

# THE BIG QUESTION: TO DIVERSIFY OR NOT TO DIVERSIFY?

Geographic Revenue Exposure

White Paper

April 2019

Research, Solactive AG



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## The Big question: To Diversify or Not to Diversify?

### EXECUTIVE SUMMARY

In this paper we dissected the benchmark into diversified and concentrated portfolios based on the companies' geographic revenue. We discovered that major political and/or market events produced significant divergence in performance historically. Therefore, an understanding of the risks from geographic revenue exposure of the companies becomes important for portfolio management.

### INTRODUCTION

For decades the world has been moving towards a more and more liberated global economy. There were short blips of protectionism such as the "Chicken Tax" in 1964, but the overall trend continued, especially with the fall of Communism in the 1990s. However, now we are witnessing a revival of protectionism foremost brought about by the uncertainties around Brexit negotiations and Trump's protectionist policies. In Jun 2016, Britain voted to leave the European Union amid rising Euroscepticism. In the United States, Trump announced a series of tariffs on imports since he came into office in Jan 2017; other nations are following suit. The question now is whether protectionism becomes the new norm or if it's just a momentary episode.

Given this market situation, the prominent concern that market participants often have is whether they should diversify the economic exposure risk of their portfolios to combat rising protectionism. In this paper, we attempt to study the historical impact of global revenue exposure by dissecting the benchmark into diversified and concentrated portfolios by geographic revenue, and we present the study on European and United States equities.

### HIGHLIGHTS

> We constructed two portfolios. The first consisted of companies with relatively high diversified geographic revenue exposure and

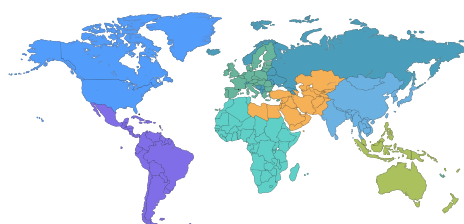
the second consisted of the companies with relatively more concentrated exposure.

- > To minimize sector bias, both the portfolios were created by taking companies from each sector until we covered 20% market capitalization of each business segment.
- > The diversified portfolios had more international revenue exposure while the concentrated portfolios maintained a higher domestic exposure.
- > Major world events such as Brexit negotiations and Trump's protectionist policies produced a significant divergence in the performance of the two portfolios.

### METHODOLOGY

The Herfindahl-Hirschman Index (HHI) is a common measure for determining the concentration in a market pre/post mergers and acquisitions. A Higher HHI indicates a stronger concentration. We used HHI to measure the concentration of a company's geographic revenue exposure. The regional breakup of a company's geographic revenue exposure was sourced from FactSet's Geographic Revenue Exposure (GeoRev™) database (see Exhibit 1).

Exhibit 1: Geographic Regions for Revenue Exposure



Source: FactSet. The regional groups as defined by FactSet are Africa, Middle East, Latin America, North America, Asia, Oceania, European Union, Non-European Union. Charts are provided by illustrative purposes.

The HHI of a company was calculated as the sum of the square of its revenue exposure across different regions. HHI of Facebook as of Feb 28, 2019, was 3049.26 (see Exhibit 2):



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Exhibit 2: Revenue Exposure and HHI of Facebook

Geographic Region	Revenue Exposure	Square
Africa	1.5%	2.25
Middle East	3.7%	13.69
Latin America	4.7%	22.09
North America	49.1%	2410.81
Asia	12.6%	158.76
Oceania	4.1%	16.81
European Union	20.2%	408.04
Non-European Union	4.1%	16.81
HHI (sum of squares)		3049.26

Source: FactSet. Data as of Feb 28, 2019. Table is provided for illustrative purposes.

Companies with lower HHI would be classified as having more diversified exposure in comparison to companies with higher HHI. For example, Facebook Inc. derived a significant portion of its revenue from the North American region (49.1%). In contrast, Intel Corp. had the majority of its exposure to the Asian region (66.7%) (see Exhibit 3). It is evident that Intel's geographic revenue exposure was less diversified than Facebook and HHI illustrates this quantitatively.

Exhibit 3: Revenue Exposure and HHI of Facebook and Intel

Geographic Region	Facebook Inc.	Intel Corp.
Africa	1.5%	0.7%
Middle East	3.7%	1.7%
Latin America	4.7%	2.0%
North America	49.1%	20.6%
Asia	12.6%	66.7%
Oceania	4.1%	1.3%
European Union	20.2%	5.9%
Non-European Union	4.1%	1.1%
HHI	3049.26	4918.34

Source: FactSet. Data as of Feb 28, 2019. Table is provided for illustrative purposes.

We constructed two portfolios. The first portfolio consisted of companies with relatively high diversified revenue exposure and the second consisted of the companies with relatively more concentrated revenue exposure. From the universe of stocks, we first removed the companies that had more than 5% unclassified revenue exposure. With the remaining companies, the diversified revenue exposure portfolio was created by taking companies from each sector with lowest HHI until the last company included brought the cumulative float market capitalization closest to 20% of float market capitalization of the respective sector in the benchmark. We chose companies from each business segment in the above manner to maintain the sector weight of the portfolio close to the benchmark to minimize sector bias. When two companies had the same HHI, then the preference was given to the company with larger float market capitalization.

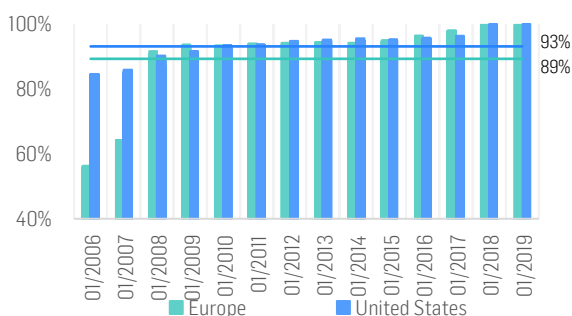
The concentrated revenue exposure portfolio was also built in the same manner as the diversified portfolio except that it consisted of companies with highest HHI. Both the portfolios were weighted according to market capitalization and rebalanced on the first Wednesday of February, May, August and November each year. The reference date for constituent selection was 28 calendar days before the rebalance date. The geographic revenue exposure data from FactSet was lagged by three months from the selection date to avoid the data backfill bias.

The constituents of the Solactive GBS Europe Large & Mid Cap Index and the Solactive GBS United States Large & Mid Cap Index were used for European and United States equities respectively. The back tests were calculated from May 8, 2006, to Feb 28, 2019. Over the entire back tested period, the average cumulative market capitalization coverage of the companies with at least 95% regionally classified revenue exposure from FactSet was 89% and 93% for European and United States equities respectively (see Exhibit 4).



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Exhibit 4: Cumulative Market Capitalization Coverage of Companies with at least 95% Regionally Classified Revenue Exposure



Source: Solactive and FactSet. Data as of Feb 28, 2019. Chart is provided for illustrative purposes.

### PORTFOLIO CHARACTERISTICS

In general, the geographic revenue exposure of the Solactive GBS Europe Large & Mid Cap Index was diversified to a higher degree than the Solactive GBS United States Large & Mid Cap Index (see Exhibit 5).

Exhibit 5: Average Revenue Exposure and HHI of Solactive GBS Europe Large & Mid Cap Index and Solactive GBS United States Large & Mid Cap Index

Geographic Region	Europe	United States
Africa	2.0%	0.8%
Middle East	2.3%	1.7%
Latin America	6.7%	3.7%
North America	16.7%	70.3%
Asia	10.7%	9.3%
Oceania	2.6%	1.6%
European Union	52.6%	10.9%
Non-European Union	6.3%	1.8%
HHI	3263.45	5166.33

Source: Solactive and FactSet. Average calculated using data as of the selection dates between Apr 10, 2006 to Jan 9, 2019. Table is provided for illustrative purposes.

The diversified portfolios for both Europe and the United States had significant revenues from

regions other than Europe and North America respectively (see Exhibits 6 and 7). In contrast, the concentrated portfolios derived most of their revenues from the European and the North American regions respectively. Moreover, the concentrated US portfolio generated a significantly higher domestic revenue exposure in comparison to the concentrated European portfolio. One intuitive conclusion from this observation is that the diversified portfolios included companies with higher international exposure and the concentrated portfolios consisted of companies with more domestic exposure.

Exhibit 6: Average Revenue Exposure and HHI of Portfolios based on Solactive GBS Europe Large & Mid Cap Index

Geographic Region	Diversified	Concentrated
Africa	3.17%	1.34%
Middle East	3.84%	1.34%
Latin America	9.24%	4.64%
North America	21.45%	9.50%
Asia	18.58%	4.37%
Oceania	4.76%	0.95%
European Union	31.70%	70.34%
Non-European Union	7.26%	7.52%
HHI	1995.75	5139.64

Source: Solactive and FactSet. Average calculated using data as of the selection dates between Apr 10, 2006 to Jan 9, 2019. Table is provided for illustrative purposes.

Exhibit 7: Average Revenue Exposure and HHI of Portfolios based on Solactive GBS United States Large & Mid Cap Index

Geographic Region	Diversified	Concentrated
Africa	1.7%	0.1%
Middle East	3.7%	0.2%
Latin America	8.1%	0.6%
North America	41.8%	95.0%
Asia	16.8%	1.8%



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Oceania	3.5%	0.2%
European Union	20.7%	1.8%
Non-European Union	3.7%	0.3%
HHI	2566.10	9032.02

Source: Solactive and FactSet. Average calculated using data as of the selection dates between Apr 10, 2006 to Jan 9, 2019. Table is provided for illustrative purposes.

### HISTORICAL RISK AND RETURN

The diversified and the concentrated portfolios in both Europe and the United States had periods of over- and under-performance with respect to their respective benchmarks. Various market, economic, and geopolitical factors had an influence on the performance. We discuss the few which caused major divergence.

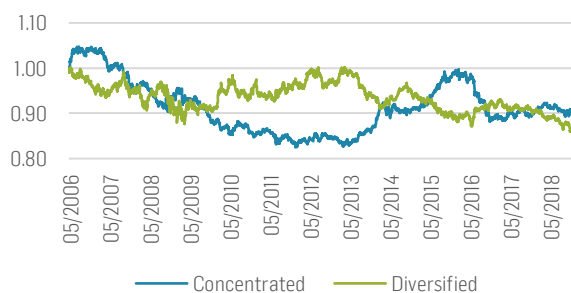
The economic growth of the North American region was stronger than the European Union region for a few years after the global financial crisis in 2008. The historical performance differential between the diversified and the concentrated portfolios in both European and the United States equities reflected the same sentiment.

The diversified portfolio in Europe outperformed the benchmark from the early growth stage following the crisis until mid-2013 since it had higher revenue exposure to the North American region (see exhibit 8). Similarly, the diversified portfolio in the United States had a down trending relative performance with respect to the benchmark in the same period, which owes to the fact that it had very high revenue exposure to the North American region (see exhibit 9).

Since late 2013 until mid-2016, the concentrated portfolio in Europe outperformed the benchmark, but the trend reversed from Jun 2016 after the United Kingdom chose to exit the European Union. In the United States, the diversified and the concentrated portfolios displayed significant divergence in performance after the presidency of Donald Trump began in Jan 2017.

### Exhibit 8: Cumulative Relative Performance and Characteristics

#### Cumulative Relative Performance with respect to Solactive Europe Large & Mid Cap Index



#### Performance characteristics over the entire back tested period

Statistic	Diversified	Concentrated	Benchmark
Total Return	3.0%	3.3%	4.2%
Risk (standard deviation)	19.7%	18.8%	19.0%
Return/Risk	0.15	0.17	0.22
Downside Deviation	15.1%	14.4%	14.5%
Sortino Ratio	0.20	0.23	0.29
Max. Drawdown	-61.1%	-61.0%	-57.6%
Daily VaR 95%	-1.9%	-1.8%	-1.8%
Daily Expected Shortfall	-3.0%	-2.9%	-2.9%
Skewness	14.3%	-6.7%	-0.1%
Excess Kurtosis	9.7	7.1	7.5
Dividend Yield	3.5%	3.5%	3.6%
Turnover (one-way)	45.0%	42.5%	NA

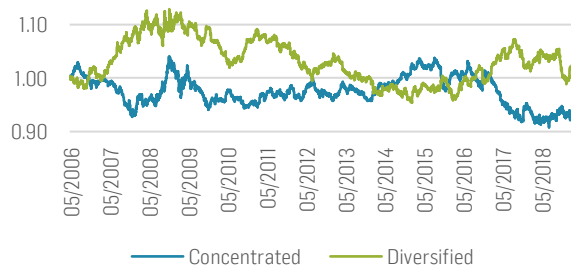
Source: Solactive and FactSet. Data from May 08, 2006 to Feb 28, 2019. Currency of calculation was Euro. Table is provided for illustrative purposes. Past performance is not a guarantee of future results.



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Exhibit 9: Cumulative Relative Performance and Characteristics

Cumulative Relative Performance with respect to Solactive United States Large & Mid Cap Index



Performance characteristics over the entire back tested period

Statistic	Diversified	Concentrated	Benchmark
Total Return	8.5%	7.6%	8.3%
Risk (standard deviation)	19.3%	19.0%	19.0%
Return/Risk	0.44	0.40	0.44
Downside Deviation	15.9%	15.7%	15.9%
Sortino Ratio	0.53	0.48	0.52
Max. Drawdown	-53.1%	-54.9%	-54.8%
Daily VaR 95%	-1.9%	-1.8%	-1.8%
Daily Expected Shortfall	-3.0%	-3.0%	-3.0%
Skewness	-10.3%	2.2%	-12.9%
Excess Kurtosis	11.8	12.7	11.7
Dividend Yield	2.0%	2.4%	2.1%
Turnover (one-way)	39.6%	31.4%	NA

Source: Solactive and FactSet. Data from May 08, 2006 to Feb 28, 2019. Currency of calculation was Euro. Table is provided for illustrative purposes. Past performance is not a guarantee of future results.

## CONCLUSION

In this paper, we attempted to study the historical impact of revenue exposure by dissecting the benchmark into diversified and concentrated portfolios by geographic revenue exposure on European and United States equities.

We used the Herfindahl-Hirschman Index (HHI) to measure the concentration of a company's geographic revenue exposure. Higher HHI indicates an increased concentration. Both the diversified and concentrated portfolios were created by taking companies from each sector until 20% float market capitalization coverage from each sector to minimize sector bias. We observed that the diversified portfolios comprised of companies with higher international exposure whereas the concentrated portfolios consisted of companies with more domestic exposure.

Major world events such as Brexit and Trump's protectionist policies produced a significant divergence in the performance of the two portfolios. In light of the historical observations, an understanding of the risks arising from the revenue exposure of a company becomes important for portfolio management and whether to diversify that risk will depend on the prevailing market situation.



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## APPENDIX

### Average HHI of sectors within the benchmark indices

Exhibit 10: Average Revenue Exposure and HHI of Sectors in Solactive GBS Europe Large & Mid Cap index

Sectors	Africa	Middle East	Latin America	North America	Asia	Oceania	European Union	Non-European Union	HHI
Basic Materials	3.8%	2.2%	8.4%	15.7%	23.8%	5.6%	34.9%	5.5%	2183.57
Consumer Durables	1.2%	2.5%	7.7%	19.1%	13.2%	2.5%	47.9%	6.0%	2936.34
Consumer Non-Durables	2.6%	3.9%	11.3%	20.6%	16.0%	4.1%	35.1%	6.4%	2118.58
Consumer Services	0.4%	1.6%	3.3%	12.9%	4.8%	0.6%	73.2%	3.1%	5578.19
Energy	4.1%	1.5%	6.1%	19.9%	13.9%	3.5%	41.1%	9.8%	2446.47
Finance	1.0%	1.5%	6.5%	13.6%	6.2%	1.4%	63.4%	6.5%	4330.04
Healthcare	2.1%	2.5%	6.2%	38.4%	14.5%	2.9%	28.5%	4.8%	2581.44
Industrials	2.6%	3.9%	6.0%	17.9%	12.0%	3.7%	48.4%	5.6%	2905.68
Technology	1.9%	4.4%	9.6%	12.4%	9.5%	2.6%	53.9%	5.8%	3305.90
Utilities	0.2%	0.5%	3.8%	6.2%	1.3%	0.4%	83.8%	3.9%	7083.56
Total	2.0%	2.3%	6.7%	16.7%	10.7%	2.6%	52.6%	6.3%	3263.45

Source: Solactive and FactSet. Average calculated using data as of the selection dates between Apr 10, 2006 to Jan 9, 2019. Table is provided for illustrative purposes.

Exhibit 11: Average Revenue Exposure and HHI of Sectors in Solactive GBS United States Large & Mid Cap index

Sectors	Africa	Middle East	Latin America	North America	Asia	Oceania	European Union	Non-European Union	HHI
Basic Materials	0.2%	0.5%	7.8%	59.4%	7.1%	5.7%	16.3%	3.0%	3943.73
Consumer Durables	0.8%	1.8%	6.0%	65.5%	5.8%	1.2%	16.7%	2.2%	4643.97
Consumer Non-Durables	1.5%	3.0%	6.9%	57.2%	9.5%	2.2%	16.6%	3.0%	3712.16
Consumer Services	0.2%	0.3%	1.5%	85.8%	5.9%	0.5%	5.3%	0.5%	7425.35
Energy	1.3%	2.6%	2.8%	61.6%	9.3%	2.2%	17.7%	2.5%	4223.13
Finance	0.6%	1.2%	3.3%	77.6%	7.9%	1.4%	6.9%	1.1%	6146.33
Healthcare	0.7%	1.2%	2.6%	75.3%	6.6%	1.2%	10.6%	1.9%	5837.01
Industrials	1.4%	2.9%	6.8%	56.4%	10.9%	2.4%	15.8%	3.4%	3624.10
Technology	1.1%	2.8%	3.7%	57.6%	17.9%	2.4%	12.3%	2.2%	3826.62
Utilities	0.1%	0.2%	3.7%	94.8%	0.1%	0.1%	0.9%	0.1%	9006.71
Total	0.8%	1.7%	3.7%	70.3%	9.3%	1.6%	10.9%	1.8%	5166.33

Source: Solactive and FactSet. Average calculated using data as of the selection dates between Apr 10, 2006 to Jan 9, 2019. Table is provided for illustrative purposes.





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Top 10 companies with most diversified geographic revenue exposure.

Exhibit 12: Companies with lowest HHI from Solactive GBS Europe Large and Mid Cap Index

ISIN	Name	Sector	Country	Float Mcap USDmn	Revenue USDmn	HHI
SE0011166933	Epiroc AB	Industrials	Sweden	7821.3	3476.7	1466.0
GB0002875804	British American Tobacco p.l.c.	Consumer Non-Durables	United Kingdom	72951.3	31499.3	1654.8
CH0002497458	SGS SA	Industrials	Switzerland	11656.9	6648.1	1673.5
FI0009007835	Metso Oyj	Industrials	Finland	3596.9	3429.1	1675.0
CH0012214059	LafargeHolcim Ltd.	Basic Materials	Switzerland	17725.0	26287.6	1678.1
FR0000120644	Danone SA	Consumer Non-Durables	France	42690.4	28764.1	1688.6
SE0000667891	Sandvik AB	Industrials	Sweden	16621.0	10841.4	1770.1
NL0000687663	AerCap Holdings NV	Finance	Ireland	5609.5	4802.8	1774.9
SE0000108656	Telefonaktiebolaget LM Ericsson	Technology	Sweden	27659.2	22583.9	1784.6
DK0060227585	Chr. Hansen Holding A/S	Industrials	Denmark	9280.3	1258.1	1811.0

Source: Solactive and FactSet. Data as of Jan 9, 2019. Selection based on rank by HHI and sub sorted by float market cap. Table is provided for illustrative purposes.

Exhibit 13: Companies with lowest HHI from Solactive GBS United States Large and Mid Cap Index

ISIN	Name	Sector	Float Mcap USDmn	Revenue USDmn	HHI
US4595061015	International Flavors & Fragrances Inc.	Consumer Non-Durables	14533.1	3613.1	1751.5
US7181721090	Philip Morris International Inc.	Consumer Non-Durables	105328.4	30425.0	1914.6
US1941621039	Colgate-Palmolive Company	Consumer Non-Durables	52906.4	15625.0	2005.8
US3024913036	FMC Corporation	Industrials	10598.2	4488.2	2025.9
BMG169621056	Bunge Limited	Industrials	7797.0	45807.0	2031.8
AN8068571086	Schlumberger NV	Industrials	57058.4	32815.0	2043.8
US6092071058	Mondelez International, Inc.	Consumer Non-Durables	59927.3	26131.0	2082.0
LR0008862868	Royal Caribbean Cruises Ltd.	Consumer Services	17256.6	9166.0	2083.0
US0126531013	Albemarle Corporation	Industrials	8123.9	3311.0	2084.6
US05722G1004	Baker Hughes, a GE Company	Industrials	11864.1	22375.0	2121.4

Source: Solactive and FactSet. Data as of Jan 9, 2019. Selection based on rank by HHI and sub sorted by float market cap. Table is provided for illustrative purposes.



## The Big question: To Diversify or Not to Diversify?

Top 10 companies with most concentrated geographic revenue exposure.

Exhibit 14: Companies with highest HHI from Solactive GBS Europe Large and Mid Cap Index

ISIN	Name	Sector	Country	Float Mcap USDmn	Revenue USDmn	HHI
GB0008706128	Lloyds Banking Group plc	Finance	United Kingdom	48760.1	48252.7	10000.0
DE000A1ML7J1	Vonovia SE	Finance	Germany	24092.4	4208.2	10000.0
GB0005603997	Legal & General Group Plc	Finance	United Kingdom	18256.9	31833.7	10000.0
DE000A0HN5C6	Deutsche Wohnen SE	Finance	Germany	17056.5	1584.1	10000.0
GB0007908733	SSE plc	Utilities	United Kingdom	14275.7	29113.1	10000.0
DK0010272202	Genmab A/S	Healthcare	Denmark	10427.6	432.1	10000.0
IT0003153415	Snam S.p.A.	Utilities	Italy	9594.6	2879.1	10000.0
GB0006825383	Persimmon Plc	Consumer Durables	United Kingdom	8425.9	4678.4	10000.0
GB00B5ZN1N88	SEGR0 plc	Finance	United Kingdom	7766.0	399.2	10000.0
GB00B019KW72	J Sainsbury plc	Consumer Services	United Kingdom	7319.6	37653.2	10000.0

Source: Solactive and FactSet. Data as of Jan 9, 2019. Selection based on rank by HHI and sub sorted by float market cap. Table is provided for illustrative purposes.

Exhibit 15: Companies with highest HHI from Solactive GBS United States Large and Mid Cap Index

ISIN	Name	Sector	Float Mcap USDmn	Revenue USDmn	HHI
US92343V1044	Verizon Communications Inc.	Technology	235668.8	130537.0	10000.0
US9497461015	Wells Fargo & Company	Finance	203586.6	100601.0	10000.0
US02209S1033	Altria Group Inc	Consumer Non-Durables	93161.3	19555.0	10000.0
US1266501006	CVS Health Corporation	Consumer Services	85156.6	188055.0	10000.0
US65339F1012	NextEra Energy, Inc.	Utilities	82381.2	16656.0	10000.0
US5486611073	Lowe's Companies, Inc.	Consumer Services	74157.6	71157.0	10000.0
US9029733048	U.S. Bancorp	Finance	70483.5	25429.0	10000.0
US0367521038	Anthem, Inc.	Healthcare	64906.0	91419.9	10000.0
US12572Q1058	CME Group Inc.	Finance	63049.5	3972.8	10000.0
US26441C2044	Duke Energy Corporation	Utilities	60421.5	24205.0	10000.0

Source: Solactive and FactSet. Data as of Jan 9, 2019. Selection based on rank by HHI and sub sorted by float market cap. Table is provided for illustrative purposes.



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## CONTACT

**Solactive AG**  
**German Index Engineering**  
Guiollettstr. 54  
60325 Frankfurt am Main  
Germany

Tel.: +49 (0) 69 719 160 00  
Fax: +49 (0) 69 719 160 25  
Email: [info@solactive.com](mailto:info@solactive.com)  
Website: [www.solactive.com](http://www.solactive.com)

© Solactive AG

**Timo Pfeiffer**  
**Head of Research & Business Development**

Tel.: +49 (0) 69 719 160 320  
Email: [timo.pfeiffer@solactive.com](mailto:timo.pfeiffer@solactive.com)

**Utkarsh Agrawal**  
**Quantitative Research Analyst**

Email: [utkarsh.agrawal@solactive.com](mailto:utkarsh.agrawal@solactive.com)

**Fabian Colin**  
**Head of Sales**

Tel.: +49 (0) 69 719 160 220  
Email: [fabian.colin@solactive.com](mailto:fabian.colin@solactive.com)

