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Media attention and the volatility effect

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Highlights

- We test whether the attention-grabbing hypothesis can explain the volatility effect
- We use a novel data set on media attention covering the global stock market
- Among stocks with similar media attention, a volatility effect is still present
- Among stocks with similar volatility, there is no media effect
- We reject the hypothesis that media attention is the driving force behind the volatility effect

Media attention and the volatility effect[1]

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Declaration of interest

All authors are employed by Robeco Institutional Asset Management, an investment firm with its headquarters in Rotterdam, the Netherlands. The insights from this research may, but do not need to be, reflected in the investment products or services that the firm offers.

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Summary

Stocks with low return volatility have high risk-adjusted returns, which might be driven by low media attention for such stocks. Using news coverage data we formally test whether the 'attention-grabbing' hypothesis can explain the volatility effect for a sample of international stocks over the period 2001 to 2018. A low-volatility effect is still present for stocks with high media attention. Among stocks with high volatility, the amount of media attention is not associated with different risk-adjusted returns. Based on these findings, we reject the hypothesis that media attention is the driving force behind the volatility effect.

Keywords: Alpha, Attention, Big data, Investing, Media, News, Volatility.

JEL Classification: G11, G12, L82

1. Introduction

The low-risk anomaly is the empirical observation that stocks with low return volatility or market beta have higher risk-adjusted returns than the market, while stocks with high-risk characteristics have lower risk-adjusted returns. Since the discovery of the low-risk anomaly by Black, Jensen, and Scholes (1972) and Haugen and Heins (1975), academics and practitioners have tried to explain its existence.[2] Blitz, Falkenstein, and Van Vliet (2014) take the perspective of the Capital Asset Pricing Model (CAPM) and relax each of its assumptions separately. They argue that each time an assumption is relaxed, this leads to a flatter security market line than predicted by the CAPM.

One of the assumptions behind the CAPM is that investors have complete information and that they rationally process this information. However, in reality investors only possess a limited amount of information. Instead of searching for all the information on every possible company, investors may only purchase the stocks of companies that are able to grab their attention. Barber and Odean (2008) develop the 'attention-grabbing' hypothesis and find empirical evidence that individual investors are more likely to buy stocks that have been in the news, all other things equal. Engelberg and Parsons (2011) and Solomon, Soltes, and Sosyura (2014) show that news coverage catches investor attention. Seasholes and Wu (2007) find evidence of attention-grabbing trading behavior on the Shanghai stock exchange. In addition, Falkenstein (1996) finds that mutual funds prefer holding stocks of companies that have been more in the news in the previous year. Blankespoor, deHaan, and Zhu (2018) show that the introduction of news articles written by robots, which add no new information to the market, led investors to increase trading in stocks with more published news articles. This investor behavior suggests that the prices of

[2] See Blitz, Van Vliet, and Baltussen (2019) for an extensive review of the volatility effect.

attention-grabbing stocks may be temporarily inflated, which subsequently leads to lower returns. This has also been documented by Da, Engelberg, and Gao (2011) for stocks that appeared more often in Google searches. According to the same reasoning, stocks that do not appear frequently in the news should more likely be underpriced, resulting in higher future returns.

Andrei and Hasler (2015) develop a theoretical model in which they show that investor attention and volatility are positively correlated. Bali, Bodnaruk, Scherbina, and Tang (2018) find that companies that experience unusually high news flows experience shocks in their price volatility, and link this to investor disagreement. Blitz et al. (2014) and Beveratos, Bouchaud, Ciliberti, Laloux, Lempérière, Potters, and Simon (2017) suggest that low-volatility stocks are 'boring' and therefore require a premium relative to 'glittering' stocks that receive a lot of investor attention. Since data on aggregate media attention has recently become available, we are able to empirically examine its relation with volatility. In addition to indeed finding a positive association between a stock's volatility, trading volume, and media attention, we empirically test whether the global low-risk anomaly can be explained by the attention-grabbing hypothesis.[3] The first hypothesis that we test is whether there are stand-alone volatility and media attention effects in our data. We continue with investigating the interaction between volatility and media attention. The two additional hypotheses following from the attention-grabbing hypothesis are that the low-volatility effect disappears for stocks with high media attention, and that there is a media attention effect among stocks with high volatility.

We find that while there is a strong stand-alone volatility effect, there is little evidence for a stand-alone media-attention effect. Our examination of the interaction between the two reveals

[3] While our paper focuses on volatility as a risk measure for the low-risk effect, note that Bednarek and Patel (2018) show that volatility-based and beta-based anomalies are positively related. Shi, Liu, and Ho (2016) investigate the effect of news sentiment on the relationship between idiosyncratic volatility and returns.

that among the group of high media attention stocks, there is still a significant volatility effect. However, among the group of high volatility stocks, we find no evidence of a media-attention effect. Based on these findings, we reject the hypothesis that media attention is the driving force behind the volatility effect.

Our empirical research is related to Fang and Peress (2009), who find that higher media attention is associated with lower returns only within the group of high-risk stocks. Their sample of US stocks runs from 1993 to 2002 and is based on articles published in four major US newspapers. Our results also link to Hillert and Ungeheuer (2018), who examine stock returns based on media mentions in the New York Times between 1924 and 2013. They report that within the group of riskiest stocks, higher media coverage is associated with higher returns, while for other groups of similar risk the differences are small. While Fang and Peress (2009) and Hillert and Ungeheuer (2018) both report a media attention effect among high risk stocks, their signs are opposite. Compared to the literature, our sample is more recent, covers international stocks markets, and the media data is much more comprehensive.

2. Data description and methodology

We identify attention-grabbing stocks by counting how many times each stock has appeared in the news media over the past year.[4] We have access to English-language content from premium newswires, many providers of regular news and press releases, and more than 19,000 web publications, through the RavenPack database over the period of January 2000 to December 2018. This data include sources such as Dow Jones Newswire, Wallstreet Journal, and StockTwits. We consider a company to play a substantial role in an article when it is mentioned

[4] Hsu and Chen (2017) use the five highest daily returns in a month as a proxy for attention. Although our measure of attention also positively correlates with volatility, it is not derived from the return distribution of the stock.

in either the title or the first or second paragraph of the article, and is determined as significantly relevant by RavenPack.[5] Figure 1 contains an example of the media attention that Volkswagen received over the period January 2015 to December 2018. It is clearly visible that the announcement of the emissions scandal in September 2015 led to a spike in media mentions, which subsequently reduced gradually over time. At the same time, the stock return volatility is also shooting up, and slowly reversing as well.

Figure 1: Media attention and return volatility of Volkswagen

Monthly media attention for Volkswagen is measured by the total number of articles in the RavenPack database where Volkswagen is mentioned in the title, first, or second paragraph and RavenPack assigned a relevance score above 75. Figure shows the total number of news articles (left axis) and the volatility (right axis) of the past year.

It is important to stress that the attention-grabbing hypothesis does not involve the news sentiment or tone, i.e. whether the news is positive or negative, but the volume of media attention only. Including the sentiment of news articles does not capture attention, but instead makes the signal more similar to that of price momentum; see Jiang, Li, and Wang (2017), Wang, Zhang, and Zhu (2018).

[5] RavenPack assigns relevance scores to indicate how strongly related the mention of a company is to the news story. Relevance scores above 75 out of 100 are considered significantly relevant.

If we would simply take the total number of news articles per company as a sorting variable, we would have a measure that is tilted to larger companies, as larger companies are more often in the news. Therefore, we use a size-adjusted news measure for our main analyses. This size adjustment follows from cross-sectional regressions:

$$News_{i,t} = \beta_0 + \beta_1 \cdot Z_{i,t}^{LOGMCAP} + \varepsilon_{i,t}$$

where $News_{i,t}$ is the total number of news articles for stock *i* during the 12 months prior to time *t*, $Z_{i,t}^{LOGMCAP}$ the normalized logarithm of the market capitalization of stock *i* at time *t*, where normalization is performed using robust z-scores.[6] The residual $\varepsilon_{i,t}$ from this regression is taken as the adjusted news measure used for sorting stocks into portfolios. The news adjustment with cross-sectional regressions with size as main factor is similar to Hillert, Jacobs, and Müller (2014).

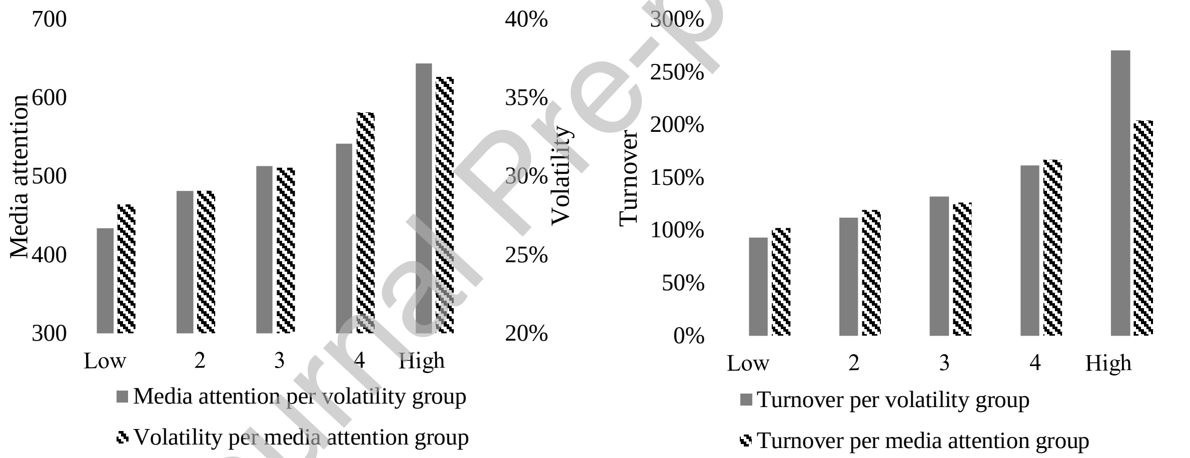
Our stock database consists of global developed stocks that are in the Morgan Stanley Capital International (MSCI) World Index or among the 3,000 largest stocks in the union of the MSCI World Index and the Standard and Poor's (S&P) Broad Market Index. For robustness, we also test our hypotheses separately on a sample of emerging markets and U.S.-only stocks. Our emerging markets sample consists of companies that are in the MSCI Emerging Markets Index or among the 1,000 largest stocks in the union of the MSCI Emerging Markets Index and the S&P IFC Emerging Markets Index. For our U.S.-only sample, we select the largest 1,500 stocks measured by market capitalization each month. We calculate return volatilities over the past year,

[6] Compared to regular z-scores, we replace the (cross-sectional) average with the median and the (cross-sectional) standard deviation with a constant (1.483) times the median absolute deviation. The normalized values are capped at -3 and 3 to further reduce the impact of outliers. See Rousseeuw and Croux (1993) for more on robust z-scores.

using 260 daily stock returns in local currency. Portfolio returns are total returns, i.e. price plus dividend returns, in excess of the U.S. risk-free rate, and in U.S. dollars.

Figure 2 describes the relation between media attention, trading volume, and volatility. After dividing the stocks into five groups based on past volatility, we calculate the average size-adjusted media attention over time. The left panel shows that there is an increasing pattern between volatility and media attention. Media attention increases for stocks in higher volatility groups, and volatility increases for stocks in higher media attention groups. The right panel shows that trading volume is positively correlated to both volatility and media attention.[7]

Figure 2: Relation between media attention, trading volume, and volatility



Media attention is defined as the count of news articles about a company over the past year. Risk is measured by volatility over the past year. Trading volume over the past year is measured as the number of shares traded as a percentage of the number of shares outstanding. The solid bars on the left-hand size panel denote the amount of (size-adjusted, i.e. the intercept plus the error term of the regression) media attention for the five groups sorted on volatility. The shaded bars on the left-hand size panel (right-hand side axis) denote volatility for the five groups sorted on size-adjusted media attention. Both solid and shaded bars on the right-hand side panel denote the amount of size-adjusted trading volume for portfolios sorted on volatility and media attention.

This figure indicates that 'glittery' stocks tend to be the stocks with relatively high volatility, while the 'boring' stocks that the media does not write about tend to have relatively low volatility. This is consistent with predictions from Blitz et al. (2014) and Beveratos et al. (2017).

[7] Goddard, Kita, and Wang (2015) find that attention, as measured by Google search volumes, is correlated with trading activity and volatility in foreign exchange markets.

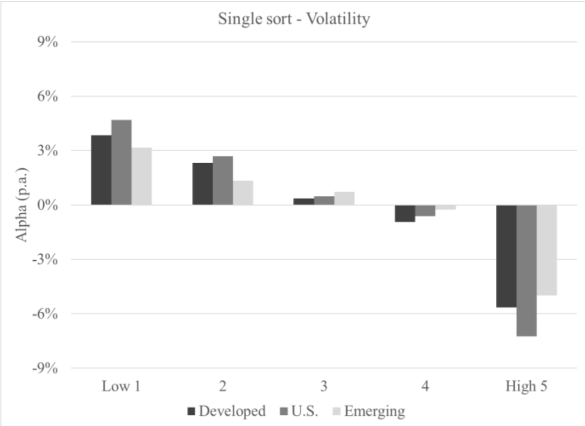
Hillert et al. (2014) also find a positive relation between the amount of media attention and the riskiness of a stock for a sample of U.S. stocks. In addition, Sprenger, Tumasjan, Sandner, and Welpe (2014) find that the volume of stock tweets is positively related to volatility and trading volume. On the other hand, Turner, Ye, and Walker (2018) find no relation between news and volatility for a sample of U.K. stocks over the period 1825 to 1870.

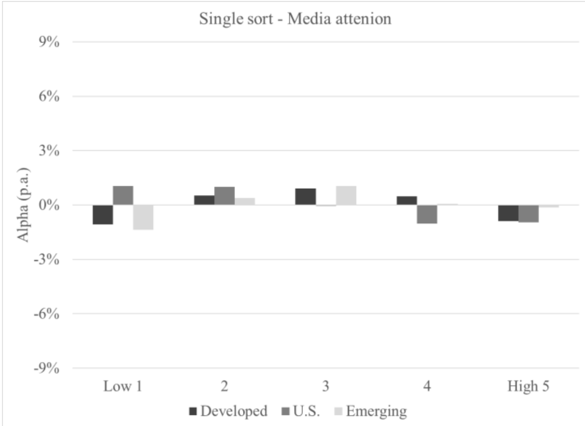
The positive correlation between media attention and volatility could imply that media attention explains the low-volatility effect. Our objective is to find the driving force behind the volatility effect, and we apply the commonly used double-sorting approach in order to disentangle the two effects. Each month, we independently sort stocks on both characteristics in five groups and then form 25 portfolios on each combination of media attention and volatility. We calculate next month's return for each group, in which we equally weight each stock within the group.

3. Empirical results

Figure 3 shows the risk-adjusted returns of portfolios single sorted on volatility and media attention for our three samples. The left side shows that the alpha is monotonically decreasing from low volatility to high volatility portfolios. The alpha of the low-volatility minus the high-volatility portfolio is economically and statistically significant in all cases, with t-statistics of 3.40, 3.45, and 2.97, respectively. This is the volatility effect. The right side of Figure 3 does not support the existence of a media attention effect, as the portfolio returns are close to zero and statistically insignificant. Hence, we find not enough evidence for a stand-alone media attention effect.

Figure 3: Risk-adjusted returns of single sorts on media attention and volatility



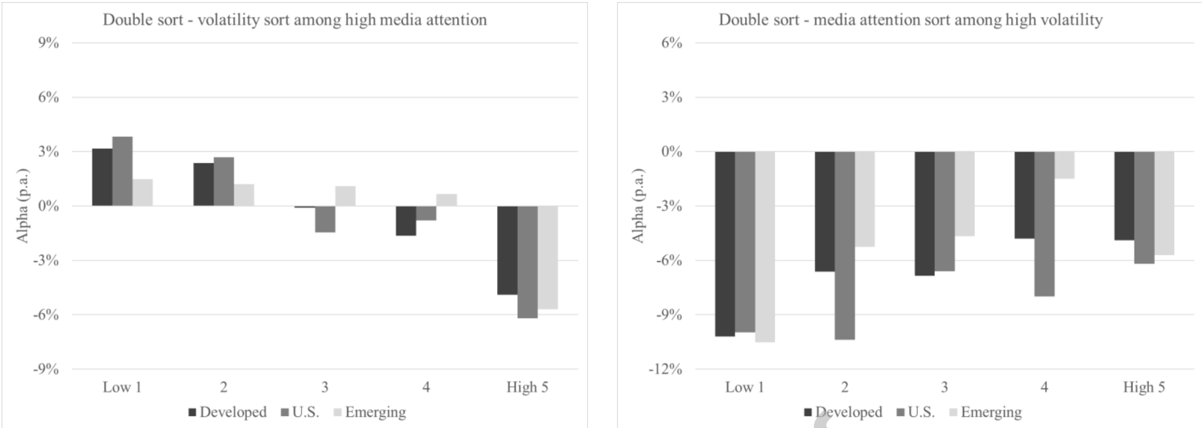


This figure display risk-adjusted returns (% per annum), or alphas relative to the CAPM. The left-side contains five volatility-sorted portfolios and the right side five media attention-sorted portfolios for our samples of global developed, U.S.-only, and emerging equity markets. Returns are in U.S. dollars and calculated over the period January 2001 to December 2018.

Even though there is no anomalous return differential on single sorts on media attention, it may be the case that there are important interaction effects between low-volatility and media attention, especially since both are positively correlated. Non-linear interaction between volatility and attention have been documented before, e.g. Dzielińskia, Rieger, and Talpsepp (2018), although they use the number of analyst estimates as their attention measure.

For media attention to be able to explain the low-volatility effect, we should see that the low-volatility effect disappears for stocks with high media attention. The left side of Figure 4 contains the risk-adjusted returns among stocks of portfolio sorted on volatility among the group of stocks with high media attention. The alphas again decline monotonically among the volatility-sorted portfolios. For our global developed sample, the alpha of the long-short portfolio is a statistically significant 8.1% per annum (t-statistic of 2.29). For our samples of U.S. and emerging markets, we find a statistically significant long-short alpha of 10.0% per annum (t-statistic 2.31) and 7.2% per annum (t-statistic 2.06), respectively. Hence, the low-volatility effect is present for high media attention stocks, which is inconsistent with the attention-grabbing hypothesis.

Figure 4: Risk-adjusted returns of double sorts on media attention and volatility



This figure display risk-adjusted returns (% per annum), or alphas relative to the CAPM. Each panel consists of five portfolios, a subset of 5x5 independently sorted portfolios on volatility and media attention. The left-side contains five volatility-sorted portfolios among high media attention stocks and the right side five media attention-sorted portfolios among high volatility stocks for our samples of global developed, U.S.-only, and emerging equity markets. Returns are in U.S. dollars and calculated over the period January 2001 to December 2018.

The attention-grabbing hypothesis implies that for stocks with similar risk, the stocks with the highest attention should have inflated prices, which leads to lower future returns. In order to investigate the third hypothesis, we look at the right side of Figure 4. Based on the attention-grabbing hypothesis, we would expect higher alphas for the low-media-attention portfolios compared to the high-media attention groups for stocks with high volatility. However, we see no clear differences between returns on these portfolios. Note that differences in alphas even have the wrong sign, so it is not the lack of statistical power due to a relatively short sample period that is to blame for insignificance here. Fang and Peress (2009) and Hillert and Ungeheuer (2018) report a media attention effect among high risk stocks, but they find opposite signs. We find that risk-adjusted returns are higher for the high media attention portfolio within the high volatility group, consistent with Hillert and Ungeheuer (2018), but find no statistical significance, possibly caused by our relatively short sample period.

4. Robustness analyses

We next perform a battery of robustness analyses. For these tests we do not report detailed results on each of the portfolios, but focus on the low-volatility effect for stocks with high media attention, and on the effect of media attention for the high-volatility stocks. For the volatility (media attention) effect, we present the CAPM-alphas and corresponding t-statistics of a long-short portfolio with long position in the low-volatility (low-media attention) portfolio and short position in the high-volatility (high-media attention) portfolio, among the high-media attention (high-volatility) group.

Table 1: Robustness analyses

		Developed markets		United States		Emerging markets	
		Volatility	Attention	Volatility	Attention	Volatility	Attention
Base case	Alpha	8.1%	-5.3%	10.0%	-3.8%	7.2%	-4.8%
	t-stat	2.29	-1.34	2.31	-0.78	2.06	-0.98
Not size adjusted	Alpha	9.3%	-0.9%	10.7%	0.9%	8.7%	-1.4%
	t-stat	2.51	-0.23	2.30	0.24	2.33	-0.31
Size & value adjusted	Alpha	8.2%	-3.7%	9.7%	-4.4%	7.8%	-4.2%
	t-stat	2.40	-0.97	2.31	-0.97	2.22	-0.90
Lookback 6 months	Alpha	8.4%	-5.2%	10.2%	-6.7%	8.0%	-0.9%
	t-stat	2.41	-1.32	2.45	-1.46	2.23	-0.19
Volatility 156 weeks	Alpha	8.2%	-4.6%	8.8%	-2.4%	8.2%	-0.5%
	t-stat	2.24	-1.20	1.98	-0.06	2.27	-0.10
Holding period 6 months	Alpha	7.1%	-5.0%	9.3%	-5.0%	7.2%	-3.9%
	t-stat	2.10	-1.36	2.27	-1.15	2.15	-0.92
Industry neutral	Alpha	7.0%	-7.3%	8.5%	-2.4%	5.6%	-8.9%
	t-stat	2.64	-2.12	2.74	-0.59	1.63	-1.90
Country neutral	Alpha	8.9%	-3.9%	-	-	11.9%	-1.6%
	t-stat	2.52	-1.11	-	-	3.72	-0.40
Value-weighted	Alpha	5.4%	-3.9%	8.4%	-0.8%	5.4%	-8.9%
	t-stat	1.46	-1.02	1.85	-0.17	1.25	-1.83

This table is based on a 5x5 independent double sort on past year volatility and media attention. The column labelled "Volatility" refers to the difference in risk-adjusted returns (% per annum, CAPM-alphas) of the low-volatility minus the high-volatility portfolios among the group of high-media attention stocks, displayed on the left side of Figure 4 for the base case. The column labelled "Attention" refers to the difference in risk-adjusted returns of the low-media attention minus the high-media attention portfolio among the group of high-volatility stocks, displayed on the right side of Figure 4 for the base case. Sample period: January 2001 to December 2018.

We provide robustness analyses on a variety of dimensions of our initial choices: First, we use raw media attention, where no adjustments are made based on company size (market capitalization), and we use both size and growth (book-to-market ratio) adjusted media attention. We also investigate a shorter (6 month) lookback period for measuring media attention, calculate volatility using a 156-week estimation window, and use a 6-month holding period, using overlapping portfolios as in Jegadeesh and Titman (1993). We also show the effect of industry-neutral and country-neutral portfolios, where the attention and volatility characteristics of each stock are first corrected for its industry and country median, respectively. Finally, instead of equally-weighting the stocks in the 25 portfolios, we also weight them by market capitalization. Even though our sample already excludes microcaps, this further reduces the impact of smaller stocks.

Table 1 shows that the volatility effect is present in each of the high media attention groups, and statistically significant for each of the robustness analyses, except when we value-weight portfolios.[8] At the same time, we find that the alphas for media attention in the high volatility group are negative, which is the wrong sign according to the attention-grabbing hypothesis, and mostly not statistically distinguishable from zero. These findings are consistently present in our samples of global developed, U.S.-only, and emerging market samples. These additional results confirm that our main findings are robust to different empirical specifications.

5. Conclusion

There appears to be no stand-alone media attention effect in global equity markets. In addition, for stocks with high media attention, alphas of low-volatility portfolios are significantly higher than for high-volatility portfolios. For stocks with high volatility, the alphas of low- and high-media attention portfolios are statistically indistinguishable. Based on these findings, we reject

[8] The coefficient is still positive and economically meaningful, but no longer statistically significant. Hou, Xue, and Zhang (2019) document that anomalies tend to be weaker when using value-weighted instead of equally-weighted returns.

that the attention-grabbing hypothesis explains the volatility effect. Of course, this conclusion relies on the assumption that the number of media articles covering a stock in our database is a good proxy for investor 'attention grabbing'.

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Declaration of interest

All authors are employed by Robeco Institutional Asset Management, an investment firm with its headquarters in Rotterdam, the Netherlands. The insights from this research may, but do not need to be, reflected in the investment products or services that the firm offers.

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