ACTIVE SHARE RISK PROFILE:

Understanding Portfolio Risk by Using the Holdings-Based Methodology of Active Share

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Executive Summary

Active Share methodology can show much more than an equity portfolio's "headline score." Used as a holdings-based risk measure, Active Share can present a detailed risk profile that allows straightforward comparison with benchmarks, peer groups and specific competitors.

For investors in global and international equity portfolios, we believe country, sector and stock-specific risks are among the most important elements of their risk exposure. Many investors use software packages that analyze risk across multiple dimensions including country and sector. Active Share Risk Profiles offer an intuitive visual approach to identifying and contrasting these key risk exposures.

In this paper, we introduce the Active Share Risk Profile (ASRP) concept, giving investors and their managers a "do-it-yourself" method of identifying and contrasting key risk exposures in their global/international equity portfolios.

Country, sector and stock-specific risks are among the most important elements of risk exposure.

ACTIVE SHARE: DRILLING DEEPER

Portfolio manager claims of high Active Share (whether justified or not) do not provide much in the way of clear differentiation for investors. Active Share is intuitively easy to understand, but we believe its potential usefulness is yet to be fully explored. Its ability to differentiate between portfolios has been limited to an aggregate-level measure and its use in practice has frequently been as an adjunct to marketing, rather than as a valuable tool in analysis.

Rather than consider Active Share as just a "measure of activeness" in an equity portfolio, we believe it is much more useful as a measure of holdings-based risk. It can lead to a clear understanding of how a portfolio's holdings differ from its benchmark. In our opinion, it is a more informative risk measure than returns-based historic tracking error, which shows only how a portfolio's returns differ from a benchmark, (and compared to ex-ante tracking error, the Active Share approach is not dependent on assumptions).

The Active Share calculation is based on measuring the difference between portfolio and benchmark holdings for every holding in either of them. The active risk for each holding is thus the risk of owning a position that differs from the benchmark. Active Share sums these differences, providing an aggregate portfolio-level measure of active holdings-based risk.

> In our opinion, it is a more informative risk measure than returns-based historic tracking error.

We believe that using only the portfolio-level Active Share number is too limiting. We need to drill deeper. The most useful information contained in an Active Share calculation is in its components. Grouping holdings by country and by sector, as well as analyzing stock selection within each country/sector combination, allows us to build a revealing picture of the risk profile of an equity portfolio and understand how it evolves over time. This Active Share Risk Profile reveals a portfolio's holdings-based risk and allows us to differentiate clearly between portfolios and peer groups (even those with similar Active Share scores).

While this paper contains useful information about peer groups and selected portfolio examples, our primary purpose is to illustrate the capabilities of this methodology in understanding the risks within investors' own portfolios.

ACTIVE SHARE RISK PROFILE AT THE PORTFOLIO LEVEL

We have built three peer groups of global equity portfolios (value, growth and blend) to illustrate the capability of Active Share Risk Profiles. The analysis is based on annual holdings-level data for 46 portfolios benchmarked against the MSCI World Index covering 2009-2018. Data is sourced from Morningstar, and accordingly, throughout

Exhibit 1: Portfolio Level Active Share Risk Profile Example

Sample Global Equity Portfolio and Value Peer Group, End 2018
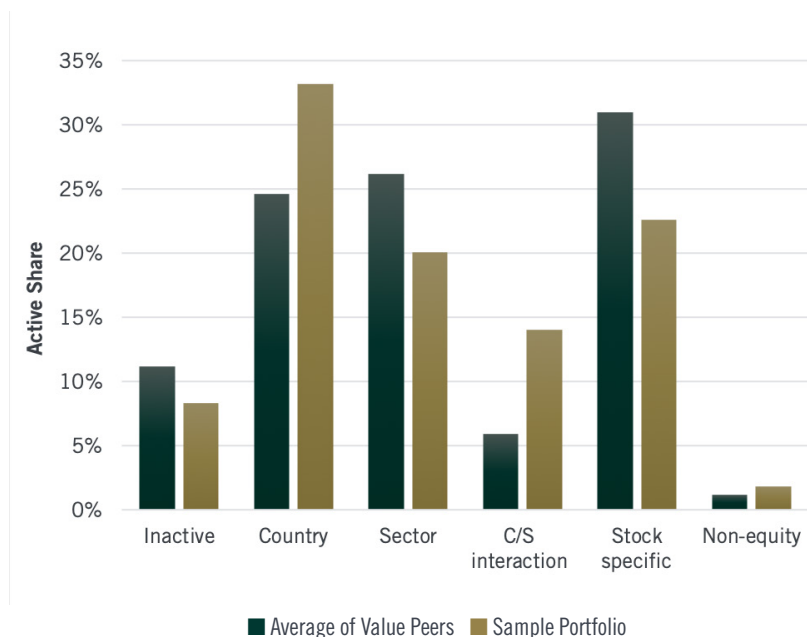
Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

this document we have used Morningstar's sector definitions, which are similar but not identical to the Global Industry Classification Standard (GICS). Details of this data-set are in Appendix 1.

Illustrations in this section are based on a single, randomly selected global equity value portfolio ("Sample"), with comparisons against the Value Peer Group of 16 portfolios.

The underline portfolio level risk profile addresses the question of how much are active risk exposures due to country and sector differences from benchmark weights, as opposed to stock-specific exposures.

On the left "Inactive" shows how much of the portfolio duplicates index holdings. In other words, "Inactive" is 100% minus Active Share. The other bars provide a portfolio-level breakdown of Active Share.

The right-hand bars, "Non-equity," show how much Active Share is derived from cash, bonds and any other non-equity holdings in the portfolio. For the Value Peer Group and for the Sample Portfolio, these are small numbers, under 2%.

The Active Share Risk Profile from equities is revealed by the remaining four sets of bars. Three of these relate to country and sector and one to "stock specific." Before explaining these, note this has no relevance to process descriptions such as "top-down" or "bottom-up." We are analyzing what is in the portfolio, not the process of how it got there.

The "stock-specific" bars explain how much Active Share is derived from active decisions within a country/sector "cell." Each such cell is the intersection in the portfolio of a specific country and sector, for example, United States and financial services. To clarify, imagine starting with an index portfolio and then selling some U.S. financial stocks and replacing them by buying the same weight in U.S. financials that aren't in the index. There has been no change in exposure to either the United States or financials, but Active Share has increased. We have generated "stock-specific" Active Share within the U.S. financials "cell." In Exhibit 1, the stock-specific bars show the sum of Active Share generated within every country/sector cell in the portfolio. For the Value Peer Group, this generates 31% toward total Active Share and for the Sample Portfolio, a bit less (23%).

The remainder of Active Share is generated by exposures to country and sector, and these typically represent the biggest proportion of Active Share. These exposures are measured by three sets of bars: country, sector and country/sector interaction ("C/S interaction"). C/S interaction is generated by stock trades between cells which do not impact country or sector level Active Share. For readers seeking a fuller explanation, please see Appendix 2.

These three sets of bars together show how much Active Share is generated by different country and sector exposures compared to the Index. Looking at

We find that a relatively high country/sector component is typical for portfolios managed in "bottom-up" styles.

them separately reveals the importance of country and sector exposures. In Exhibit 1, the total of these three bars for the Value Peer Group is 57% (i.e., of the Value Peer Group average Active Share of 89%, 57 of the 89 percentage points comes from country and sector differences from the index). For the Sample Portfolio, that total is 67%, although the constituents differ: more from country, less from sector than peers.

We can also view these profiles over time. Exhibit 2 provides a 10-year history of change, for both the Sample Portfolio (on the left) and the Value Peer Group (on the right). We can see that in both the Sample Portfolio and the Value Peer Group, Active Share has been increasing (the dark green "Inactive" area generally has been shrinking). For the Sample

Portfolio, the country and sector risk exposure (including country/sector interaction) has increased in absolute terms, and relative to peers, primarily due to an increased country component (gold). Correspondingly, the stock-specific component of the Sample Portfolio has declined.

Reviewing the portfolios in our peer groups, we find that a relatively high country/sector component is typical for portfolios managed in "bottom-up" styles, whether value or growth. We believe this is the result of managers owning "clusters" of stocks in a country or a sector that may be attractive for similar reasons.

So far, we have analyzed country and sector at the aggregate level. We now drill down into the country and sector risk profile in more detail.

Exhibit 2: Portfolio Level Risk Profile Time Series

Sample Global Equity Portfolio and Value Peer Group, End 2009 to End 2018, AS Risk Profile
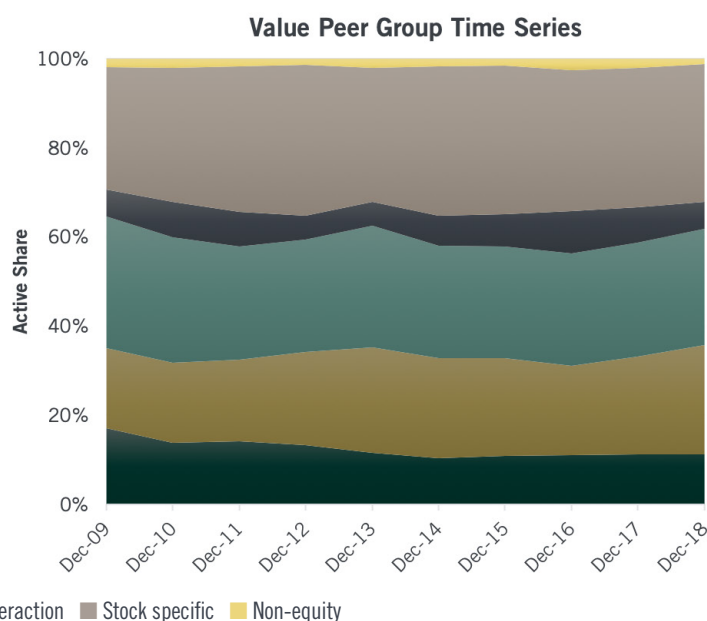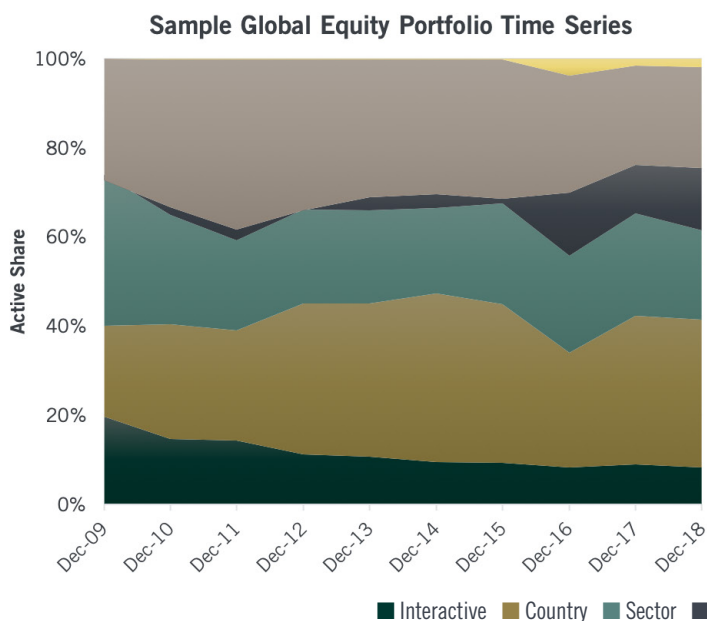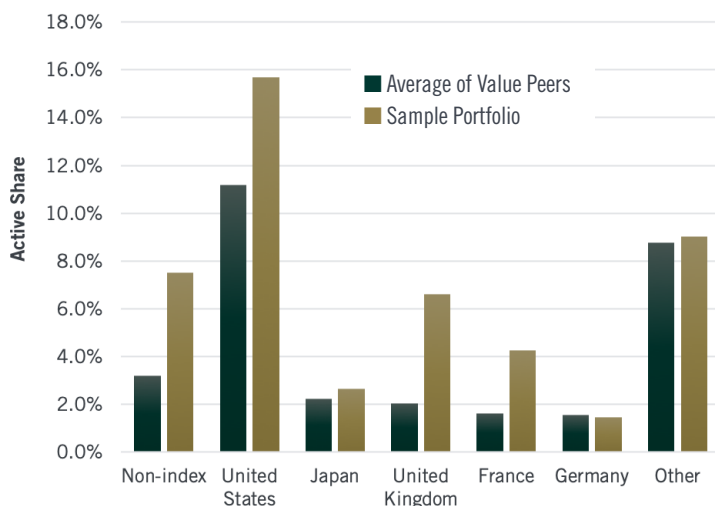

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

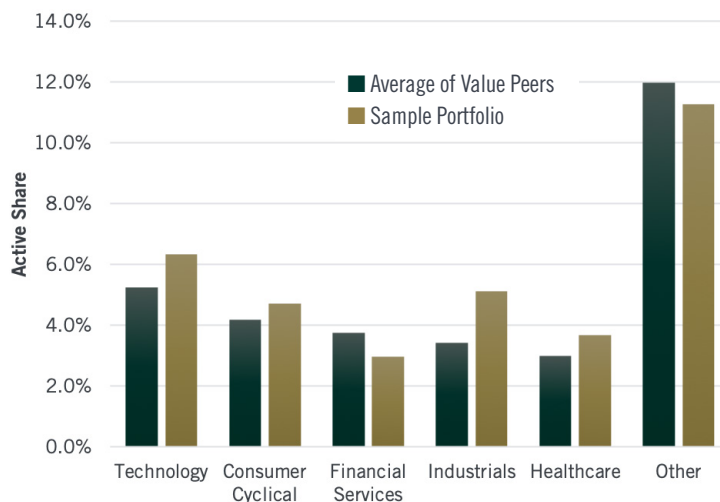**ACTIVE SHARE RISK PROFILE AT COUNTRY AND SECTOR LEVEL**

For the country risk profile, we have identified the five countries for the Value Peer Group that have the largest contributions to total Active Share Risk Profile: the United States; Japan; the United Kingdom; France; and Germany. (As an aside, for the Blend and Growth Peer Groups, the top four are the same, but Germany is replaced by Switzerland). In Exhibit 3, we show the Active Share Risk contribution for each country for the Sample Portfolio and Value Peer Group. The United States is significantly the largest contributor for the Peer Group, and even more so for the Sample Portfolio. Other countries in the benchmark MSCI World Index are aggregated in the right-hand bars, and countries outside the benchmark (typically emerging markets) comprise the "Non-index" bar on the left.

For the Sample Portfolio, the Non-index score of 7.5% is materially higher than that of peers.

We can do a similar analysis of the sector impact. Unlike the country analysis, where one country (United States) had significantly the largest contribution, sector impact is more evenly spread, as shown in Exhibit 4, which includes the top five sectors for the Value Peer Group. Technology is the sector with the highest risk contribution for both the Value Peer Group and the Sample Portfolio. For the Growth and Blend Peer Groups (not shown here), consumer defensive is the largest sector contributor to their risk profiles. These observations may be surprising, but note that Active Share is driven by both over and underweight positions, and it is the underweight positions that lead to this result.

Exhibit 3: Country Active Share, Top Five Countries and Non-Index Aggregated

Sample Global Equity Portfolio and Value Peer Group, End 2018

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Exhibit 4: Sector Active Share, Top Five Sectors

Sample Global Equity Portfolio and Value Peer Group, End 2018

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Exhibit 5 uses a heatmap to show which country/sector cells make the largest contribution to active risk.

ACTIVE SHARE RISK PROFILE WITHIN THE COUNTRY/SECTOR MATRIX

Drilling down further, we can identify the contribution to Active Risk in each country/sector cell. This can be particularly useful when comparing a portfolio's Active Share Risk Profile against its competitors, as well as a peer group. By breaking down Active Share contributions in a matrix format (see Exhibit 5), portfolios with similar aggregate Active Share can be clearly differentiated.

Exhibit 5 uses a heatmap to show which country/sector cells make the largest contribution to active risk (the larger the number, the deeper the red). For illustration purposes, we've broken out only the five countries and eight sectors that have the largest impact, aggregating the others.

For this Sample Portfolio, the three country/sector cells with the highest active risk exposures are all in the United States (healthcare 9.5%, financials 9.0%,

and technology 6.0%). These three cells also occupy the top three slots for each of the Value, Blend and Growth Peer Groups, although their order may differ. Our analysis has thus identified the biggest country/sector contributors to active risk for our whole global equity universe: these three segments of the U.S. market.

Exhibit 5 does not split out the extent to which each cell's Active Share risk contribution is due to exposure (country or sector exposure differing from benchmark) or stock-specific reasons (holdings differ from benchmark inside the cell). In Exhibit 6, we can do this by breaking down the data from Exhibit 5 into those two components: country/sector exposure and stock specific. This heatmap uses green shading to highlight larger country/sector risk exposure and blue shading for stock-specific risk exposure. We have removed the numbers to keep the chart uncluttered, and allow the heatmap to show the key aspects.

Exhibit 5: Active Share Risk Profile Contribution by Country/Sector Cell

Sample Global Equity Portfolio, End 2018

Active Share Risk Profile Breakdown		*Cons.Cyc.*	*Cons.Def.*	*Energy*	*Financial*	*Healthcare*	*Industrials*	*Technology*	*Comm.Serv.*	*Other*
USA	Country/sector	3.2%	1.8%	1.3%	3.0%	1.8%	2.3%	6.0%	3.1%	2.8%
	Stock specific	0.0%	0.4%	0.5%	6.0%	7.7%	1.0%	0.0%	0.0%	0.0%
Japan	Country/sector	0.8%	0.4%	0.0%	0.5%	0.4%	0.9%	0.4%	0.3%	0.5%
	Stock specific	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
UK	Country/sector	1.2%	2.8%	0.8%	0.3%	1.6%	0.3%	0.0%	0.7%	0.4%
	Stock specific	0.3%	0.8%	0.7%	0.7%	0.3%	0.0%	0.0%	0.3%	0.0%
France	Country/sector	0.3%	0.3%	0.7%	0.2%	1.8%	0.8%	0.1%	0.7%	1.0%
	Stock specific	0.0%	0.4%	0.0%	0.0%	0.0%	0.7%	0.0%	0.2%	0.1%
Germany	Country/sector	0.3%	0.1%	0.0%	0.2%	0.2%	0.2%	0.2%	0.1%	0.3%
	Stock specific	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rest of Index	Country/sector	0.4%	0.9%	1.9%	5.1%	1.0%	0.9%	1.6%	1.6%	1.8%
	Stock specific	0.0%	0.0%	0.1%	0.3%	0.0%	0.0%	0.2%	0.0%	0.0%
Non-index	Country/sector	2.5%	0.5%	1.0%	0.0%	0.0%	1.4%	0.8%	0.0%	0.9%

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

We can see from the predominance of green that in this Sample Portfolio, country/sector exposures contribute to risk more than stock-specific variances within the cells. There is also a clear difference between the U.S. healthcare and U.S. technology risk contributions. In U.S. healthcare, the bulk of active share risk is for stock-specific reasons (blue shading), while in U.S. technology, it is nearly all from country/sector exposure (green), as this portfolio

has minimal exposure to U.S. technology.

This risk profile analysis also lends itself to comparisons with a peer group or with specific competitors. We've shown how an Active Share Risk Profile can drill down to each country/sector cell, and within that cell, identify whether the contribution to Active Share is from exposure or from stock selection within the cell. Exhibit 7 subtracts the peer group number from that of our

Exhibit 6: Active Share Risk Profile Contribution by Cell, Split Between Country/Sector and Stock Specific

Sample Global Equity Portfolio, End 2018

Active Share Risk Profile Breakdown		Cons.Cyc.	Cons.Def.	Energy	Financial	Healthcare	Industrials	Technology	Comm.Serv.	Other
Country/sector	USA	3.2%	1.8%	1.3%	3.0%	1.8%	2.3%	6.0%	3.1%	2.8%
Stock specific	USA	0.0%	-0.4%	-0.5%	-6.0%	-7.7%	-1.0%	0.0%	0.0%	0.0%
	Japan	0.8%	0.4%	0.0%	0.5%	0.4%	0.9%	0.4%	0.3%	0.5%
		-1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	UK	1.2%	2.8%	0.8%	0.3%	1.6%	0.3%	0.0%	0.7%	0.4%
		-0.3%	-0.8%	-0.7%	-0.7%	-0.3%	0.0%	0.0%	-0.3%	0.0%
	France	0.3%	0.3%	0.7%	0.2%	1.8%	0.8%	0.1%	0.7%	1.0%
		0.0%	-0.4%	0.0%	0.0%	0.0%	-0.7%	0.0%	-0.2%	-0.1%
	Germany	0.3%	0.1%	0.0%	0.2%	0.2%	0.2%	0.2%	0.1%	0.3%
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Rest of Index	0.4%	0.9%	1.9%	5.1%	1.0%	0.9%	1.6%	1.6%	1.8%
		0.0%	0.0%	-0.1%	-0.3%	0.0%	0.0%	-0.2%	0.0%	0.0%
	Non-index	2.5%	0.5%	1.0%	0.0%	0.0%	1.4%	0.8%	0.0%	0.9%

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Exhibit 7: Active Share Risk Profile Contribution by Cell

Difference between Sample Global Equity Portfolio and Value Peer Group Average, End 2018

Active Share Risk Profile vs PEERS		Cons.Cyc.	Cons.Def.	Energy	Financial	Healthcare	Industrials	Technology	Comm.Serv.	Other
USA	Country/sector	0.7%	0.4%	0.2%	0.7%	-0.1%	0.3%	2.2%	0.8%	-0.2%
	Stock specific	-1.7%	-1.4%	-0.8%	1.4%	2.9%	-1.2%	-3.5%	-2.3%	-1.7%
Japan	Country/sector	0.3%	-0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	-0.1%	-0.1%
	Stock specific	0.7%	-0.1%	0.0%	-0.3%	-0.1%	-0.5%	-0.1%	-0.2%	-0.1%
UK	Country/sector	0.6%	2.0%	-0.1%	-0.6%	0.8%	-0.1%	0.0%	0.2%	-0.2%
	Stock specific	0.2%	0.5%	0.5%	0.1%	0.2%	-0.2%	0.0%	0.1%	-0.1%
France	Country/sector	0.1%	0.1%	0.2%	-0.4%	1.2%	0.4%	0.0%	0.4%	0.4%
	Stock specific	-0.2%	0.3%	0.0%	-0.1%	0.0%	0.3%	0.0%	0.2%	0.0%
Germany	Country/sector	-0.3%	0.0%	0.0%	-0.4%	-0.2%	-0.3%	0.0%	-0.1%	-0.1%
	Stock specific	-0.2%	0.0%	0.0%	-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%
Rest of Index	Country/sector	-0.7%	-0.4%	1.1%	1.1%	-0.3%	-1.4%	1.0%	0.4%	-1.2%
	Stock specific	0.0%	-0.1%	-0.3%	-0.5%	-0.3%	-0.2%	0.2%	0.0%	-0.3%
Non-index	Country/sector	2.1%	0.4%	0.8%	-0.7%	0.0%	1.2%	0.0%	-0.2%	0.8%

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Sample Portfolio in each cell in order to illustrate where that Sample Portfolio differs materially from its peers.

The heatmap in Exhibit 7 shows green for positive (i.e. where the sample portfolio has a <u>higher</u> Active Share contribution than the peer group) and red for negative. In the U.S. technology cell, for example, relative to the Value Peer Group average, the Sample Portfolio has 2.2% higher risk contribution from country/sector exposure and 3.5% lower from stock-specific selection within that cell.

EXAMPLES OF PORTFOLIOS WITH DIFFERING ACTIVE SHARE RISK PROFILES

Having used a representative Sample Portfolio to illustrate the types of information this analysis can provide, we now look at examples of portfolios that show more contrast. The two portfolios we illustrate in Exhibits 8-10 have the highest Active Shares in the Value Peer Group (96% and 97%, respectively, at end 2018), but they have very different Active Share Risk Profiles.

The first one (in Exhibit 8) is a portfolio marketed as "Low Volatility." That claim is correct: this portfolio has had the lowest volatility within the peer group. At the same time, the Risk Profile is quite different from its peers and has varied significantly over time. As shown later, this dynamic highlights how ASRP may offer insights for portfolio evaluation by contrasting returns- vs. holdings-based analysis.

We can see from the "Inactive" dark green shaded area that total Active Share has increased materially over the period. In the earlier years, the stock-specific contribution to Active Share (beige area) was high, and then contracted sharply, going from one of the highest in the peer group in 2012, to one of the lowest two years later. Correspondingly, the country/sector contribution (stacked gold, light green and dark gray areas) to the risk profile increased sharply in those two years, driven primarily by sector (light green area) and C/S interaction (dark gray area). This portfolio is a good illustration of seeming low risk through the lens of a returns-based measure (volatility) but presents a much different risk profile through a holdings-based lens.

Our approach can quickly identify the primary differences in risk profile between two portfolios. In the same way that Exhibit 7 compared our original Sample Portfolio to the Value Peer Group, Exhibit 9 compares that Sample Portfolio to the Low Volatility competitor we used for Exhibit 8. The two biggest differences show up in the deep green and red: the original Sample Portfolio has significantly more stock-specific risk in U.S. financials, while the Low Volatility Portfolio has a much higher risk profile in smaller sectors ("other") in countries outside the largest five ("rest of index").

Exhibit 8: Active Share Risk Profile over 10-Year Period, Low Volatility Portfolio

Portfolio Time Series
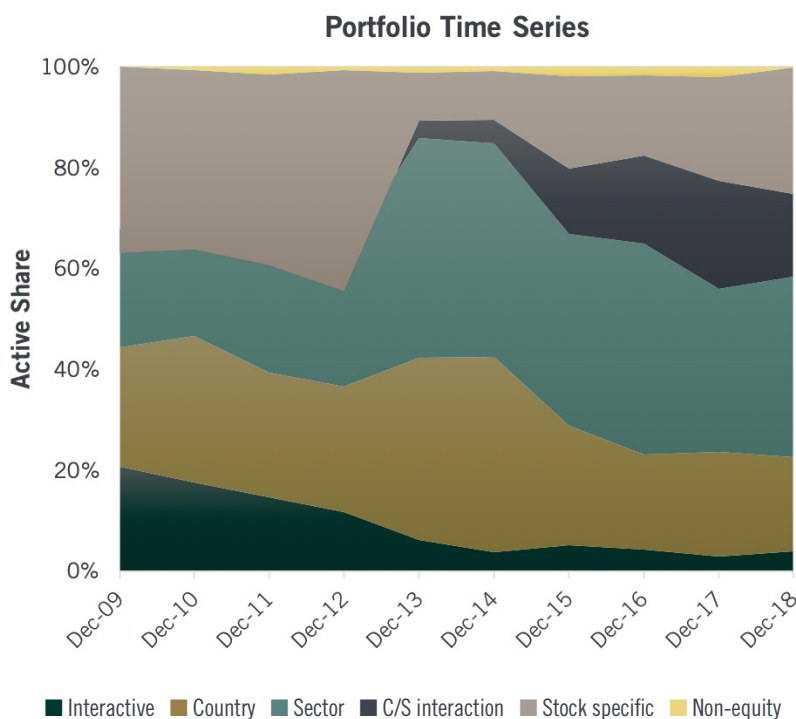
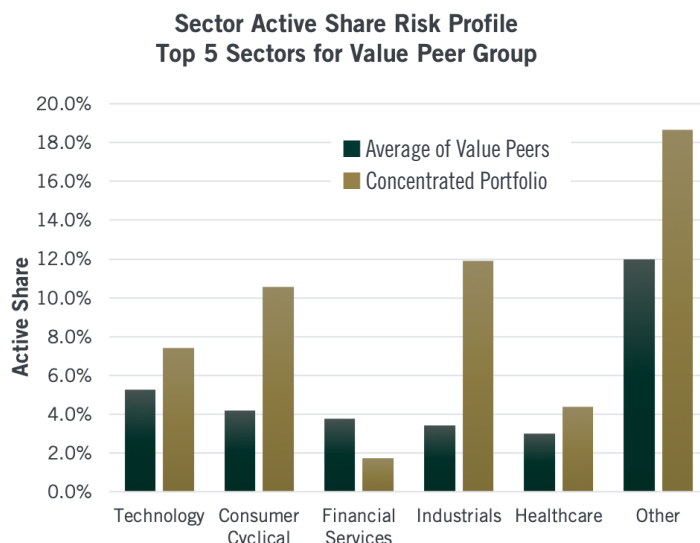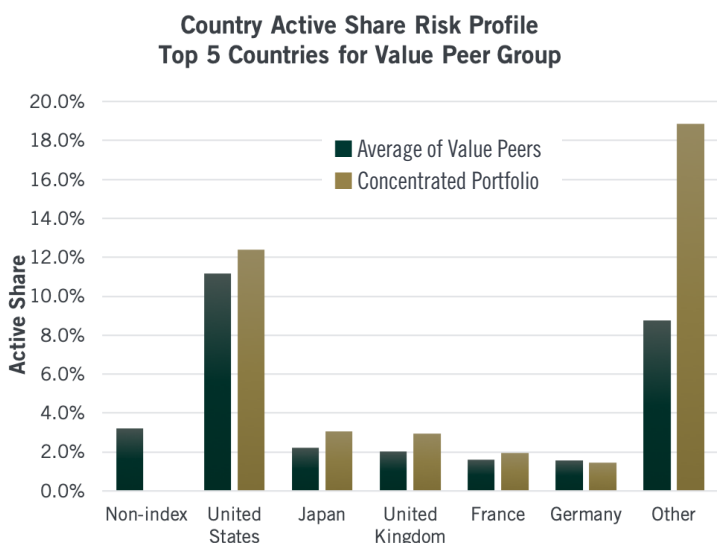Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Exhibit 9: Difference Between Sample Global Equity Portfolio and Low Volatility Global Equity Portfolio

Active Share Risk Profile Contribution by Cell, End 2018

Active Share Risk Profile, vs Low Vol Fund		Cons.Cyc.	Cons.Def.	Energy	Financial	Healthcare	Industrials	Technology	Comm.Serv.	Other
USA	Country/sector	0.8%	-0.4%	0.3%	-1.0%	-1.5%	-0.6%	1.1%	0.0%	-1.9%
	Stock specific	-4.1%	0.4%	-0.6%	6.0%	2.9%	1.0%	-2.8%	0.0%	-3.6%
Japan	Country/sector	0.0%	0.0%	0.0%	0.3%	0.2%	0.7%	0.0%	0.0%	0.0%
	Stock specific	1.5%	0.0%	0.0%	-0.6%	-0.4%	-1.7%	0.0%	0.0%	0.0%
UK	Country/sector	-0.5%	2.3%	0.2%	-0.3%	1.0%	-0.6%	0.0%	0.1%	-0.6%
	Stock specific	0.0%	0.8%	0.7%	0.7%	0.0%	-0.2%	0.0%	0.1%	0.0%
France	Country/sector	0.0%	0.1%	0.6%	0.0%	1.6%	0.3%	0.0%	0.5%	0.8%
	Stock specific	-0.6%	0.4%	0.0%	0.0%	0.0%	0.7%	0.0%	0.2%	0.1%
Germany	Country/sector	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stock specific	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rest of Index	Country/sector	-1.1%	-2.9%	0.8%	3.2%	0.3%	-3.4%	1.2%	-0.6%	-7.0%
	Stock specific	-0.1%	-0.5%	0.1%	-0.6%	-0.6%	-0.7%	0.2%	0.0%	-1.0%
Non-index	Country/sector	2.5%	0.5%	1.0%	0.0%	0.0%	1.4%	0.8%	0.0%	0.9%

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

Our other example is a highly concentrated portfolio with quite different country and sector risk characteristics than its peers. Unlike the Low Volatility example, this portfolio's risk profile has been fairly stable over time, with the main driver of Active Share being country/sector exposure and relatively little from stock-specific decisions within country/sector cells. This is not surprising given that the concentrated portfolio has typically held 20 to 25 stocks. In Exhibit 10, we can see that the risk profile emphasizes the "Other" bars on the right of each chart. This means the concentrated portfolio has significantly more risk exposure relative to peers in countries and sectors outside the "big five" of each (and interestingly no risk exposure at all to countries outside the MSCI World Index).

Exhibit 10: Concentrated Global Equity Portfolio and Value Peer Group, End 2018

Country Active Share Risk Profile
Top 5 Countries for Value Peer Group

Sector Active Share Risk Profile
Top 5 Sectors for Value Peer Group

Source: Morningstar data, Brandes Institute. Data as of 12/31/2018

COMPARING PEER GROUPS

We have used portfolios from the Value Peer Group for our illustrations, but have similar data for the other two peer groups (Growth and Blend). One of the objectives of this initial phase of research was to identify differences between these three peer groups. Our conclusion, from an admittedly small total universe of 46 portfolios, is that there are *some* differences, but they are nuanced rather than dramatic.

Exhibit 11 shows the three peer groups side-by-side over the 10-year end periods. The nuanced differences would include:

- Active Share has increased over time for Value and decreased for Growth and Blend (the complement to the dark green "inactive" shading)

- Stock-specific risk component has been increasing for Growth and Blend, but stable for Value (beige shading)

- Country risk exposure (gold shading) has increased more over time for Value than for Growth

Differences not shown in Exhibit 11 include:

- The country Active Share Risk Profile contribution for the United States is significantly higher for the Value Peer Group (11.2%) than for Blend (9.3%) or Growth (4.8%).

- The top-contributing sector to the risk profile for Value is technology and for Growth it's consumer defensive. At first, this seems surprising; shouldn't these be the other way around? However, as we've previously noted, these risk profiles include all *differences* from benchmark regardless of direction. It turns out that substantial underweights can impact the risk profile as much or more than the overweights on which many investors are focused.

> Substantial underweights can impact the risk profile as much or more than the overweights.

Exhibit 11: Active Share Risk Profile over 10-Year Period: Value; Blend; and Growth Peer Groups
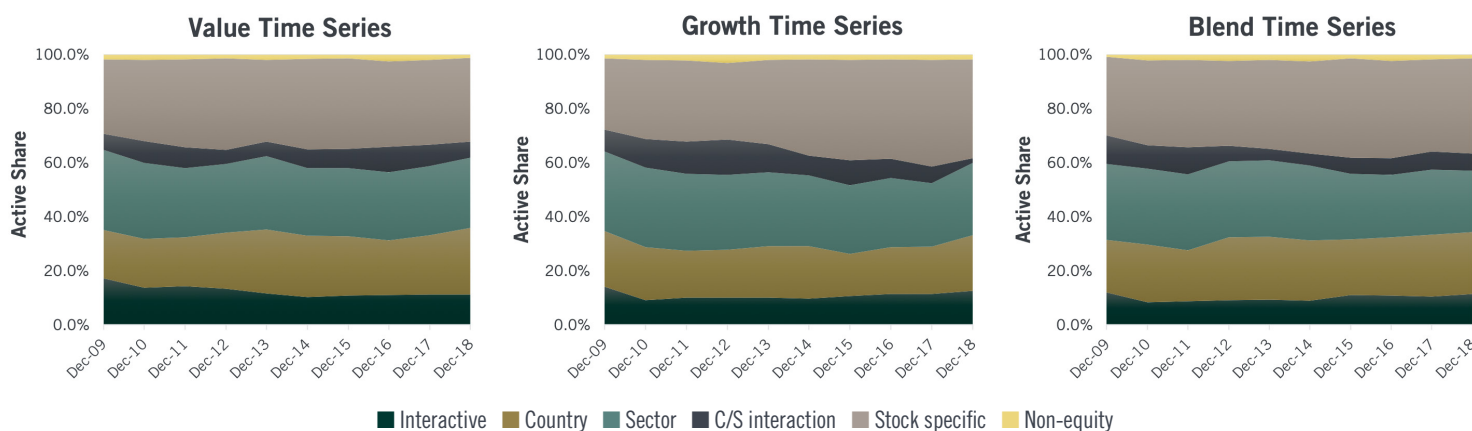
Source: Morningstar data, Brandes Institute. Data as of 12/31/2018
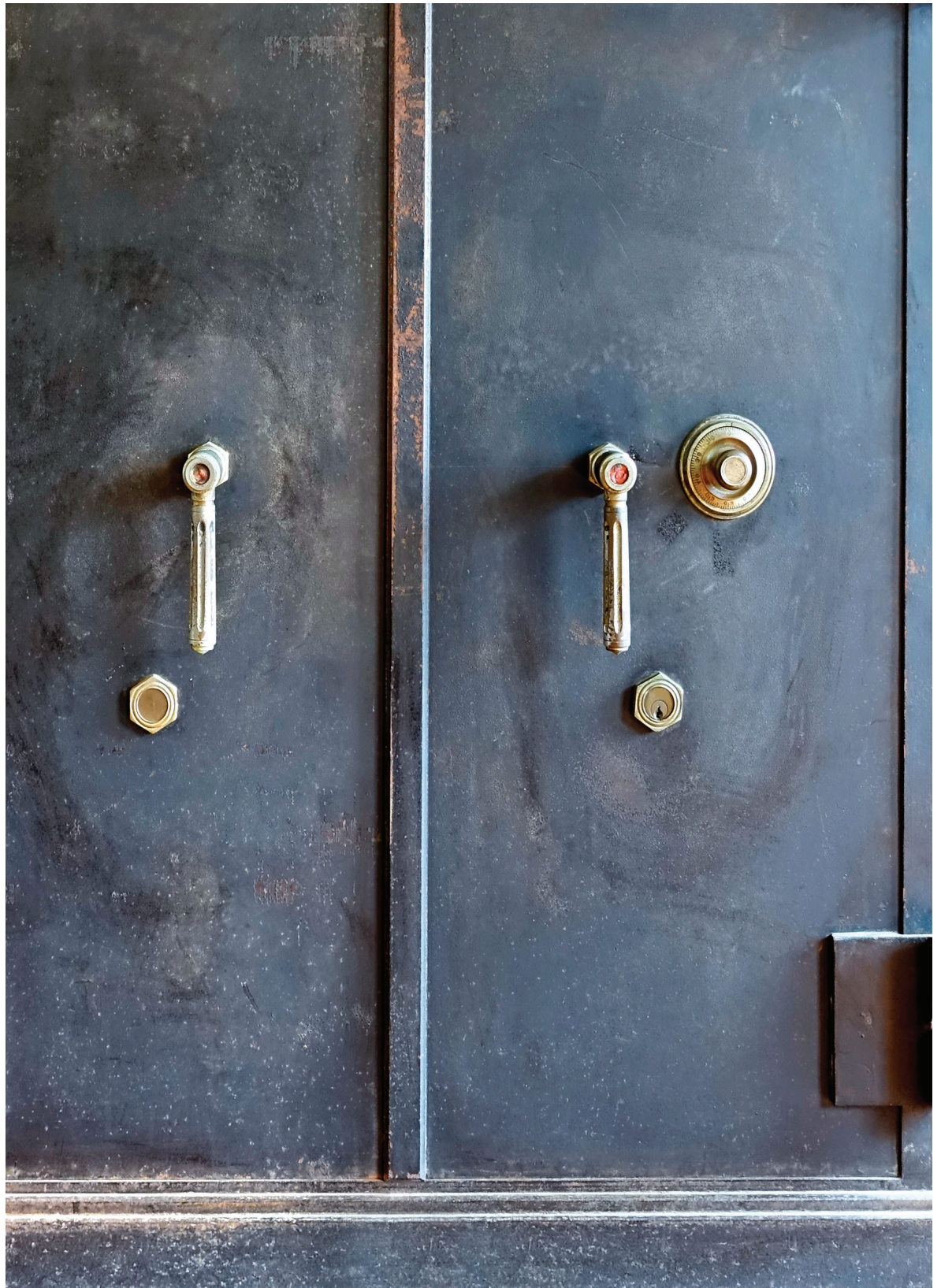
One characteristic shared by all three peer groups is a strong positive correlation between Active Share and the country/sector component within it. The higher a portfolio's headline Active Share, the more likely it is driven by a high contribution from country and sector exposure (including C/S interaction). The correlation is 69% across our full data-set of portfolios and dates. As might be expected, the correlation between Active Share and the stock-specific risk profile contribution is negative (-36% across the data-set). Essentially, portfolios with high Active Share get there largely because they have substantial country and/or sector risk exposures, not because they are particularly active within country/sector cells.

CONCLUSION

We've shown how Active Share methodology can be used to learn much more about a portfolio's risk profile than is revealed by the conventional Active Share "headline score." In particular, this technique can help investors:

- Understand the holdings-based risks taken in a portfolio over time in a way that clearly differentiates them when compared to a peer group or specific competitors

- Assess risk and exposures at a summary level and drill down to increasingly granular details

- Observe whether a portfolio is materially changing its risk profile (and possibly its investment approach) over time

- Interpret and analyze managers' claims of "high active share" with information that can lead to a deeper and more effective dialogue.

Active Share Risk Profile provides an intuitive and visual risk assessment measure. Global investment managers and their clients can use it to understand a portfolio's holdings-based risks over time.

APPENDIX 1: METHODOLOGY, DATA AND SECTOR CLASSIFICATION

Active Share calculations require holdings-level data for all portfolios at all dates. The portfolio holdings data is sourced from Morningstar's mutual fund database of U.S.-registered mutual fund portfolios. The universe used was Foreign Large Cap Equity and within this universe, we downloaded the 69 global equity portfolios benchmarked to the MSCI World Index with inception dates prior to 12/31/2009. Data was downloaded for the 10 calendar year-end dates from 12/31/2009 to 12/31/2018. We then eliminated portfolios from the list if their holdings data was substantially incomplete, or if the portfolio did not substantially consist of equities. A number of the remaining portfolios had a limited amount of missing data. Some portfolio data included equity holdings, but without identifiers or country and sector categories. To the extent practical, these were input manually; however, for some portfolios, the amount of incomplete data was so substantial to make that task impractical.

The final dataset includes 46 funds benchmarked to the MSCI World Index. Not all of these portfolios had holdings data for every year-end date. Using Morningstar's style categorization of these portfolios, the universe was divided into three peer groups: Value (16 portfolios), Growth (17 portfolios) and Blend (13 portfolios).

The sector names and classifications in Morningstar's data are similar but not identical to the industry-standard GICS sectors. As all the downloaded security level data is identified with Morningstar sectors, the Morningstar sector classifications have been used throughout this paper instead of GICS sectors. The following table shows the Morningstar sectors alongside the corresponding GICS sectors. The securities in a Morningstar sector may not always be an exact duplicate of those in the equivalent GICS sector.

MORNINGSTAR SECTOR VS. GICS SECTOR

Morningstar sector	GICS sector
Consumer Cyclical	Consumer Discretionary
Consumer Defensive	Consumer Staples
Energy	Energy
Financial Services	Financials
Healthcare	Health Care
Industrials	Industrials
Technology	Information Technology
Basic Materials	Materials
Communication Services	Communication Services
Utilities	Utilities
Real Estate	Real Estate

APPENDIX 2: EXPLANATION OF PORTFOLIO-LEVEL BREAKDOWN, INCLUDING COUNTRY/SECTOR INTERACTION

The portfolio level breakdown of Active Share, as illustrated in Exhibit 1, splits Active Share into five bars, with a sixth bar, "Inactive," which is 100% minus Active Share, showing how much of the portfolio duplicates index holdings. "Non-equity" shows how much Active Share is derived from cash, bond and any other non-equity holdings in the portfolio. The remaining four bars illustrate the Active Share breakdown of the equity holdings in the portfolio. These four are country, sector, country/sector ("C/S") interaction, and stock specific. Three of these are intuitively understandable, but C/S interaction requires some more explanation.

The country contribution to Active Share is calculated as follows. First, we take the difference between portfolio and benchmark weight (positive and negative) for all stocks in each country that are in either the portfolio or the benchmark. We sum these for each country separately (so positives and negatives net out for that country). Consistent with the Active Share methodology, for that country we then calculate half the absolute value of the total. The

country contribution to Active Share is the total of these calculations summed across all countries.

Sector contribution to Active Share is calculated similarly, replacing countries with sectors. However, as the country and sector Active Share contributions have been calculated separately, but each stock is associated with both a country and a sector, there may be some double-counting due to that overlap. C/S interaction is a measure of that overlap: the difference between the contribution to total Active Share when country and sector contributions are calculated separately, versus when they are calculated simultaneously by measuring the contribution of Active Share within each country/sector cell (eliminating the double-counting).

C/S interaction = Country AS contribution + Sector AS contribution – (sum of AS contributions for each country/sector cell)

To illustrate with a simple example, we use a hypothetical portfolio universe with only two countries (Japan and the United States), and only two sectors (financials and technology). Plus and minus signs are used to represent stock buys and sells of equal amounts.

There are four ways in which the Active Share of a portfolio can change. Assume we start with a portfolio indexed to this simplified benchmark, and then make trades as shown. The first example is "stock specific," when the holdings <u>within</u> a country/sector cell are traded, without changing the country or sector weights of that cell. Such a trade will change Active Share of the portfolio, but will not impact the country or sector weights.

STOCK SPECIFIC

	Financials	Technology
Japan		
United States	+/–	

The second way is to change country weights, but not sector weights. In the diagram below, financials

and technology stocks are bought in Japan and an equivalent amount of sales are made in the United States in those two sectors. The country weights for both the United States and Japan have changed (impacting Active Share), but the total sector weights are unchanged. So this change in Active Share is solely due to the country contribution.

COUNTRY IMPACT

	Financials	Technology
Japan	+	+
United States	–	–

Similarly, sector impact is generated by trades that keep the country weights unchanged, but alter the sector weights. In this example, financials are bought in both countries and technology is sold. The country weights are unchanged, so this change in Active Share is driven by the sector contribution.

SECTOR IMPACT

	Financials	Technology
Japan	+	–
United States	+	–

In the final example, there are trades in each cell, and each trade changes the portfolio's Active Share. However, country weight is unchanged, and so is sector weight. The Active Share generated by this pattern of trades goes in the C/S interaction category. At total portfolio level, C/S interaction can be positive or negative.

COUNTRY/SECTOR IMPACT

	Financials	Technology
Japan	–	+
United States	+	–

In practice, any particular trade may have elements impacting more than one of these types of contribution.

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