors displayed only around half of the dispersion of stocks, on average, and offer fewer choices from which to select, but the average size of each sector was around 10 times larger than the average stock. The relative magnitudes of dispersion and capacity tell us that **active strategies based on sectors have the potential to be considerably more fruitful than active strategies based on stocks**.

The relative magnitudes of dispersion and capacity tell us active strategies based on sectors could be more fruitful than those based on stocks.

Taken together, Exhibits 2 and 5 illustrate that a sectoral perspective had a high potential value, on average, over a fairly long-term horizon for the S&P 500. To examine more recent trends, we will need to develop a deeper understanding of how sectoral, stock, and overall market risks manifest.

4. A CASE STUDY IN SECTORS

"The reason our stock market is so successful is because of me."

Donald J. Trump[10]

Volumes and assets in sector-based products offer only circumstantial evidence of the importance of sectors. For a more formal analysis of sectoral risks, we begin with an occasion when sectoral effects were particularly visible and market effects were particularly suppressed: the market reactions to the result of the 2016 U.S. presidential election.

[10] Remarks to press, Nov. 5, 2017. See e.g., https://www.cnbc.com/2017/11/06/trump-boasts-the-reason-our-stock-market-is-so-successful-is-because-of-me.html.

Sectoral effects were particularly prominent around the 2016 U.S. presidential election.

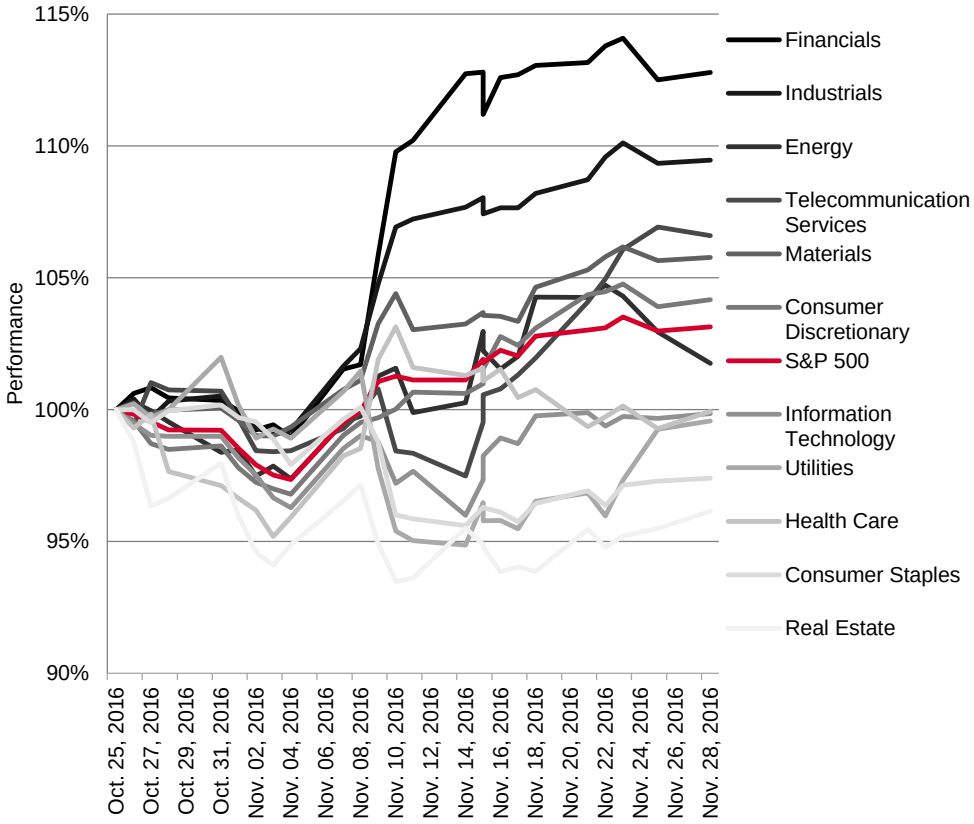
Consensus opinion at the time expected a win for Democratic nominee Hillary Clinton; a significant decline in U.S. equity prices was anticipated should Donald Trump upset the favorite.[11] Yet the S&P 500 opened more or less unchanged on the morning after Trump's victory, and remained stable during the subsequent week of trading. **One might conclude that the impact of the election on U.S. equity prices had been overestimated**.

Before the vote, consensus opinion expected a win for Hillary Clinton and a decline in U.S. equity prices should Donald Trump upset the favorite.

However, while broad-based benchmarks displayed only muted responses to the election, **the extent of repricing was much greater than overall market benchmarks indicated**. Exhibit 6 shows the daily levels of the S&P 500 (in red) together with its 11 GICS sector subindices (in various shades of grey) during the two-week period leading up to, and the month after, the election. **Sector returns varied widely in the aftermath of the election result**.

The extent of repricing was much greater than overall market benchmarks indicated, as S&P 500 sector returns varied widely.

Exhibit 6: Wide Dispersion in Sectoral Responses to the 2016 U.S. Election



Source: S&P Dow Jones Indices LLC. Data as of January 2019. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The significant spread among the reactions of the various sectors of the S&P 500 suggests that market participants believed some sectors might prosper and others struggle under the new administration. We shall return

[11] For example, Financial Times columnist John Authers predicted "horror and a big sell-off, centred on US stocks and the dollar" in the event of a Republican victory. Authers, John, "So how would the markets react if Donald Trump wins?" *Financial Times*, Nov. 4, 2016.

What does it mean to say that sectors were "more" or "less" important in a particular period?

to the topic of sectoral dispersion, after first considering the role of correlations. **Correlations show that in November 2016, sectors played an unusually significant role in determining equity risk**.

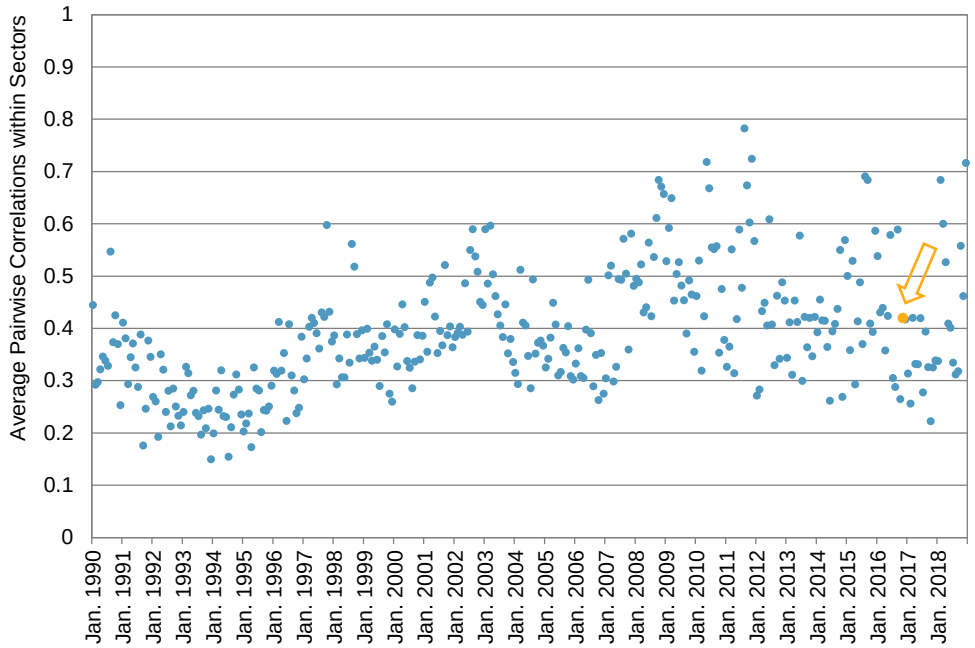
What does it mean to say that sectors were "more" or "less" important in any particular period? When correlation among price changes of stocks in the same sector are relatively high, stocks in the same sector are—broadly speaking—behaving more similarly. From this we might infer that sectoral drivers are of above-average importance.

A starting point for this analysis is correlation among price changes of stocks in the same sector…

Exhibit 7 plots a snapshot of such correlations, specifically displaying the index-weighted average correlation of daily price changes between all pairs of S&P 500 constituents in the same sector over each month. **The yellow point corresponding to November 2016 is identified by an arrow**.

Exhibit 7: Average Pairwise Correlation of S&P 500 Constituents in the Same Sector

Relative to history, the average correlation of stocks in the same sector for November 2016 was unremarkable…



Source: S&P Dow Jones Indices LLC. We calculate the average correlation between pairs of stocks in each sector, and then take a capitalization-weighted average across sectors to produce each monthly data point. The average includes 10 sectors prior to the elevation of Real Estate to a top-level sector in September 2016, and 11 sectors thereafter. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

…but that doesn't mean we can conclude that sectoral trends were unimportant.

Relative to history, the 0.42 average correlation of stocks in the same sector for November 2016 was unremarkable. Can we therefore conclude that sectoral trends were unimportant? Not yet! The average correlation in sectors also reflects the broader correlation environment, as well as its sectoral drivers.

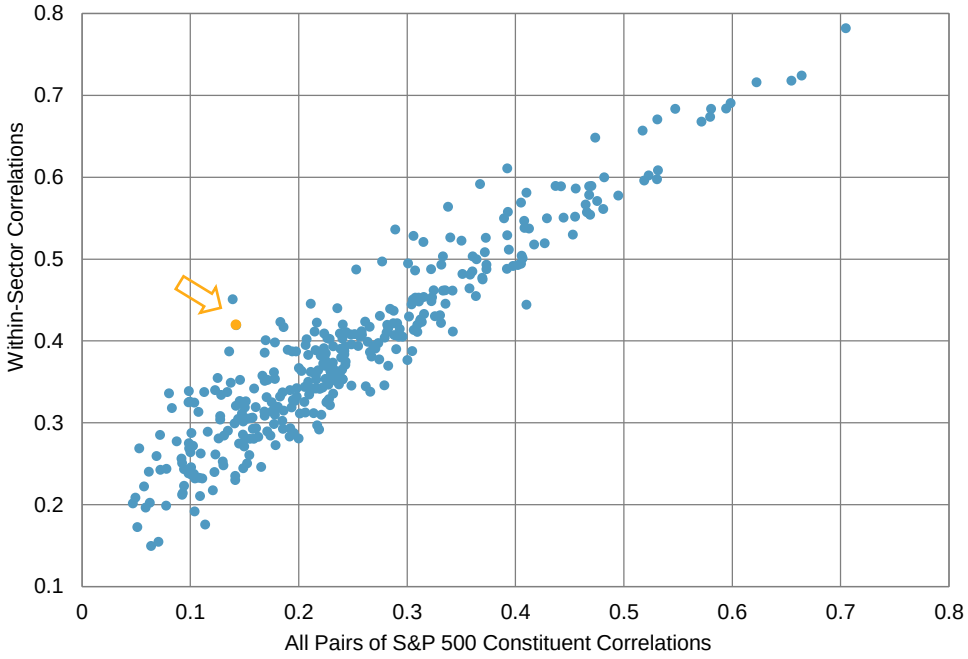
Exhibit 8 compares the average within-sector correlations of S&P 500 constituents (as displayed in Exhibit 7) to the correlation among *all* possible

pairs of constituents (including correlations between stocks in different sectors). As before, each point represents a single calendar month in the period from January 1990 to June 2018, with November 2016 highlighted by an arrow.

When that average correlation within sectors is viewed relative to the overall average correlation between all S&P 500 stocks…

As becomes clear from Exhibit 8, when November 2016's average correlation of 0.42 between pairs of stocks within the same sector is viewed *relative* to the same month's 0.14 overall average correlation among all pairs of S&P 500 stocks, **sectoral correlations were indeed unusually high.**

Exhibit 8: All versus Within-Sector Correlations in the S&P 500



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

…it becomes clear that sectoral correlations were unusually high in the election month.

There is a strong linear correspondence between the two series, which supports the intuitive notion that the broader correlation environment should be an important determinant of within-sector correlations. In other words, when stock-to-stock correlations are high within each sector, we can expect that stock-to-stock correlations will also be high across sectors.

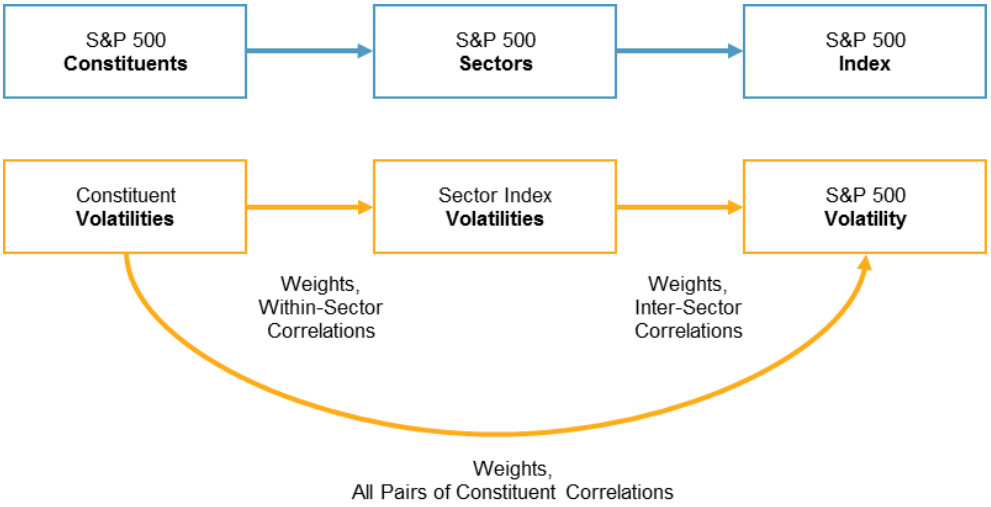
We can go slightly further in exploring the relationship between correlations within and across sectors.

There is yet more to the relationship between the overall correlation environment and the correlations within and across sectors. We address this relationship conceptually in the next section.

5. MEASURING "IMPORTANCE" WITH CORRELATIONS

The volatility of *any* portfolio is a mathematical consequence of the weights, volatilities, and correlations of its constituents. As Exhibit 9 illustrates, beginning with its constituents, we can arrive at the S&P 500 in two ways, which gives us two ways to calculate the resulting index volatility.

Exhibit 9: Schematic Decomposition for the Effect of Correlations on S&P 500 Volatility



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

We can arrive at the S&P 500 in two ways, which gives us two ways to calculate the resulting index volatility.

In the first calculation: following the horizontal arrows in Exhibit 9, we group the constituents of the S&P 500 into sectors first, and then subsequently group sectors to form the final index portfolio. The volatility of each sector index will be determined by the volatilities, weights, and *within*-sector correlations of its constituents. Then the volatility of the benchmark will be determined by the volatilities, weights, and *inter*-sector correlations of the sector indices.

Since the end result of either volatility calculation must be the same…

In the second calculation: following the curved arrow in Exhibit 9, we instead group *all* the constituents of the S&P 500 together in a single step. In this case, the volatility of the benchmark is determined by the constituent weights, volatilities, and the set of *all possible pairs* of correlations between constituents.

Since either procedure leads to the same portfolio, **the end result of either volatility calculation must be the same**. Thus, the impact of correlations among *all* S&P 500 constituents **may be viewed as a combination of the impacts of correlations *within* sectors and correlations *across* sectors**.

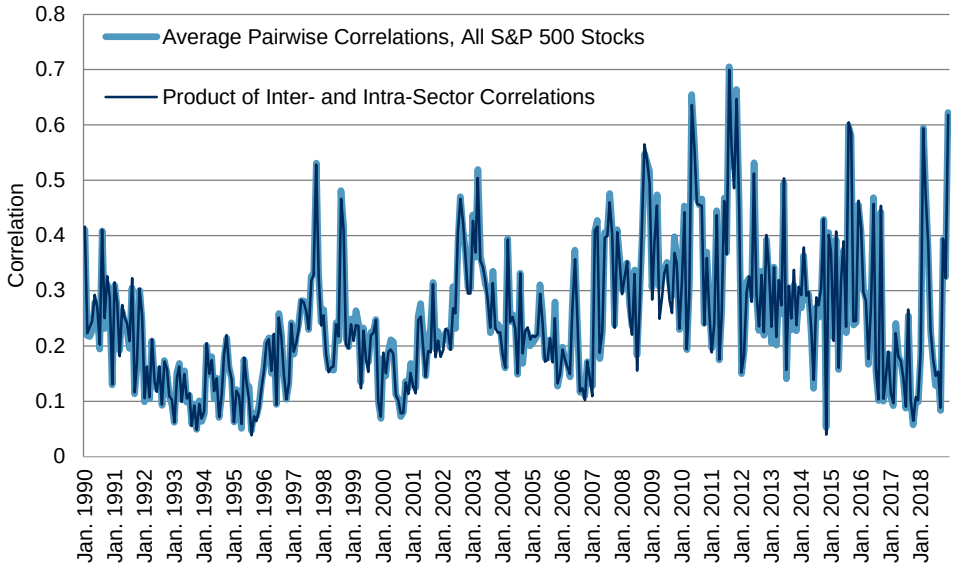
…the impact of correlations among all constituents may be viewed as a combination of the correlations within and across sectors.

In practice, the combination is multiplicative and approximate. More precisely, the overall correlation environment, as represented by the average pairwise correlation among all S&P 500 constituents, is closely approximated by multiplying the average inter-sector correlation by the

average within-sector correlation.[12] To illustrate the extent to which such approximations may be useful, Exhibit 10 displays the monthly similarity between the overall average correlations and the product of intra- and inter-sector averages within the S&P 500.

Exhibit 10: The Product of Intra- and Inter-Sector Correlations Approximates the Overall Correlation Environment

The balance between sectoral and cross-sector effects is germane to questions of sectoral importance…



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

…essentially measuring which of two kinds of correlation are contributing more to the overall environment…

By analyzing the contribution of each factor to their product, we can investigate the *balance* between sectoral and cross-sector effects in determining the overall index correlation.[13] **This balance is particularly germane to questions of sectoral** "**importance**," measuring which of two kinds of correlation are contributing more to the overall environment: those *within* sectors or those *across sectors*.

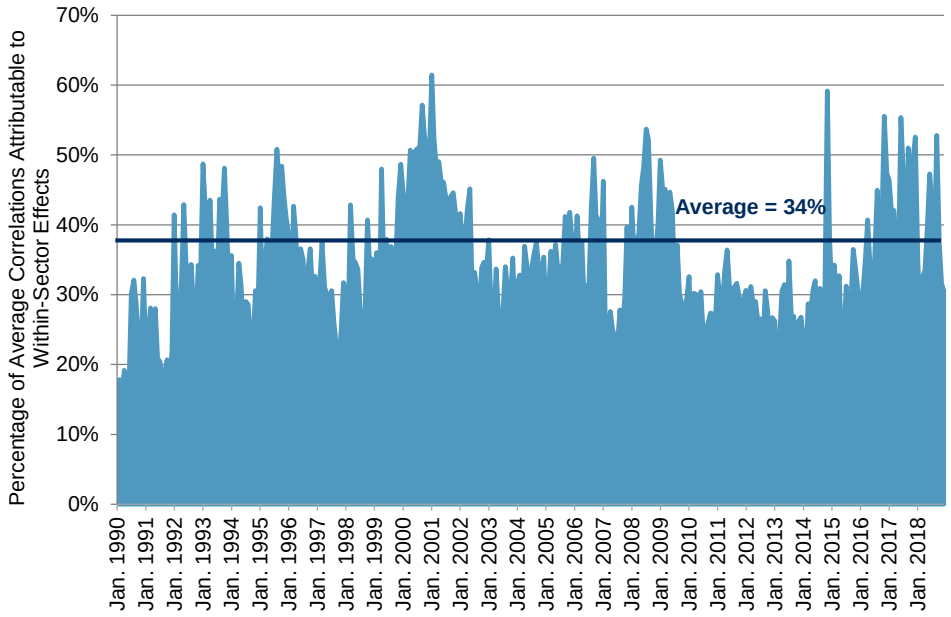
To illustrate this balance and its evolution over time, Exhibit 11 plots the proportion of the overall average correlation that can be attributed to within-sector and cross-sector effects. As a guide to interpretation, when the series of Exhibit 11 rises above 50%, the shared relationships among stocks in the same sector are stronger, on average, than the relationships among different sectors.

…those within sectors or those across sectors.

[12] The relationship is approximate. Every correlation between *particular pairs* of stocks cannot necessarily be simply decomposed into a combination of within-sector and cross-sector effects. The point is that the *overall* effect of such correlations is well approximated by such a decomposition. In practice, corporate actions, sector reassignments, and index rebalances also create differences in the results of such calculations.

[13] Provided all terms are positive, the application of logarithms provides the contribution of each term to a product: since if $C = AB$, then $\ln(C) = \ln(A) + \ln(B)$. If both A and B are between zero and one (as in this case), their logarithms will be negative, and the additive decomposition measures the extent to which the product is *less* than 1. Accordingly, we define the "contribution" of A as $\ln(B)/\ln(C)$ and similarly for the contribution of B as $\ln(A)/\ln(C)$.

Exhibit 11: Relative Importance of Within-Sector Effects



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 11 shows some historical features that we might have anticipated.

Note that the series shown earlier in Exhibit 1 corresponds to a 12-month rolling average of the series shown in Exhibit 11.

The series of Exhibit 11 rarely rises above 50%, and has a long-term average of around 34%—implying that **most of the time, the correlation environment was determined more by cross-sector effects than within-sector effects. This result should not be surprising**—to the extent that *all* S&P 500 stocks share a common sensitivity, this will manifest itself as an effect shared across sectors.[14]

Within-sector effects were at a relative historical low in the period of 2012-2013, but have risen noticeably in the past several years

Exhibit 11 shows some historical features that we might have anticipated, and supports the hypothesis that sectoral importance has been increasing recently. The series rose above 50% in several months during the sectorally driven "tech bubble" of the late 1990s and early 2000s, and rose above the same level again as the financial crisis hit in 2008. The series then rose above 50% briefly in November 2014, and a further four times in the last three years (including November 2016).

In summary, **Exhibit 11 suggests that within-sector effects were at a relative historical low in the period of 2012-2013, but have risen noticeably in the past several years to approach the higher register of its historical range**.

[14] Sectors may have a different "beta" to the market, but still have a similar magnitude of correlation.

6. STOCK AND SECTOR DISPERSION

An analysis of the dispersion of S&P 500 constituents within and across sectors…

While correlations are germane to the notion of "explanatory power," they are not necessarily indicative of performance. Highly correlated assets will not necessarily offer the same returns in the long term, while uncorrelated assets can ultimately reach similar destinations.[15] **The dispersion of S&P 500 constituents within and across sectors can offer a complementary perspective to the tale told by correlations**.

In the spirit of Exhibit 9, for an index like the S&P 500, dispersion may be measured among all constituents, among constituents in the same sector, or among sectoral returns. If taken across all constituents, stock-level dispersion will *always* be higher than sector-level dispersion; constituent returns will always be distributed more broadly than their sectoral averages. A strategy of picking only one stock, without regard to capacity or diversification constraints, will always offer the potential for greater rewards than picking the best sector.

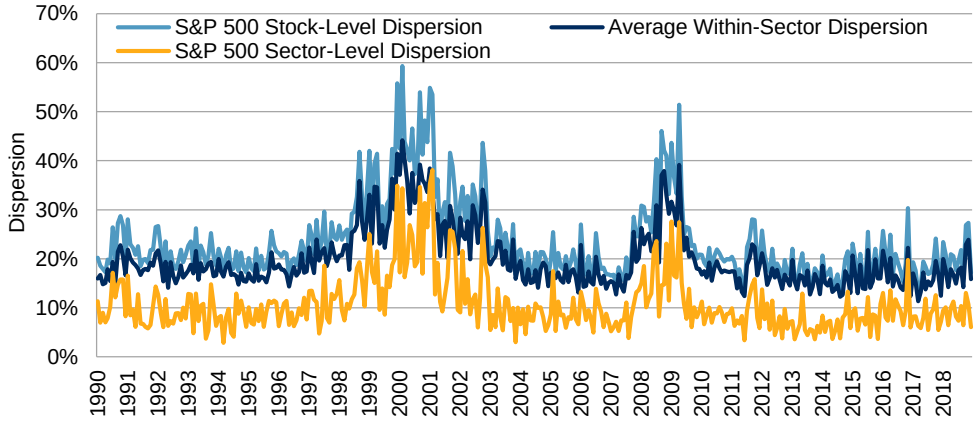
…can offer a complementary perspective to the tale told by correlations.

However, just as a portfolio comprising the best stock in each sector won't necessarily beat the best sector, **cross-sector dispersion *can* theoretically be, and on rare occasions *has* been, larger than the average stock dispersion within sectors**.

Exhibit 12 shows the monthly evolution of each dispersion statistic. Over the full period of Exhibit 12, the annualized monthly dispersion of all the constituents averaged 24%, the dispersion of constituents within each sector averaged 20%, while the average dispersion across sectors was 11%.

Exhibit 12: S&P 500 Stock, Sector, and Within-Sector Dispersion

Cross-sector dispersion can theoretically be larger than the average stock dispersion within sectors.



Source: S&P Dow Jones Indices LLC. To calculate the average within-sector dispersion, we calculate the dispersion in each sector, and then take a capitalization-weighted average across sectors to produce each monthly data point. The average includes 10 sectors prior to the elevation of Real Estate to a top-level sector in September 2016, and 11 sectors thereafter. Data from January 1990 to December 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

[15] Lazzara, Craig, "Dispersion and Correlation: Which is 'Better?'" Jan. 30, 2014.

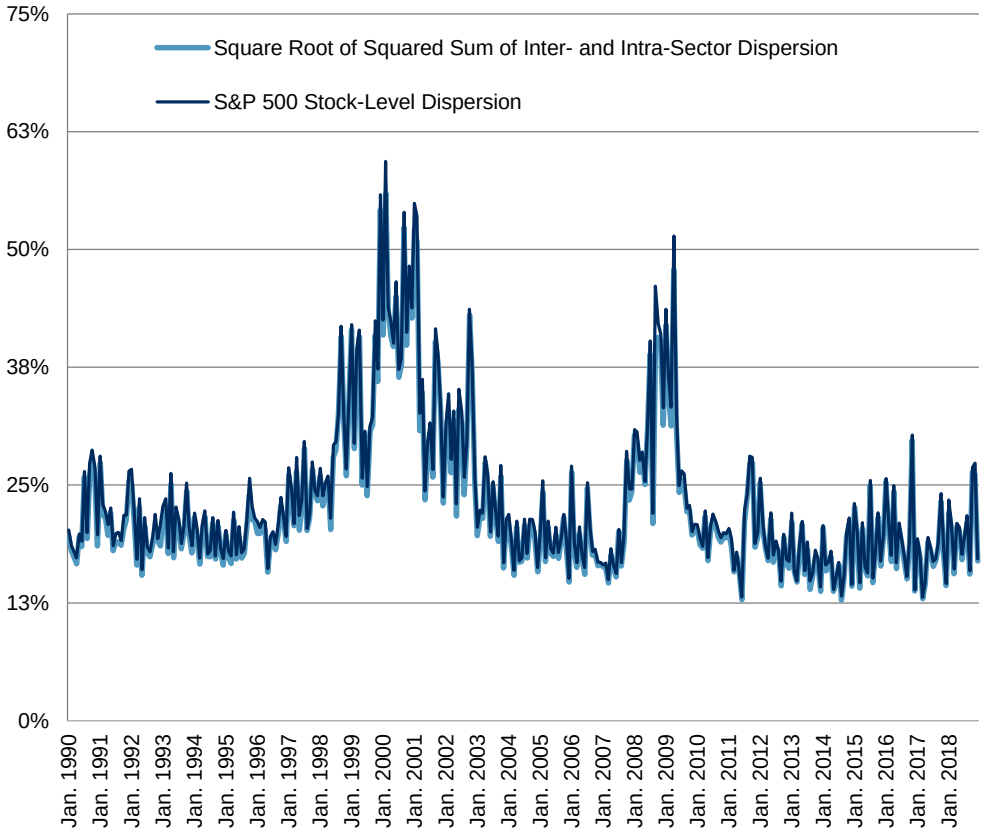
Analogously to the case of correlations, **we can decompose overall S&P 500 stock-level dispersion into the combined effect of dispersion within sectors and dispersion among sectors.**

We can decompose S&P 500 dispersion into a combination of within sector and cross sector effects.

The three types of dispersion (within-sector, cross-sector, and market-wide) are approximately related to each other by simple mathematical relationship. Whereas in the case of correlations the product of the first two equaled the third, in the case of dispersion, the relationship is akin to that shared between the three sides of a right-angled triangle; the sum of the square of the first two terms equals the square of the latter.[16]

Exhibit 13 illustrates this relationship in the case of the S&P 500, as applied to the three series shown in Exhibit 12.

Exhibit 13: Dispersion Decomposition in Stock- and Sector-Level Effects



The decomposition allows us to measure the relative importance of sectors in driving overall dispersion.

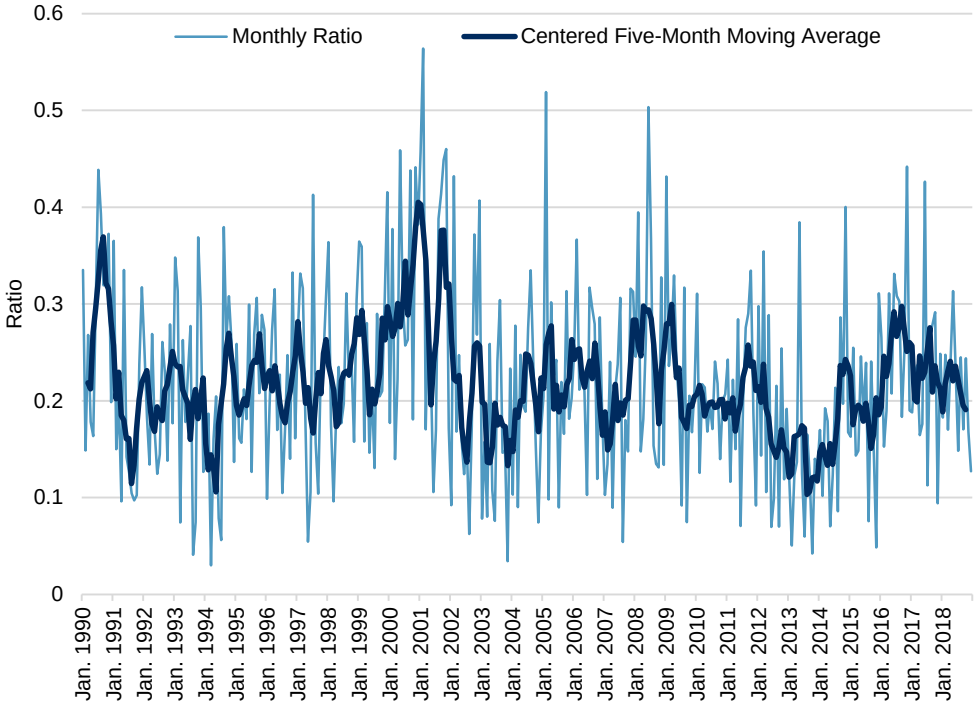
Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

There were only a few occasions when sectoral effects appeared larger than stock-level effects.

As before, we can use such a decomposition to provide a sense of the importance of within- and cross-sector effects in determining the overall market-wide level of dispersion. Exhibit 14 shows the ratio of (squared) cross-sector dispersion to its sum with (squared) intra-sector dispersion.

[16] As with correlations, the relationship is necessarily approximate, but appears to be practically accurate. For a sense of *why* such a relationship holds, see Edwards, Tim and Craig J. Lazzara, "At the Intersection of Diversification, Volatility and Correlation," *S&P Dow Jones Indices LLC,* April 2014.

Exhibit 14: Relative Contributions of Stock and Sector Dispersion



Source: S&P Dow Jones Indices LLC. A centered rolling average is applied to illustrate the broader trends, in this case a five-month average. Data as of Dec. 31, 2018. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

When the series of Exhibit 14 rose above 0.5, dispersion in cross-sectoral returns was higher than the average dispersion of stocks within each sector

As a guide to interpreting Exhibit 14, on the rare occasions when the series rose above 0.5, dispersion in cross-sectoral returns was higher than the average dispersion of stocks within each sector. **At these times, one would expect skillful sector picks to offer higher rewards than skillful stock picks in each sector, even without taking capacity into consideration**.

The perspective that dispersion offers is that this rise in sectoral importance might be better characterized as a "return to the norm"…

As with Exhibit 11, there were only a few occasions when sectoral effects appeared larger than stock-level effects. In November 2016, the two series were close in equivalence (sector dispersion was 20%, and within-sector stock dispersion was only 2% higher). Only in February 2001, February 2005, and June 2008 did sector dispersion actually exceed the average within-sector stock dispersion.

More importantly, **as was the case in Exhibit 11, there is an increase in the series—particularly visible in the moving average—from a low in 2013 to a higher level more recently**. However, and in contrast to correlations, the increase in dispersion might be better characterized as a "return to the norm" rather than a trend toward a historical extreme.

…rather than a trend toward a historical extreme.

The fluctuating levels of sectoral dispersion, when combined with remarks in earlier sectors regarding the correlations, potential liquidity, and capacity of sector-based investment tools, **reinforce the sense of a growing importance of sectoral perspectives in the construction of active portfolios**.

7. PASSIVE PRODUCTS, ACTIVE APPLICATIONS

Our analysis suggests that we may have emerged from a period in which the importance of sectors was unusually diminished.

As we have seen, market participants are making increasing usage of listed products that enable U.S. equity sector- and industry-based investing and trading. The phenomenon may be symptomatic of a wider trend toward the adoption of index-based products in investment portfolios, typically as the basis for passive investment strategies. However, as evidenced by the significant trading volumes observed in the associated ETFs and futures, **index-based products linked to U.S. sector and industry indices are not always being used in a "passive" manner.**

Index-based products linked to equity sectors are hardly antithetical to "active" investing, as this paper shows, and we think that market participants are using them precisely to express active views. This could be in support of an active position elsewhere in the portfolio (hedging a concentrated position in a single name with an opposite position in the relevant sector, for example). Investors may also be using sector-based products to make direct active bets on the fortunes of one sector over another.

If the trend were to continue, it may benefit investors to consider a sectoral perspective.

While sectors are always important, their importance fluctuates. **Our analysis suggests that we may have emerged from a period in which the importance of sectors was unusually diminished, relative to history**. **If this trend continues, it may benefit the investment practitioner to consider a sectoral perspective in the context of security selection and portfolio construction**.

APPENDIX A: NOTES ON EXHIBITS

Average Pairwise Correlations. For each index and period, the average correlation between pairs of stocks in the index is calculated as a ratio of variances. Specifically, we calculate the average pairwise correlation by the ratio of index variance to the index-weighted average variance of constituents. Similarly, the average pairwise correlations of sectors are calculated as the ratio of the variance of the free-float-capitalization-weighted portfolio of sectors to the free-float-capitalization-weighted average sector variance. See Edwards, Tim and Craig J. Lazzara, "At the Intersection of Diversification, Volatility and Correlation," *S&P Dow Jones Indices LLC*, April 2014 for details on the validity of this approximation, and its potential advantages in measuring risk attributions.

Average Stock-Sector R-Squared Statistics (as shown in Exhibit 2) are calculated by the simple approximation that the index-weighted average correlation of a stock to its sectoral index will equal the square root of the index-weighted pairwise average correlation taken across all single stock pairs. Accordingly, the R-squared statistic relating stocks to their sector index is directly provided by the average pairwise correlations. See Solnik, Bruno and Jacques Roulet, "Dispersion as Cross-Sectional Correlation," *Financial Analysts Journal,* Vol. 56, Issue 1, January 2000 for an intuitive introduction to the calculation.

Sectoral Changes 1 – Real Estate. In September 2016, Real Estate, which had previously been an industry group contained within the Financials sector under the GICS classification system, was carved out from Financials and elevated to the position of the 11th GICS sector. In our analysis, except in the case of Exhibit 2, we treat Real Estate as part of the Financials sector until the point in September 2016 when it departed. In the case of Exhibit 2, the statistic for Real Estate is an average taken over the full 15-year period for the segment; for the period covered by Exhibit 2, it is considered an industry group instead of a top-level sector. The statistic for Financials is for the sector as it was, and so includes a contribution from equities classified within the Real Estate industry for the period when they were included in Financials.

Sectoral Changes 2 – Telecommunication Services. In September 2018, the Telecommunication Services sector expanded to include several industries previously considered part of either Information Technology or Consumer Discretionary. The sector also was renamed Communication Services as part of the change. Notwithstanding the remark above regarding Real Estate, in the construction of all our exhibits, the sector and constituents included in historical analyses are according to the relevant classification at the time.

Notes regarding the construction of Exhibit 3. Volumes for leveraged and leveraged inverse ETFs have been multiplied by the appropriate factor to reflect notional volumes in the respective index. The aggregate volumes for European ETFs were sourced from the Bloomberg LLP "European Composite" statistics, with trading in currencies other than U.S. dollars converted at the average exchange rate prevalent that month. It should be noted that prior to the introduction of the MiFID II regulations in Europe in early 2018, volumes in European-listed ETFs were not necessarily reported to Bloomberg and hence Exhibit 3 may be understating the degree of historical volume. However, the overall trend displayed by Exhibit 3 would be unlikely to change significantly; the U.S. component of the exhibit accounts for an overwhelming majority of each series.

APPENDIX B: ETFS AND FUTURES USED IN CONSTRUCTING EXHIBIT 3

Exhibit B1 provides the licensed products whose related aggregated volumes, assets, and open interest are displayed in Exhibit 3.

Exhibit B1: ETFs Used in Constructing Exhibit 3		
EUROPEAN-LISTED ETFS		
TICKER	**ETF**	**INDEX**
SXLY	SPDR® S&P® U.S. Consumer Discretionary Select Sector UCITS ETF	Consumer Discretionary Select Sector Index
SXLP	SPDR S&P U.S. Consumer Staples Select Sector UCITS ETF	Consumer Staples Select Sector Index
SXLE	SPDR S&P U.S. Energy Select Sector UCITS ETF	Energy Select Sector Index
SXLF	SPDR® S&P® U.S. Financials Select Sector UCITS ETF	Financials Select Sector Index
SXLV	SPDR S&P U.S. Health Care Select Sector UCITS ETF	Health Care Select Sector Index
SXLI	SPDR S&P U.S. Industrials Select Sector UCITS ETF	Industrials Select Sector Index
SXLB	SPDR S&P U.S. Materials Select Sector UCITS ETF	Materials Select Sector Index
IUCM	iShares S&P 500 Communication Services Sector UCITS ETF	S&P 500 Capped 35/20 Communication Services Index
IUCD	iShares S&P 500 Consumer Discretionary Sector UCITS ETF	S&P 500 Capped 35/20 Consumer Discretionary Index
IUCS	iShares S&P 500 Consumer Staples Sector UCITS ETF	S&P 500 Capped 35/20 Consumer Staples Index
IUES	iShares S&P 500 Energy Sector UCITS ETF	S&P 500 Capped 35/20 Energy Index
IUFS	iShares S&P 500 Financials Sector UCITS ETF	S&P 500 Capped 35/20 Financials Index
IUHC	iShares S&P 500 Health Care Sector UCITS ETF	S&P 500 Capped 35/20 Health Care Index
IUIS	iShares S&P 500 Industrials Sector UCITS ETF	S&P 500 Capped 35/20 Industrials Index
IUIT	iShares S&P 500 Information Technology Sector UCITS ETF	S&P 500 Capped 35/20 Information Technology Index
IUMS	iShares S&P 500 Materials Sector UCITS ETF	S&P 500 Capped 35/20 Materials Index
IUUS	iShares S&P 500 Utilities Sector UCITS ETF	S&P 500 Capped 35/20 Utilities Index
SXLC	SPDR S&P U.S. Communication Services Select Sector UCITS ETF	S&P 500 Communication Services Select Sector Daily Capped 25/20 Index
XLYS	Invesco Consumer Discretionary S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Communication Services Index
XLCS	Invesco Communication Services S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Consumer Discretionary Index
XLPS	Invesco Consumer Staples S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Consumer Staples Index
XLES	Invesco Energy S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Energy Index
XLFS	Invesco Financials S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Financials Index
XLVS	Invesco Health Care S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Health Care Index
XLIS	Invesco Industrials S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Industrials Index
XLBS	Invesco Materials S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Materials Index
XRES	Invesco Real Estate S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Real Estate Index
XLKS	Invesco Technology S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Technology Index
XLUS	Invesco Utilities S&P US Select Sector UCITS ETF	S&P Select Sector Capped 20% Utilities Index
SXLK	SPDR S&P U.S. Technology Select Sector UCITS ETF	Technology Select Sector Index
SXLU	SPDR S&P U.S. Utilities Select Sector UCITS ETF	Utilities Select Sector Index
U.S.-LISTED ETFS		
MUTE	Direxion Daily Communication Services Bear 3X Shares	Communication Services Select Sector
SCOM	Proshares Ultrashort Communication Services Select Sector ETF	Communication Services Select Sector
TAWK	Direxion Daily Communication Services Bull 3X Shares	Communication Services Select Sector
UCOM	Proshares Ultrapro Communication Services Select Sector ETF	Communication Services Select Sector
XCOM	Proshares Ultra Communication Services Select Sector ETF	Communication Services Select Sector
XLC	Communication Services Select Sector SPDR Fund	Communication Services Select Sector
YCOM	Proshares Ultrapro Short Communication Services Select Sector ETF	Communication Services Select Sector
PASS	Direxion Daily Consumer Discretionary Bear 3X Shares	Consumer Discretionary Select Sector
WANT	Direxion Daily Consumer Discretionary Bull 3X Shares	Consumer Discretionary Select Sector

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

Exhibit B1: ETFs Used in Constructing Exhibit 3 (cont.)

U.S.-LISTED ETFS

TICKER	ETF	INDEX
XLY	Consumer Discretionary Select Sector SPDR Fund	Consumer Discretionary Select Sector
LACK	Direxion Daily Consumer Staples Bear 3X Shares	Consumer Staples Select Sector
NEED	Direxion Daily Consumer Staples Bull 3X Shares	Consumer Staples Select Sector
XLP	Consumer Staples Select Sector SPDR Fund	Consumer Staples Select Sector
FDN	First Trust Dow Jones Internet Index Fund	Dow Jones Internet Composite Index
IYT	iShares Transportation Average ETF	Dow Jones Transportation Average
TPOR	Direxion Daily Transportation Bull 3X Shares	Dow Jones Transportation Average
IYM	iShares U.S. Basic Materials ETF	Dow Jones U.S. Basic Materials Index
SBM	ProShares Short Basic Materials ETF	Dow Jones U.S. Basic Materials Index
SMN	ProShares UltraShort Basic Materials ETF	Dow Jones U.S. Basic Materials Index
UYM	ProShares Ultra Basic Materials ETF	Dow Jones U.S. Basic Materials Index
IYK	iShares U.S. Consumer Goods ETF	Dow Jones U.S. Consumer Goods Index
SZK	ProShares UltraShort Consumer Goods ETF	Dow Jones U.S. Consumer Goods Index
UGE	ProShares Ultra Consumer Goods ETF	Dow Jones U.S. Consumer Goods Index
IYC	iShares U.S. Consumer Services ETF	Dow Jones U.S. Consumer Services Index
SCC	ProShares UltraShort Consumer Services ETF	Dow Jones U.S. Consumer Services Index
UCC	ProShares Ultra Consumer Services ETF	Dow Jones U.S. Consumer Services Index
IYG	iShares US Financial Services ETF	Dow Jones U.S. Financial Services Index
IYF	iShares U.S. Financials ETF	Dow Jones U.S. Financials Index
SEF	ProShares Short Financials ETF	Dow Jones U.S. Financials Index
SKF	ProShares UltraShort Financials ETF	Dow Jones U.S. Financials Index
UYG	ProShares Ultra Financials ETF	Dow Jones U.S. Financials Index
IYH	iShares U.S. Healthcare ETF	Dow Jones U.S. Health Care Index
RXD	ProShares UltraShort Health Care ETF	Dow Jones U.S. Health Care Index
RXL	ProShares Ultra Health Care ETF	Dow Jones U.S. Health Care Index
IYJ	iShares U.S. Industrials ETF	Dow Jones U.S. Industrials Index
SIJ	ProShares UltraShort Industrials ETF	Dow Jones U.S. Industrials Index
UXI	ProShares Ultra Industrials ETF	Dow Jones U.S. Industrials Index
DDG	ProShares Short Oil & Gas ETF	Dow Jones U.S. Oil & Gas Index
DIG	ProShares Ultra Oil & Gas ETF	Dow Jones U.S. Oil & Gas Index
DUG	ProShares UltraShort Oil & Gas ETF	Dow Jones U.S. Oil & Gas Index
IYE	iShares U.S. Energy ETF	Dow Jones U.S. Oil & Gas Index
IYR	iShares U.S. Real Estate ETF	Dow Jones U.S. Real Estate Index
REK	ProShares Short Real Estate ETF	Dow Jones U.S. Real Estate Index
SRS	ProShares UltraShort Real Estate ETF	Dow Jones U.S. Real Estate Index
URE	ProShares Ultra Real Estate ETF	Dow Jones U.S. Real Estate Index
DFEN	Direxion Daily Aerospace & Defense Bull 3X Shares	Dow Jones U.S. Select Aerospace & Defense Index
ITA	iShares U.S. Aerospace & Defense ETF	Dow Jones U.S. Select Aerospace & Defense Index
IHF	iShares U.S. Healthcare Providers ETF	Dow Jones U.S. Select Health Care Providers Index
ITB	iShares U.S. Home Construction ETF	Dow Jones U.S. Select Home Construction Index
NAIL	Direxion Daily Homebuilders & Supplies Bull 3X Shares	Dow Jones U.S. Select Home Construction Index
IAK	iShares U.S. Insurance ETF	Dow Jones U.S. Select Insurance Index
IAI	iShares U.S. Broker-Dealers & Securities Exchanges ETF	Dow Jones U.S. Select Investment Services Index
IHI	iShares U.S. Medical Devices ETF	Dow Jones U.S. Select Medical Equipment Index
IEZ	iShares U.S. Oil Equipment & Services ETF	Dow Jones U.S. Select Oil Equipment & Services Index
IEO	iShares U.S. Oil & Gas Exploration & Production ETF	Dow Jones U.S. Select Oil Exploration & Production Index
IHE	iShares U.S. Pharmaceuticals ETF	Dow Jones U.S. Select Pharmaceuticals Index

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

Exhibit B1: ETFs Used in Constructing Exhibit 3 (cont.)

U.S.-LISTED ETFS

TICKER	ETF	INDEX
IAT	iShares U.S. Regional Banks ETF	Dow Jones U.S. Select Regional Banks Index
RWR	SPDR Dow Jones REIT ETF	Dow Jones U.S. Select REIT Index
SCHH	Schwab U.S. REIT ETF	Dow Jones U.S. Select REIT Index
NURE	NuShares Short-Term REIT ETF	Dow Jones U.S. Select Short-Term REIT Index
IYZ	iShares U.S. Telecommunications ETF	Dow Jones U.S. Select Telecommunications Index
LTL	ProShares Ultra Telecommunications ETF	Dow Jones U.S. Select Telecommunications Index
SSG	Proshares Ultrashort Semiconductors ETF	Dow Jones U.S. Semiconductors Index
USD	ProShares Ultra Semiconductors ETF	Dow Jones U.S. Semiconductors Index
IYW	iShares U.S. Technology ETF	Dow Jones U.S. Technology Index
REW	ProShares UltraShort Technology ETF	Dow Jones U.S. Technology Index
ROM	ProShares Ultra Technology ETF	Dow Jones U.S. Technology Index
IDU	iShares U.S. Utilities ETF	Dow Jones U.S. Utilities Index
SDP	ProShares UltraShort Utilities ETF	Dow Jones U.S. Utilities Index
UPW	ProShares Ultra Utilities ETF	Dow Jones U.S. Utilities Index
ERX	Direxion Daily Energy Bull 3x Shares	Energy Select Sector
ERY	Direxion Daily Energy Bear 3X Shares	Energy Select Sector
XLE	Energy Select Sector SPDR Fund	Energy Select Sector
FINU	ProShares UltraPro Financial Select Sector ETF	Financials Select Sector
FINZ	ProShares UltraPro Short Financial Select Sector ETF	Financials Select Sector
XLF	Financial Select Sector SPDR Fund	Financials Select Sector
XLV	Health Care Select Sector SPDR Fund	Health Care Select Sector
DUSL	Direxion Daily Industrials Bull 3X Shares	Industrials Select Sector
XLI	Industrial Select Sector SPDR Fund	Industrials Select Sector
XLB	Materials Select Sector SPDR Fund	Materials Select Sector
XLRE	Real Estate Select Sector SPDR Fund	Real Estate Select Sector
EWCO	Invesco S&P 500 Equal Weight Communication Services ETF	S&P 500 Equal Weight Communication Services Index
RCD	Invesco S&P 500 Equal Weight Consumer Discretionary ETF	S&P 500 Equal Weight Consumer Discretionary Index
RHS	Invesco S&P 500 Equal Weight Consumer Staples ETF	S&P 500 Equal Weight Consumer Staples Index
RYE	Invesco S&P 500 Equal Weight Energy ETF	S&P 500 Equal Weight Energy Index
RYF	Invesco S&P 500 Equal Weight Financials ETF	S&P 500 Equal Weight Financials Index
RYH	Invesco S&P 500 Equal Weight Health Care ETF	S&P 500 Equal Weight Health Care Index
RGI	Invesco S&P 500 Equal Weight Industrials ETF	S&P 500 Equal Weight Industrials Index
RYT	Invesco S&P 500 Equal Weight Technology ETF	S&P 500 Equal Weight Information Technology Index
RTM	Invesco S&P 500 Equal Weight Materials ETF	S&P 500 Equal Weight Materials Index
EWRE	Invesco S&P 500 Equal Weight Real Estate ETF	S&P 500 Equal Weight Real Estate Index
RYU	Invesco S&P 500 Equal Weight Utilities ETF	S&P 500 Equal Weight Utilities Plus Index
RWW	Oppenheimer S&P Financials Revenue ETF	S&P 500 Financials Sector Revenue-Weighted Index
XAR	SPDR S&P Aerospace & Defense ETF	S&P Aerospace & Defense Select Industry Index
KBE	SPDR S&P Bank ETF	S&P Banks Select Industry Index
LABD	Direxion Daily S&P Biotech Bear 3X Shares	S&P Biotechnology Select Industry Index
LABU	Direxion Daily S&P Biotech Bull 3X Shares	S&P Biotechnology Select Industry Index
XBI	SPDR S&P BIOTECH ETF	S&P Biotechnology Select Industry Index
KCE	SPDR S&P Capital Markets ETF	S&P Capital Markets Select Industry Index
XHE	SPDR S&P Health Care Equipment ETF	S&P Health Care Equipment Select Industry Index
XHS	SPDR S&P Health Care Services ETF	S&P Health Care Services Select Industry Index
XHB	SPDR S&P Homebuilders ETF	S&P Homebuilders Select Industry Index
KIE	SPDR S&P Insurance ETF	S&P Insurance Select Industry Index

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

Exhibit B1: ETFs Used in Constructing Exhibit 3 (cont.)

U.S.-LISTED ETFS		
TICKER	**ETF**	**INDEX**
XWEB	SPDR S&P Internet ETF	S&P Internet Select Industry Index
XME	SPDR S&P Metals & Mining ETF	S&P Metals and Mining Select Industry Index
IGE	iShares North American Natural Resources ETF	S&P North American Natural Resources Sector Index
IGN	iShares North American Tech-Multimedia Networking ETF	S&P North American Technology Multimedia Networking Index
IGM	iShares North American Tech ETF	S&P North American Technology Sector Index
IGV	iShares North American Tech-Software ETF	S&P North American Technology Software Index
XES	SPDR S&P Oil & Gas Equipment & Services ETF	S&P Oil & Gas Equipment & Services Select Industry Index
DRIP	Direxion Daily S&P Oil & Gas Exp. & Prod. Bear 3X Shares	S&P Oil & Gas Exploration & Production Select Industry Index
GUSH	Direxion Daily S&P Oil & Gas Exp. & Prod. Bull 3X Shares	S&P Oil & Gas Exploration & Production Select Industry Index
XOP	SPDR S&P Oil & Gas Exploration & Production ETF	S&P Oil & Gas Exploration & Production Select Industry Index
XPH	SPDR S&P Pharmaceuticals ETF	S&P Pharmaceuticals Select Industry Index
DPST	Direxion Daily Regional Banks Bull 3X Shares	S&P Regional Banks Select Industry Index
KRE	SPDR S&P Regional Banking ETF	S&P Regional Banks Select Industry Index
WDRW	Direxion Daily Regional Banks Bear 3X Shares	S&P Regional Banks Select Industry Index
RETL	Direxion Daily Retail Bull 3x Shares	S&P Retail Select Industry Index
XRT	SPDR S&P Retail ETF	S&P Retail Select Industry Index
XSD	SPDR S&P Semiconductor ETF	S&P Semiconductor Select Industry Index
PSCD	Invesco S&P SmallCap Consumer Discretionary ETF	S&P SmallCap 600® Capped Consumer Discretionary
PSCC	Invesco S&P SmallCap Consumer Staples ETF	S&P SmallCap 600 Capped Consumer Staples
PSCE	Invesco S&P SmallCap Energy ETF	S&P SmallCap 600 Capped Energy
PSCF	Invesco S&P SmallCap Financials ETF	S&P SmallCap 600 Capped Financials & Real Estate
PSCH	Invesco S&P SmallCap Health Care ETF	S&P SmallCap 600 Capped Health Care
PSCI	Invesco S&P SmallCap Industrials ETF	S&P SmallCap 600 Capped Industrials
PSCT	Invesco S&P SmallCap Information Technology ETF	S&P SmallCap 600 Capped Information Technology
PSCM	Invesco S&P SmallCap Materials ETF	S&P SmallCap 600 Capped Materials
PSCU	Invesco S&P SmallCap Utilities ETF	S&P SmallCap 600 Capped Utilities & Communication Services
XSW	SPDR S&P Software & Services ETF	S&P Software & Services Select Industry Index
XTH	SPDR S&P Technology Hardware ETF	S&P Technology Hardware Select Industry Index
XTL	SPDR S&P Telecom ETF	S&P Telecom Select Industry Index
XTN	SPDR S&P Transportation ETF	S&P Transportation Select Industry Index
FRI	First Trust S&P REIT Index Fund	S&P United States REIT
TECL	Direxion Daily Technology Bull 3x Shares	Technology Select Sector
TECS	Direxion Daily Technology Bear 3X Shares	Technology Select Sector
XLK	Technology Select Sector SPDR Fund	Technology Select Sector
UTSL	Direxion Daily Utilities Bull 3X Shares	Utilities Select Sector
XLU	Utilities Select Sector SPDR Fund	Utilities Select Sector
US-LISTED FUTURES		
XAS	E-mini Communication Services Select Sector Future	Communication Services Select Sector
IXY	E-mini Consumer Discretionary Select Sector Future	Consumer Discretionary Select Sector
IXR	E-mini Consumer Staples Select Sector Future	Consumer Staples Select Sector
IXP	E-mini Energy Select Sector Future	Energy Select Sector
IXA	E-mini Financials Select Sector Future	Financials Select Sector
IXC	E-mini Health Care Select Sector Future	Health Care Select Sector
IXI	E-mini Industrial Select Sector Future	Industrials Select Sector
IXD	E-mini Materials Select Sector Future	Materials Select Sector
XAR	E-mini Real Estate Select Sector Future	Real Estate Select Sector
IXT	E-mini Technology Select Sector Future	Technology Select Sector
IXS	E-mini Utilities Select Sector Future	Utilities Select Sector

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

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