

## Portfolio Strategy July 2016

July 14, 2016

### *Quant Hedge Funds: Menacing Machines?*

*You, Robot?*

- Robots have long had a penchant for taking over the world, sometimes with dramatic consequences. Many investors have been wondering if the machines are at it again, only this time armed with Big Data on their holdings instead of Big Budget special effects. In the space of six months they've witnessed a stomach-churning collapse in high growth stocks, a vertigo-inducing bounce in deep-value cyclicals, and now a historically-large momentum run in stable, high-yielding, bond proxies. Are the quants to blame for these cataclysmic gyrations? Is Skynet alive and well and living in a nondescript data center somewhere in suburban New Jersey?
- We did some empirical work to assess the impact of quant hedge funds on U.S. equities. In aggregate quant hedge funds account for just under a quarter of the U.S. equity holdings of all hedge funds. That share is on par with the previous high watermark set during the so-called Quant Crisis in the summer of 2007. Furthermore, the quants' assets are concentrated in a handful of funds; the 10 largest quant hedge funds control 80% of that pie whereas the top-10 non-quant hedge funds control only 20% of theirs.
- Quant hedge funds have a disproportionate impact on day-to-day trading activity because their turnover, based on 13F filings, is more than twice that of their fundamental peers. But that's only a lower bound because 13Fs don't capture what happens intra-quarter. Using commission wallet data and average execution costs we estimate that quant hedge fund turnover is more like 50-to-60% of the total dollar turnover of all hedge funds. That's a big number because it means that quant hedge funds account for something like 20-to-25% of the turnover in U.S. equities by hedge funds and traditional long-only managers combined.

*Stability: Algorithms at the Wheel?*

- One of the questions stock-pickers are asking is whether quants are behind the powerful momentum in the stability trade. Over the long-run quant hedge funds, and non-quant hedge funds for that matter, have actually had an *anti*-stability exposure in aggregate. However, over the last year the quants pared their negative stability tilt back towards zero while the non-quants have left theirs on the table. The last time quant hedge funds reduced their anti-stability exposure by that much was from April 2011 through September 2012.
- We studied the magnitude of quant hedge fund buying in stable stocks in that episode and concluded that it
- just wasn't big enough to matter; in aggregate quant hedge funds bought about \$3 billion-worth of stable stocks. By way of comparison, over that same period high yield ETFs, which disproportionately hold stable stocks, saw net new money flows that were five times greater than the quant buying. It's been the same story over the past year too. The robots may look scary, but in this case they're more Wall-E than Terminator.

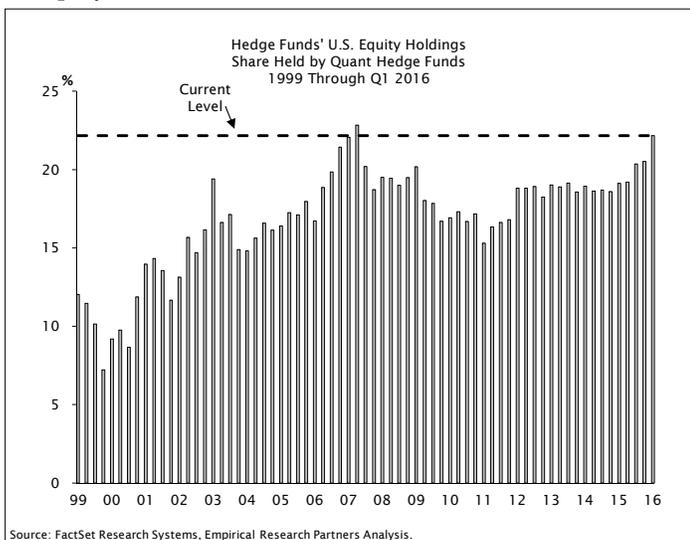
*Quant Hedge Funds and ETFs: Robots with Death Rays?*

- A related question is whether quant hedge funds are big users of ETFs, which might magnify their influence.
- It's true that quant hedge funds have dramatically increased their ETF use since the Crisis and currently about 5% of their U.S. equity holdings are in ETFs. However, that's not much different from ETFs' share of overall U.S. market capitalization, so the quants aren't disproportionately large users. Most of the increase in quant ETF use has been driven by the rise in risk parity-type strategies that deploy ETFs for their equity exposure.
- Appendix 1 on page 13 lists stocks that are quant hedge fund favorites but out-of-favor with the non-quant crowd. Appendix 2 does the opposite, looking for issues favored by stock-pickers but loathed by the machines. The big difference is the non-quants are seeking growth whereas the quants are leaning value.

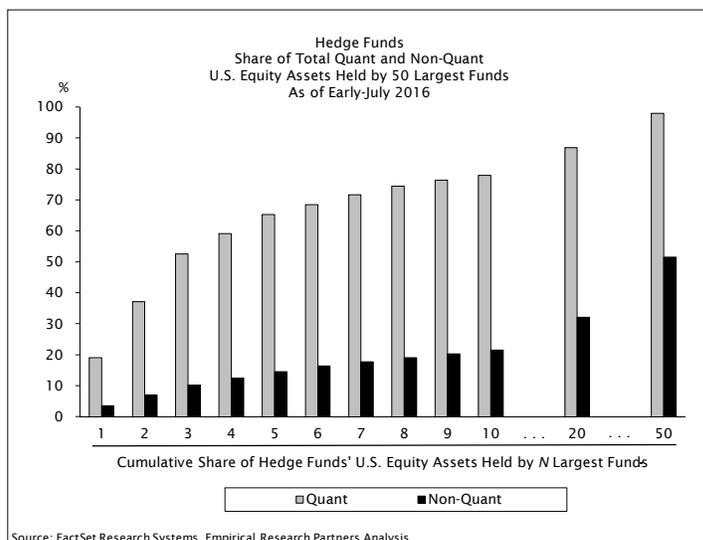
Sungsoo Yang (212) 803-7925 Nicole Price (212) 803-7935 Yi Liu (212) 803-7942 Iwona Scanzillo (212) 803-7915

## Conclusions in Brief

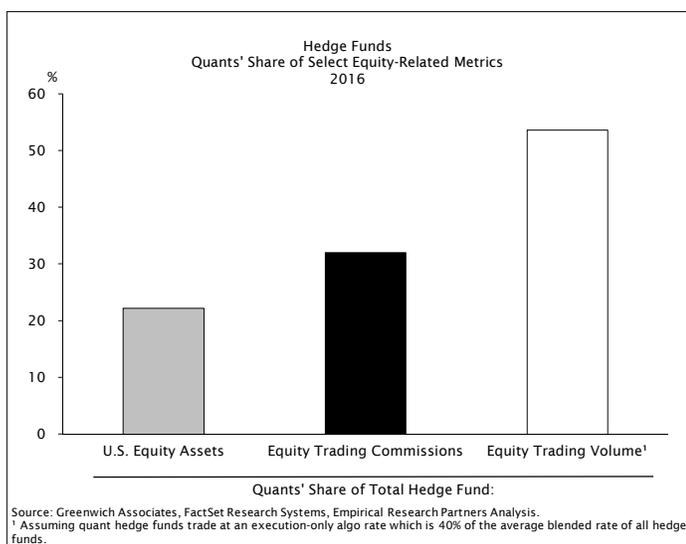
- Quants account for nearly a quarter of hedge funds' U.S. equity assets...



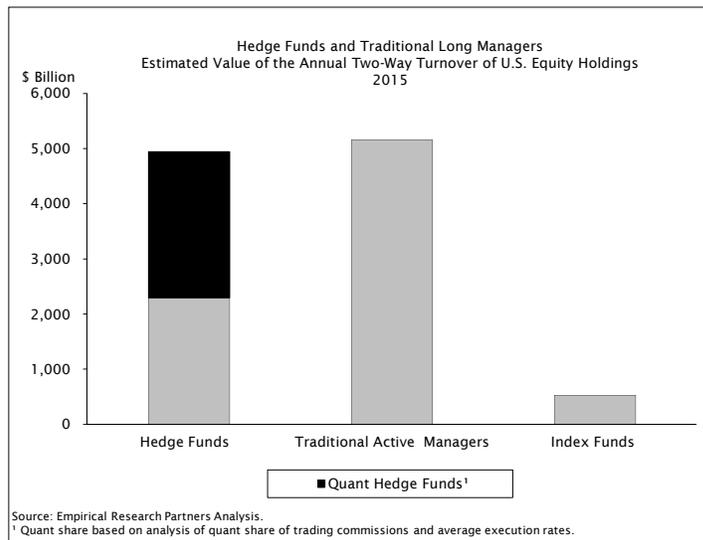
- ...And most of those assets are concentrated in the 10 largest funds:



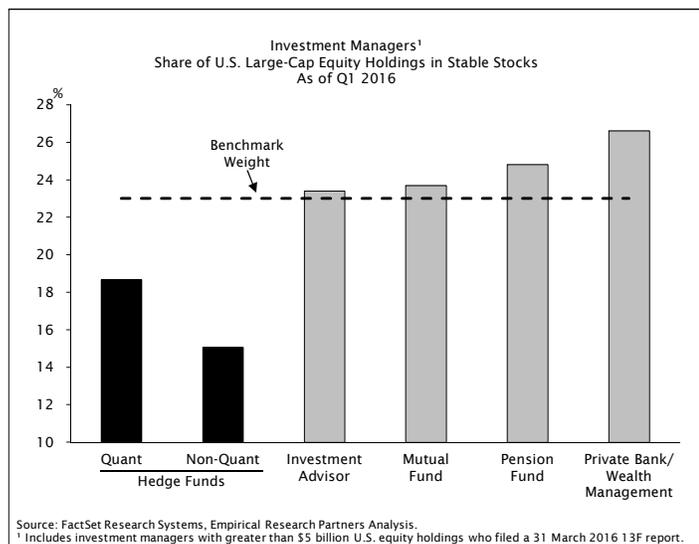
- Quants represent more than half of all hedge fund turnover...



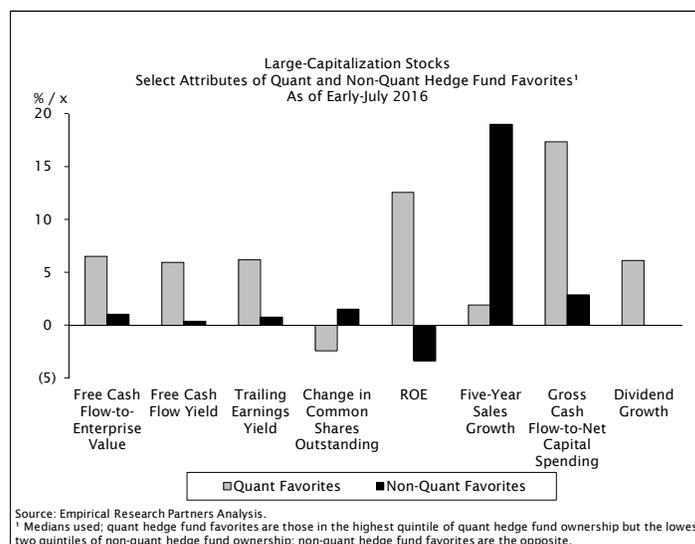
- ...Making them significant players overall:



- Hedge funds, both quant and fundamental, are underweight stability:



- Quant hedge funds are leaning value while non-quants are seeking growth:



## Quant Hedge Funds: Menacing Machines?

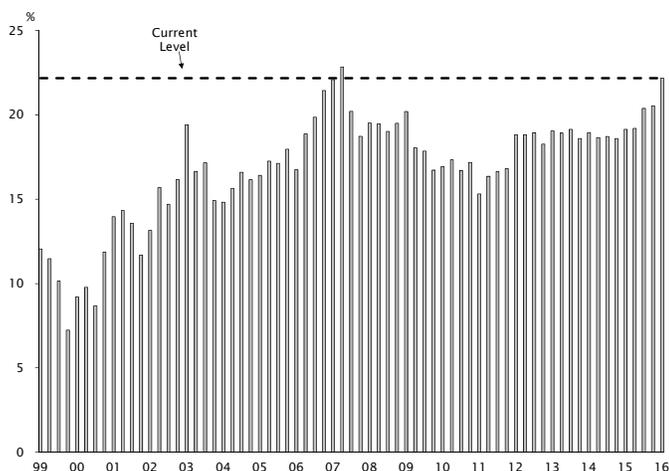
### You, Robot?

Ever since Karel Čapek’s play “Rossum’s Universal Robots” hit the stage back in 1921, robots taking over the world has been an enduring plotline. Nothing excites humans, and studio executives, more than watching a better version of themselves run amok, laser cannons blazing and LED-eyes glaring, only to eventually succumb to some very human-like weakness. Of course these days not all robots walk around with a prissy British accent and a gold-plated humanoid body. Most of the power of the machines is hidden from sight in nebulous algorithms that live among us all; they’re the ones driving your Tesla, picking your next song on Spotify, deciding which stories you see on your Facebook feed, and perhaps even choosing your stock investments.

The latter point has generated a lot of discussion in our conversations with clients recently. There’s a sense among some fundamental investors that stocks this year have been jumping around way beyond what is justified by their fundamentals. In the space of six months they’ve witnessed a stomach-churning collapse in high growth stocks, a vertigo-inducing bounce in deep-value cyclicals, and now a historically-large momentum run in stable, high-yielding, bond proxies. Could the machines be to blame? Are quant hedge funds the new Skynet?

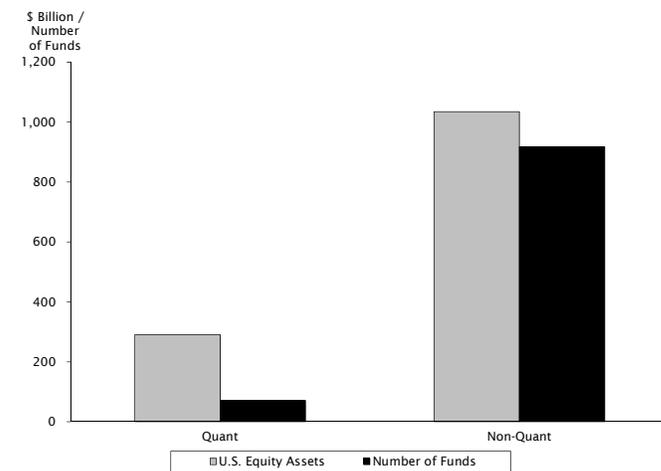
To answer that question we did some empirical work to gauge the impact of quant hedge funds on the U.S. equity market. As a starting point, rolling up 13F filings shows that quant hedge funds account for about 22% of the U.S. equity holdings of all hedge funds (see Exhibit 1). The current reading is just shy of the all-time high that coincided with the so-called Quant Crisis in the summer of 2007.<sup>1</sup> In dollar terms, quant hedge funds held about \$300 billion in U.S. equities at the end the March quarter, the latest for which 13F filing are available, compared to the \$1 trillion owned by non-quant hedge funds (see Exhibit 2).

**Exhibit 1: Hedge Funds’ U.S. Equity Holdings  
Share Held by Quant Hedge Funds  
1999 Through Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

**Exhibit 2: Hedge Funds  
U.S. Equity Assets and Number of Funds  
As of Early-July 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

It’s noticeable that the quant hedge fund assets are concentrated in far fewer firms: about 70 in total compared to the nearly 1,000 non-quant hedge funds. In fact, the largest 10 quant hedge funds command almost 80% of the U.S. equity assets of their peer-group, whereas the top-10 non-quant hedge funds only own a fifth of their pie (see Exhibit 3). The disproportionate size of the very largest quant hedge funds means that five of them now rank among the top-10 hedge funds, quant or non-quant, by total U.S. equity assets.

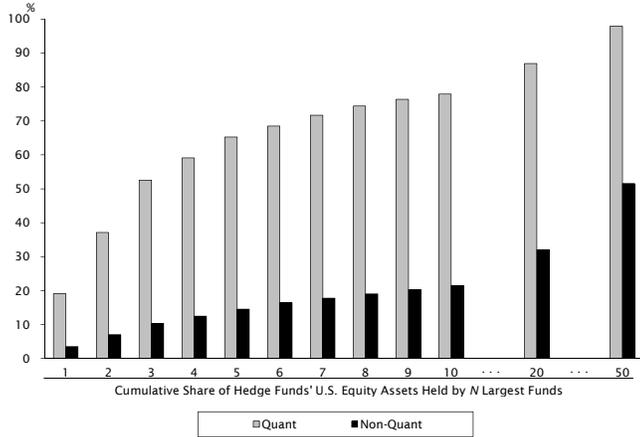
Even though quants control less than a quarter of hedge funds’ U.S. equity positions, they have an outsized impact on day-to-day trading because of their higher turnover. Of course, it’s impossible to measure the aggregate turnover of quant managers precisely given the proprietary nature of their strategies, but we can establish a lower bound for the long side of their books by tracking turnover in 13F positions between quarters (see Exhibit 4). Over time

<sup>1</sup> For a good description of that episode see: Khandani, A.E., and Andrew Lo, 2011. “What Happened to the Quants in August 2007? Evidence from Factors and Transactions Data.” *Journal of Financial Markets*, Vol. 14, pp. 1-46.

13F turnover for the aggregate quant hedge fund portfolio has been a little over twice that of their non-quant peers. That means the quants' share of hedge fund dollar turnover in the U.S. equity market is a lot higher than their 22% share of assets; historically it's been between a third to two-fifths of hedge fund dollar turnover (see Exhibit 5).

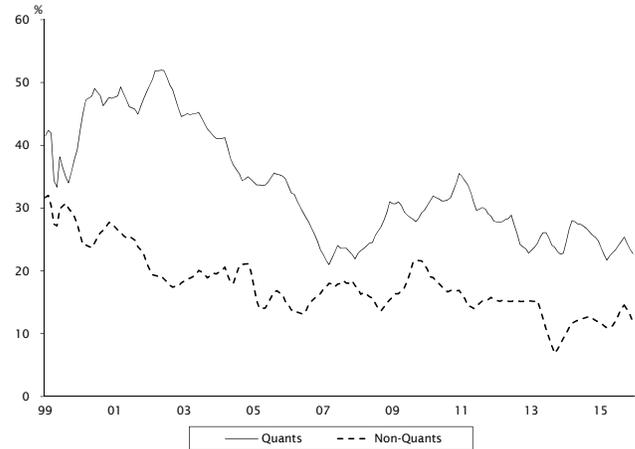
In reality the ratio is likely even higher than that, because 13Fs don't capture what happens intra-quarter and often a quant portfolio will be turned over multiple times between quarter-ends. We can make a guess at how much higher by leaning on consultant data. Quant hedge funds control around a third of the annual equity commission wallet in the U.S. even though they mostly trade at very low execution-only rates (see Exhibit 6). From that we can back out a back-of-the-envelope share of trading volume, which comes in at between 50-to-60%, see the white bar in the chart.

**Exhibit 3: Hedge Funds**  
Share of Total Quant and Non-Quant U.S. Equity Assets Held by 50 Largest Funds As of Early July 2016



Source: FactSet Research Systems, Empirical Research Partners Analysis.

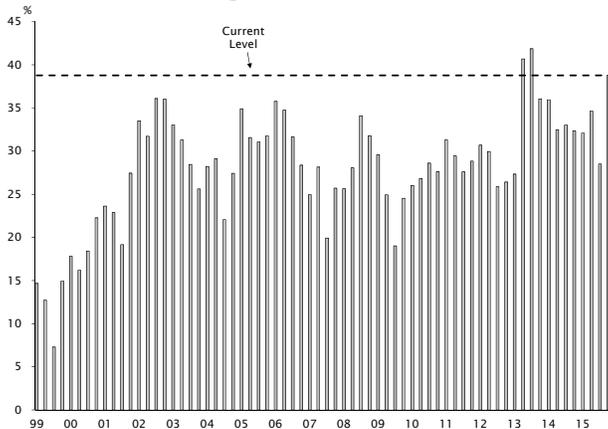
**Exhibit 4: Hedge Funds**  
Quarterly Turnover of U.S. Equity Holdings<sup>1</sup> 1999 Through June 2016



Source: FactSet Research Systems, Empirical Research Partners Analysis.

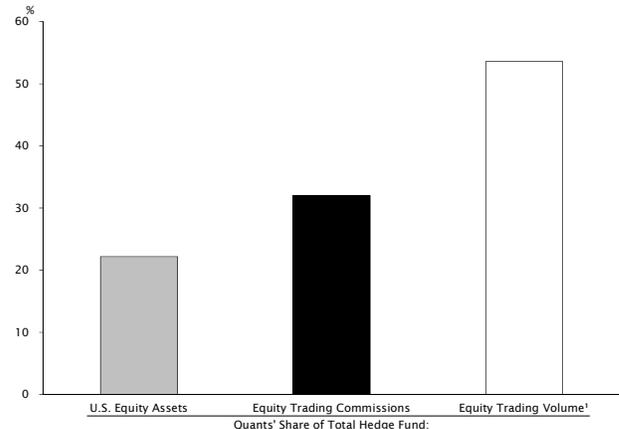
<sup>1</sup> Turnover measured as share of stocks that drop out of the top quintile of hedge fund ownership from one quarter to the next.

**Exhibit 5: Hedge Funds' U.S. Equity Holdings**  
Share of Dollar Turnover by Quant Hedge Funds 1999 Through Q1 2016



Source: FactSet Research Systems, Empirical Research Partners Analysis.

**Exhibit 6: Hedge Funds**  
Quants' Share of Select Equity-Related Metrics 2016



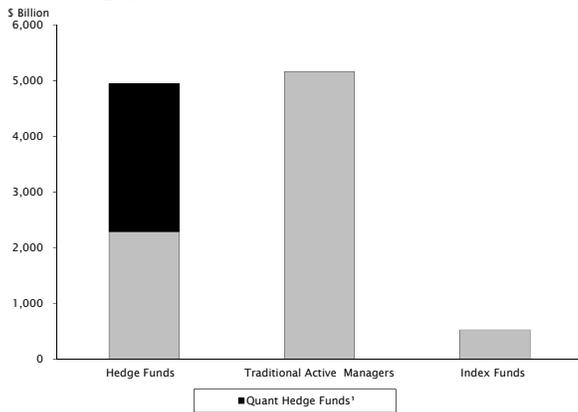
Source: Greenwich Associates, FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Assuming quant hedge funds trade at an execution-only algo rate which is 40% of the average blended rate of all hedge funds.

To put that in context, in our past research on the Future of the Money Management Industry we've shown that hedge funds account for roughly the same annual turnover as the traditional long-only community and now we've shown that quants command perhaps half the hedge fund turnover (see Exhibit 7).<sup>2</sup> So quant hedge funds aren't just a significant share of *hedge fund* trading, they're a significant share of *all* U.S. equities trading. That means understanding what they're up to matters. We'll tackle that question next.

<sup>2</sup> The Future of the Money Management Industry December 2015. "Hedge Funds: The Numbers Game."

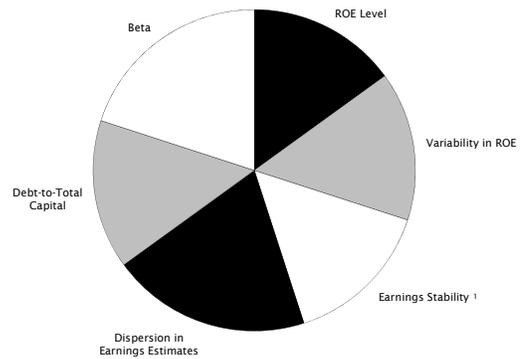
**Exhibit 7: Hedge Funds and Traditional Long Managers  
Estimated Value of the Annual  
Two-Way Turnover of U.S. Equity Holdings  
2015**



Source: Empirical Research Partners Analysis.

<sup>1</sup> Quant share based on analysis of quant share of trading commissions and average execution rates.

**Exhibit 8: Earnings Stability Score  
Factor Composition  
2016**



Source: Empirical Research Partners Analysis.

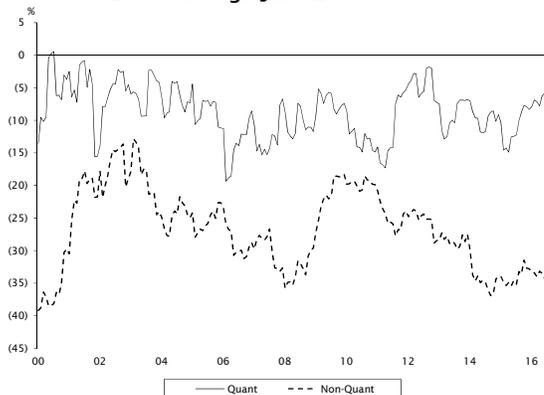
<sup>1</sup> Computed over the trailing 12 quarters.

**Stability: Algorithms at the Wheel?**

The question stock-pickers are frequently asking is whether quants are behind the momentum in the stability trade. Given the outsized trading influence of quant hedge funds that's a topic worth investigating. Earlier this year we built a multifactor screen to assess a stock's fundamental stability credentials, looking at things like consistency of earnings growth, dispersion of analysts' forecasts, debt burden, and beta (see Exhibit 8). We can use that stability score to track the exposure of quant hedge funds to stable stocks over time. It turns out the quants have on average had a consistent *anti*-stability bet over time, although they've steadily reduced their negative exposure over the past year (see Exhibit 9). But non-quants have held the line and kept an anti-stability bet on the table that's as large as any since the New Economy era, see the dashed line in the chart.

To put these stability exposures in context we cast the net wider and looked at the weight non-hedge fund investors are putting on stable stocks (see Exhibit 10). It turns out hedge funds, both robotic and human, are the odd ones out; in aggregate other major investors have market-like or overweight positions in the most stable stocks, particularly the most loss-averse players like pension funds and wealth managers. We also noticed that managers outside the U.S. tend to lean towards the stable stocks for their U.S. equity exposure, a finding that's very consistent with what we hear when we're out visiting clients in Europe and the U.K. (see Exhibit 11).<sup>3</sup>

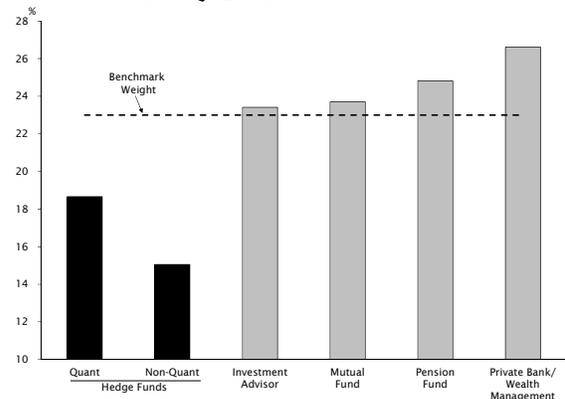
**Exhibit 9: Large-Capitalization Stocks  
Holdings Correlation Between Hedge Fund  
Active Weight and Stability Score<sup>1</sup>  
2000 Through June 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

**Exhibit 10: Investment Managers<sup>1</sup>  
Share of U.S. Large-Cap Equity Holdings in  
Stable Stocks  
As of Q1 2016**

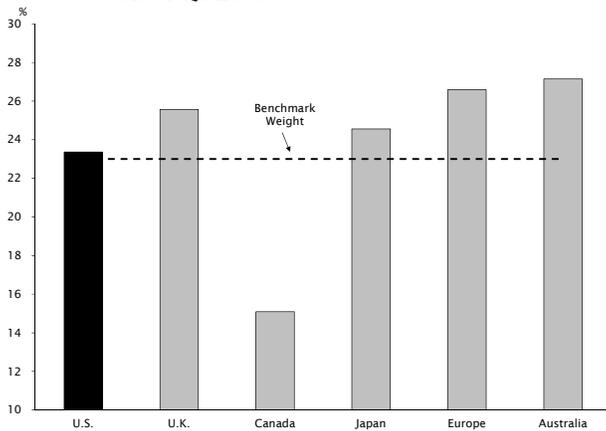


Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers with greater than \$5 billion U.S. equity holdings who filed a 31 March 2016 13F report.

<sup>3</sup> Canada is the odd one out, but that might be because they have plenty of stable stocks in their home market so they tend to look to the U.S. for their growth exposure in sectors like technology and health care where there are less opportunities at home.

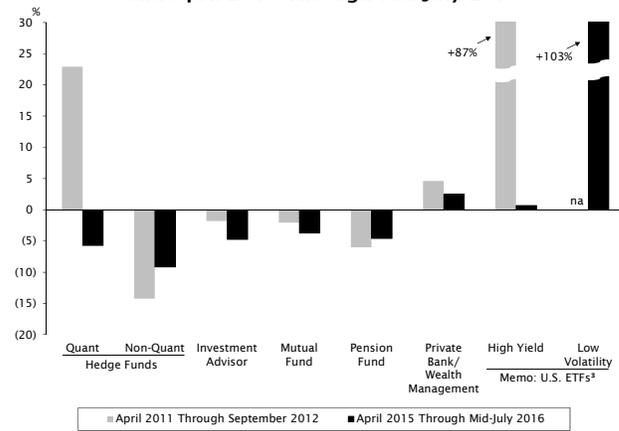
**Exhibit 11: Investment Managers<sup>1</sup>  
Share of U.S. Large-Cap Equity Holdings in  
Stable Stocks by Manager's Country  
As of Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers with greater than \$5 billion U.S. equity holdings who filed a 31 March 2016 13F report.

**Exhibit 12: Investment Managers<sup>1</sup>  
Change in Holdings of Stable Stocks<sup>2</sup>  
April 2011 Through September 2012  
and April 2015 Through Mid-July 2016**



Source: FactSet Research Systems, Strategic Insight Simfund, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers required to file a 13F report.

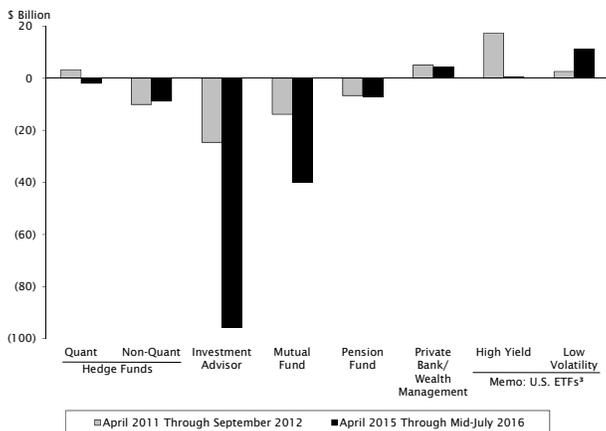
<sup>2</sup> Change in holdings is based on the percentage change in the number of shares of stable stocks held, to remove the price effect.

<sup>3</sup> Net new money flows as a percentage of start-of-period assets.

To assess the likelihood that quants are behind the outperformance of stable stocks we studied two periods in more detail: April 2011 through September 2012 and April 2015 through today. Those correspond to periods where the quant hedge funds in aggregate pared their anti-stability exposure back towards zero in Exhibit 9. The question is whether their buying pressure was enough to move the needle in these stocks. Exhibit 12 shows the change in the number of shares of stable stocks owned by various types of investment manager over each period. For example, the grey bar on the left shows that quant hedge funds increased their holdings in stable stocks by almost +25% from April 2011 to September 2012.

That looks like a hefty increase, but in dollar terms it was fairly negligible, amounting to only a little over \$3 billion in new positions (see Exhibit 13). The *reduction* in stability exposure by investment advisors and mutual funds was much bigger in dollar terms, even though in percentage terms these players didn't change their holdings by more than (2)%. High yield ETFs, which disproportionately hold stable stocks, saw net new money flows that were five times larger than the quant hedge buying in the stable stocks over the same window.

**Exhibit 13: Investment Managers<sup>1</sup>  
Change in Dollar Holdings of Stable Stocks<sup>2</sup>  
April 2011 Through September 2012  
and April 2015 Through Mid-July 2016**



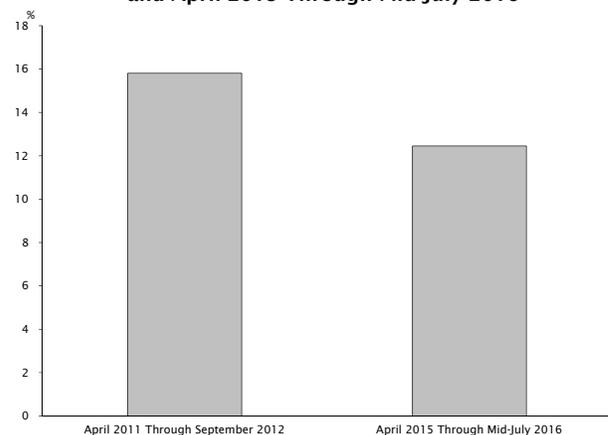
Source: FactSet Research Systems, Strategic Insight Simfund, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers required to file a 13F report.

<sup>2</sup> Change in dollar holdings is based on the change in the number of shares of stable stocks held assuming constant prices, to remove the price effect.

<sup>3</sup> Net new money flows.

**Exhibit 14: Large-Capitalization Stable Stocks  
Relative Returns  
Monthly Data Compounded  
April 2011 Through September 2012  
and April 2015 Through Mid-July 2016**

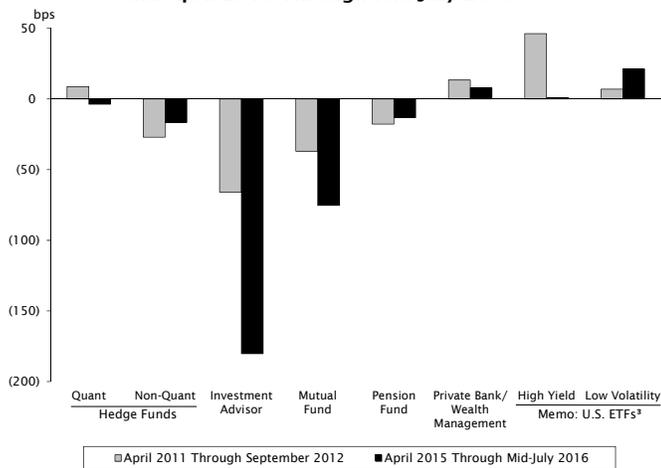


Source: Empirical Research Partners Analysis.

The black bars in both charts repeat the analysis for the period from April of last year to the present. It turns out over that timeframe quant hedge funds didn't add to their stable positions; they marginally cut them as shown in the first black bar from the left in Exhibit 13. The reason Exhibit 9 shows a reduction in anti-stability exposure by quant hedge funds is because the stable stocks have been outperforming, making them a larger share of the aggregate quant hedge fund portfolio, not because quants have been buying them per se (see Exhibit 14 overleaf).

Stepping back, Exhibit 15 shows the magnitude of buying and selling in the stable stocks by the various players as a percentage of the total capitalization of the stable stocks. In both periods the buying or selling by the different constituencies rarely represented more than  $\pm 50$  bps of total capitalization, and the quant hedge funds have been little more than bit players overall. Our conclusion from all of this is that the robots, despite their scary laser guns, aren't really the bad guys when it comes to the stable stocks. In fact, in aggregate the 13F filers captured in this analysis have been net *sellers* of stable stocks in both periods. Which begs the question: who was buying them? Since 13F filers account for about 65% of the capitalization of the stable stocks the other 35% were presumably on the other side of the trade: probably some combination of foreign non-13F filers, retail investors, and ETFs.

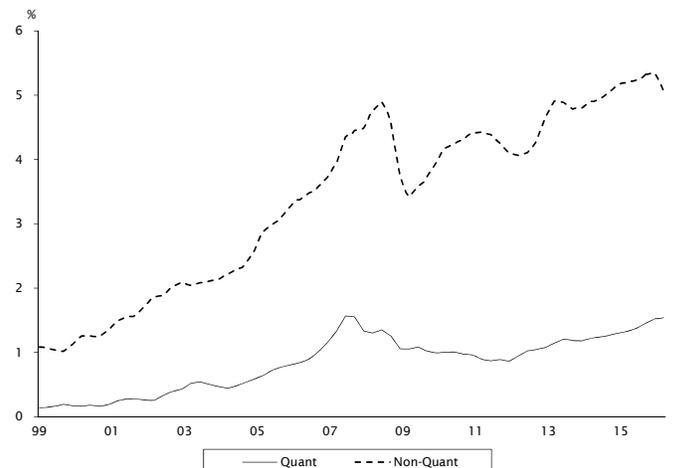
**Exhibit 15: Investment Managers<sup>1</sup>**  
**Change in Dollar Holdings of Stable Stocks as a Share of Capitalization<sup>2</sup>**  
**April 2011 Through September 2012**  
**and April 2015 Through Mid-July 2016**



Source: FactSet Research Systems, Strategic Insight Simfund, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers required to file a 13F report.  
<sup>2</sup> Change in dollar holdings is based on the change in the number of shares of stable stocks held assuming constant prices, to remove the price effect; denominator is start-of-period capitalization of all stable stocks.  
<sup>3</sup> Net new money flows scaled by start-of-period capitalization of all stable stocks.

**Exhibit 16: Large-Capitalization Stocks**  
**Average Ownership by Hedge Funds<sup>1</sup>**  
**1999 Through June 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Data smoothed on a trailing six-month basis.

### Stocks Versus Factors at High Noon

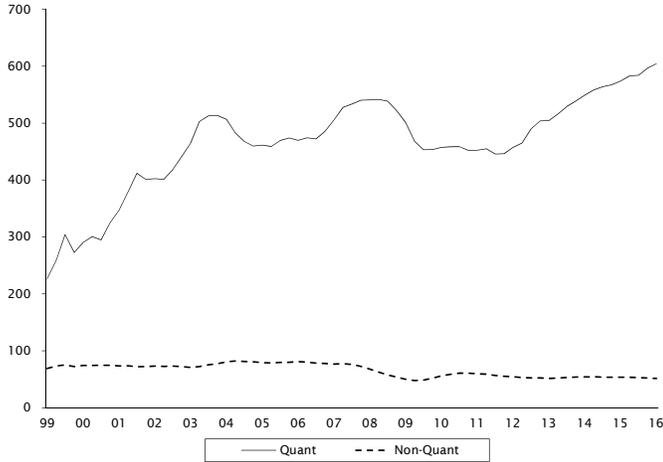
Expanding beyond the stable stocks, it's worth noting that quant hedge funds tend to have a lower impact *at the stock level* (see Exhibit 16). For the average U.S. large-cap stock, quant hedge funds hold about 1.5% of the share register, compared to 5% for non-quant hedge funds. Quant hedge funds usually make lots of little bets spread across a broad portfolio of stocks; the average quant hedge fund holds around 600 U.S.-listed stocks whereas the average non-quant hedge fund holds around 50 (see Exhibit 17). Over time the quants have moved towards even more diversified portfolios while the non-quants have become more concentrated.

That means that for risk management purposes, non-quants are worth watching at the single stock level given they'll have much larger positions in single names. But for the risk management of *factor* exposures, quants matter a lot, after all their modus operandi is to diversify away as much stock-specific risk as possible to take clean bets on factors. We took a look at how quant hedge funds were positioned in aggregate at the time of their latest 13F filings (see Exhibit 18).<sup>4</sup> The standout difference between the quants, in grey, and the non-quants, in black, is their diametrically opposite view on value. Stocks with high quant hedge fund ownership are disproportionately likely to be

<sup>4</sup> Relying on 13F filings comes with all the usual caveats: they're backwards looking, only capture the long side of the portfolio, and don't capture derivatives exposure or hedging. Still, we think in aggregate they paint a useful picture, see for example: *Portfolio Strategy* November 2015. "Great Rotations: Hedge Funds and the Growth Stocks."

value stocks, regardless of the valuation metric used. On the other hand, stocks with heavy non-quant hedge fund ownership tend to have low fundamental stability, in terms of earnings and ROE consistency for example, and high trailing growth rates.

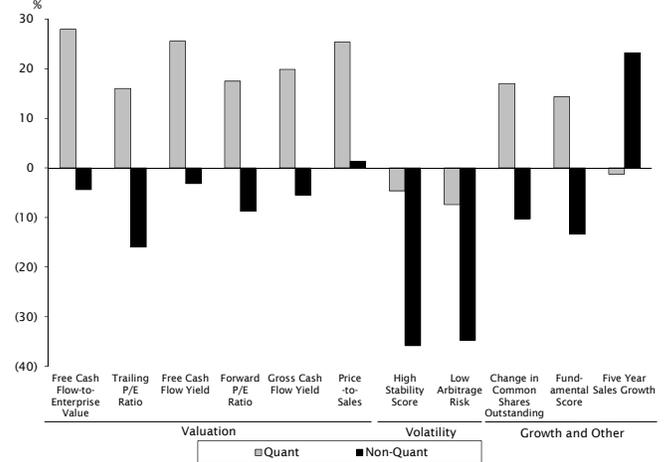
**Exhibit 17: Hedge Funds**  
Average Number of U.S. Stocks Held in Portfolio'  
1999 Through Q1 2016



Source: Empirical Research Partners Analysis.

<sup>1</sup> Equally-weighted data; data smoothed on a trailing four-quarter basis.

**Exhibit 18: Hedge Funds**  
Top Ten Factors by Difference in Exposure  
Between Quant and Non-Quant Ownership'  
As of Q1 2016

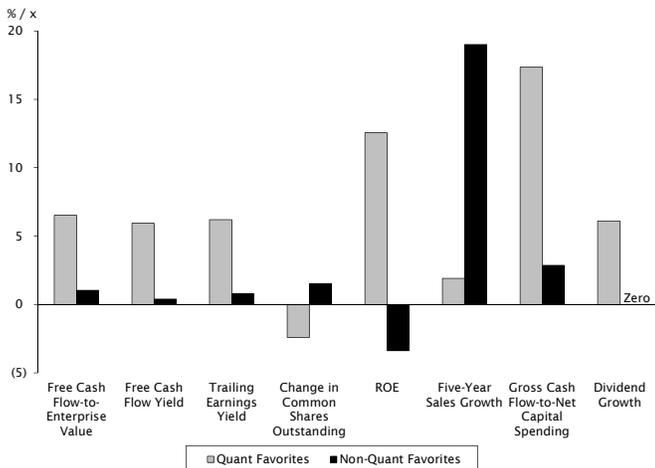


Source: Empirical Research Partners Analysis.

<sup>1</sup> Exposure measured as the cross-sectional correlation between quintiled ownership rank and quintiled factor score.

To dig deeper we built two portfolios, that we'll call the quant favorites and the non-quant favorites. The former is a list of issues with quant hedge fund ownership that's in the top quintile of all stocks, but non-quant hedge fund ownership in the lowest two quintiles. The non-quant favorites are the opposite; they're stocks beloved by fundamental hedge funds but out-of-favor with the quants. Appendixes 1 and 2 on page 13 show the constituents of each and Exhibit 19 shows the median attributes of stocks in both baskets. Again the growth-value divergence is stark: the median non-quant favorite has a trailing five-year sales growth rate of close to 20% compared to about 1% for a quant favorite. Conversely, the quant favorites tend to trade at nominal free cash flow and earnings yield in excess of 5%, have ROEs in the mid-teens, and have gross cash flows that dwarf the draw from capital spending.

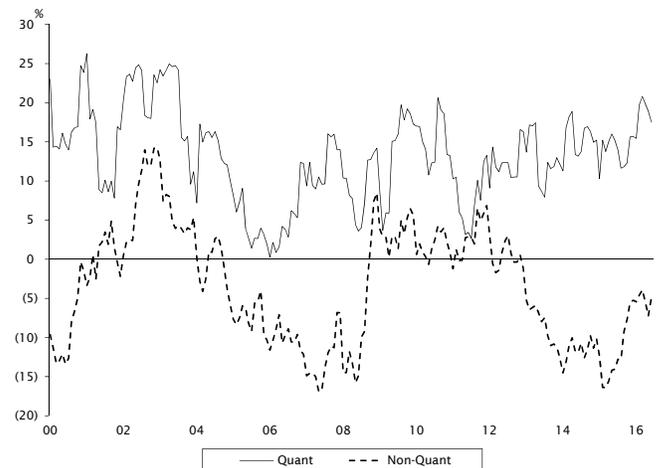
**Exhibit 19: Large-Capitalization Stocks**  
Select Attributes of Quant and Non-Quant  
Hedge Fund Favorites'  
As of Early-July 2016



Source: Empirical Research Partners Analysis.

<sup>1</sup> Medians used; quant hedge fund favorites are those in the highest quintile of quant hedge fund ownership but the lowest two quintiles of non-quant hedge fund ownership; non-quant hedge fund favorites are the opposite.

**Exhibit 20: Large-Capitalization Stocks**  
Holdings Correlation Between Hedge Fund  
Active Weight and Valuation Super Factor'  
2000 Through June 2016



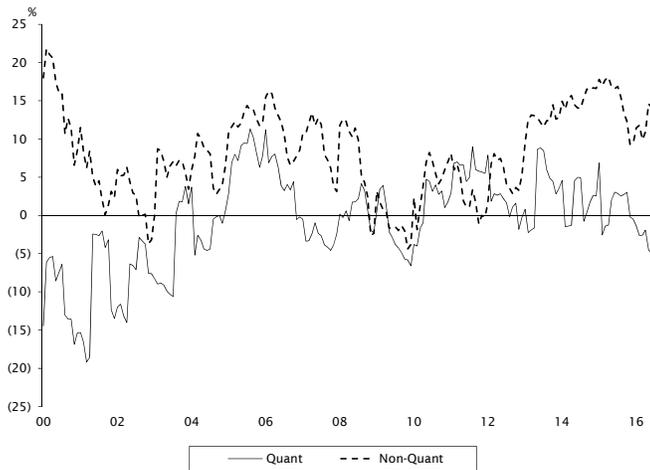
Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

The current value-tilt for quant hedge funds is nothing unusual, in aggregate they've always had a valuation bent (see Exhibit 20 overleaf). Non-quants tend to be a little less dogmatic; usually they move away from value stocks as a cycle progresses and growth picks up momentum. The picture for growth is mostly opposite: non-quant hedge funds have almost always had a positive tilt towards growth whereas quants have generally avoided a big directional bet there given growth on its own doesn't backtest very well (see Exhibit 21).

Where there's more agreement between quants and non-quants is in their positive exposure to higher arbitrage risk stocks and, currently, their massively negative exposure to momentum (see Exhibits 22 and 23). The latter in particular is noteworthy: if we combine quants and non-quants together and look at all hedge funds, their aggregate momentum exposure hit the lowest level in our data in the first quarter of this year as hedge fund favorites suffered a vicious sell-off (see Exhibit 24).

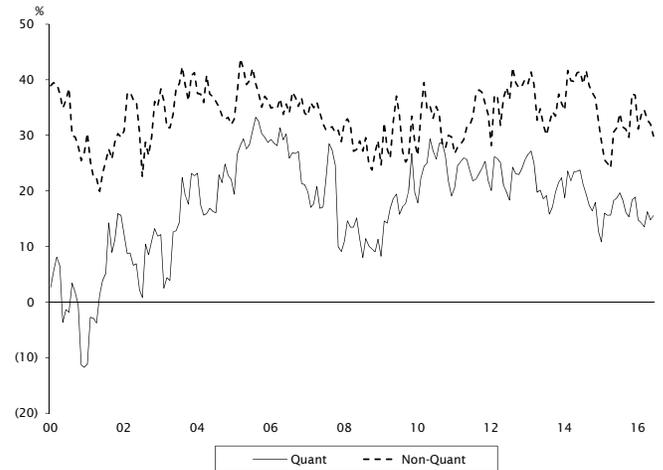
**Exhibit 21: Large-Capitalization Stocks Holdings Correlation Between Hedge Fund Active Weight and Growth Score<sup>1</sup> 2000 Through June 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

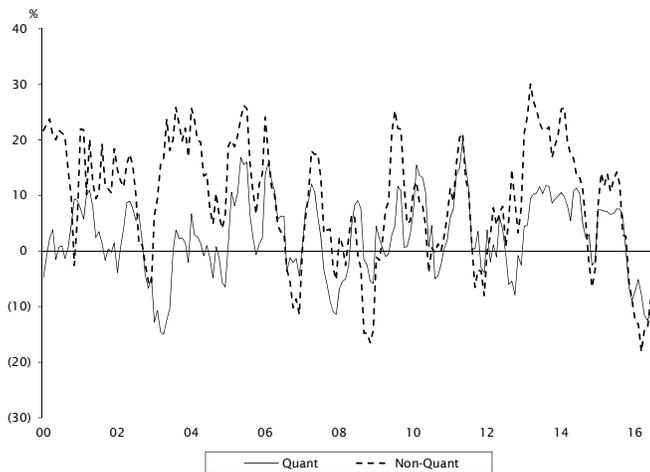
**Exhibit 22: Large-Capitalization Stocks Holdings Correlation Between Hedge Fund Active Weight and Arbitrage Risk<sup>1</sup> 2000 Through June 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

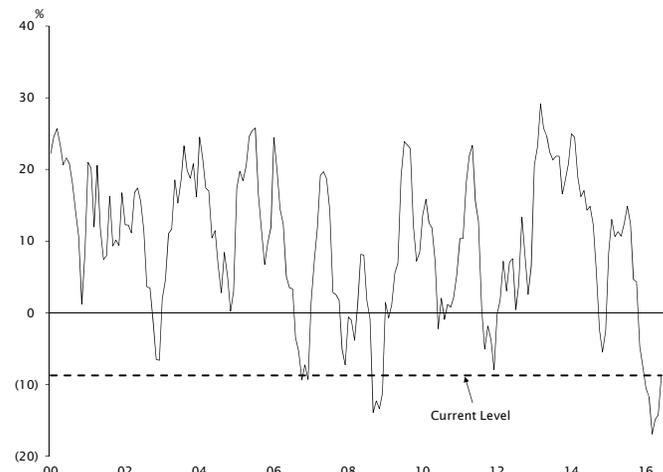
**Exhibit 23: Large-Capitalization Stocks Holdings Correlation Between Hedge Fund Active Weight and Nine-Month Price Momentum<sup>1</sup> 2000 Through June 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

**Exhibit 24: Large-Capitalization Stocks Holdings Correlation Between Hedge Fund Active Weight and Nine-Month Price Momentum<sup>1</sup> 2000 Through June 2016**



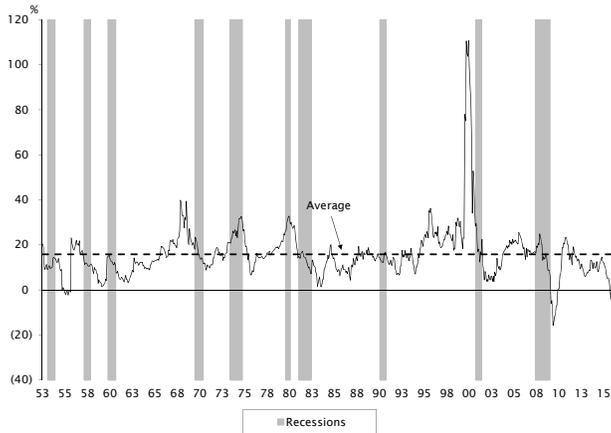
Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Correlation is computed as the cross-sectional rank correlation between factor scores each month.

**Different Philosophy, Same Challenge**

From here both camps, fundamental and systematic, have a big challenge. The stock-pickers, who have always backed their ability to pick the real growth stories from the charlatans, are struggling because the momentum leadership in the market has no growth to speak of. In fact, stocks in the top quintile of nine-month price momentum have *negative* revenue growth on average, an extremely rare occurrence (see Exhibit 25). Meanwhile, the quants are in a bind too because the high-momentum leadership group, which contains lots of bond proxies, has very similar fundamental attributes to the anti-bonds but trade at 21x trailing earnings instead of 12x (see Exhibit 26). Their models have a hard time paying up for something that looks pretty similar sitting on the shelf but has twice the price tag.

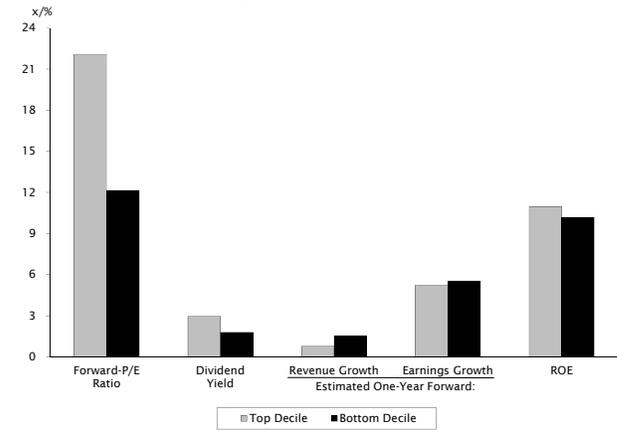
**Exhibit 25: Large-Capitalization Stocks**  
**Top Quintile of Nine-Month Price Momentum**  
**Average Growth Rate of Revenue<sup>1</sup>**  
**1953 Through Late-June 2016**



Source: Corporate Reports, National Bureau of Economic Research, Empirical Research Partners Analysis.

<sup>1</sup> Based on trailing four-quarter data, equally-weighted average.

**Exhibit 26: Large-Capitalization Stocks**  
**Top and Bottom Deciles of Correlation of**  
**Their Relative Return with Performance of**  
**Ten-Year Treasury Bonds**  
**Select Metrics<sup>1</sup>**  
**As of Early-July 2016**

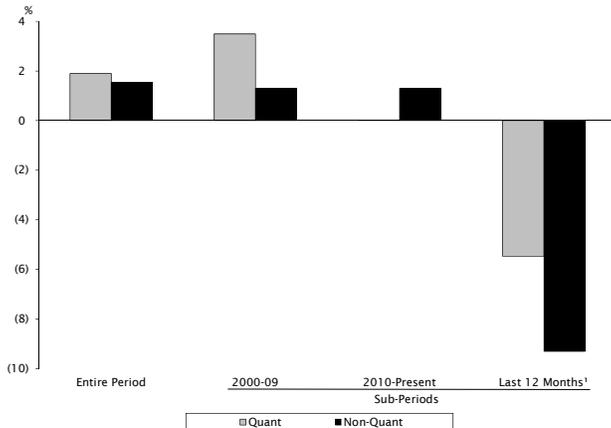


Source: Empirical Research Partners Analysis.

<sup>1</sup> Medians.

Given that tough environment it's no surprise that stocks with high hedge fund ownership, whether quant or fundamental, have struggled in the past year (see Exhibit 27). What's interesting though is that quant hedge funds have gradually been shifting towards a less-volatile sandbox (see Exhibit 28). In the post-Crisis era the average tracking error of stocks in the highest quintile of quant hedge fund ownership has come down, to the extent that it's now less than half that of stocks in the highest quintile of non-quant hedge fund ownership. The rise of the low volatility paradigm, a product unique to quants, probably explains some of that.

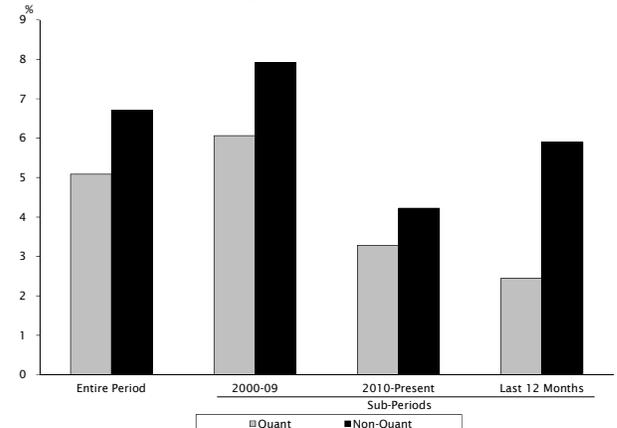
**Exhibit 27: Large-Capitalization Stocks**  
**Relative Returns to the Highest Quintile of**  
**Hedge Fund Ownership**  
**Measured Over One-Year Holding Periods**  
**2000 Through Early-July 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Monthly data compounded to annual periods.

**Exhibit 28: Large-Capitalization Stocks**  
**Annualized Tracking Error of Stocks in the**  
**Highest Quintile of Hedge Fund Ownership<sup>1</sup>**  
**Measured Over One-Year Holding Periods**  
**2000 Through Early-July 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

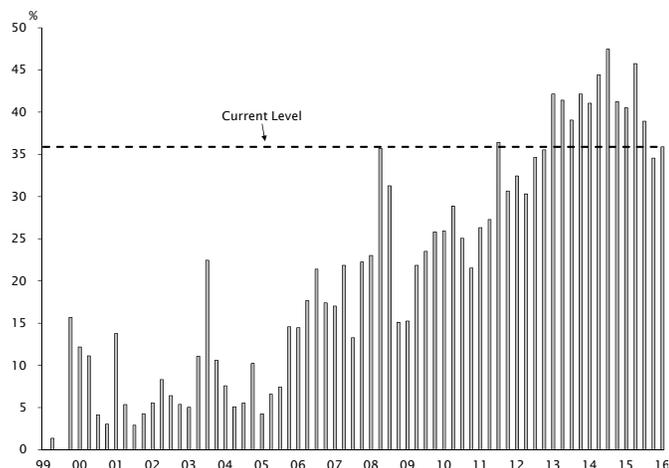
<sup>1</sup> Volatility of monthly relative returns, annualized.

**Quant Hedge Funds and ETFs: Robots with Death Rays?**

A related question we often get when discussing the topic of quant hedge fund impact is whether ETFs offer a new transmission mechanism that magnifies their influence. We looked into that too. It turns out that quant hedge funds do, on face value, hold a disproportionate share of all hedge funds' ETF assets. Recall from earlier that quant hedge funds have a 22% share of hedge funds' U.S. equity assets but as shown in Exhibit 29 their current share of U.S. ETF holdings is around 35% so they're punching above their weight.

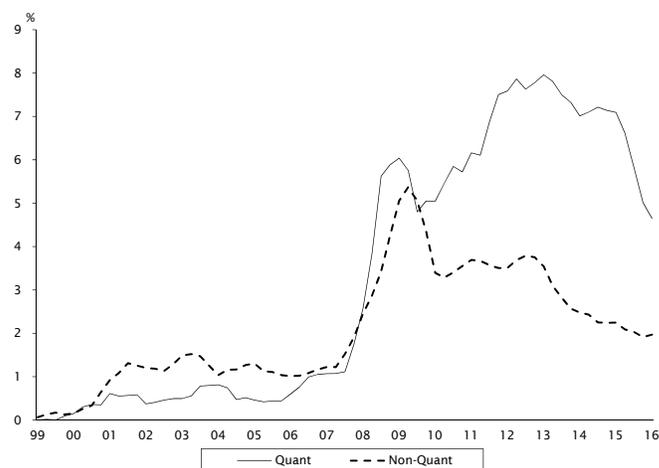
Up until the Crisis both types of hedge funds held about the same share of their U.S. equity assets in ETFs, which is to say not very much at all (see Exhibit 30). But post-Crisis there was a big divergence and by 2013 quant hedge funds' use of ETFs was double that of their fundamental peers. Looking beneath the surface it turns out that divergence was driven almost entirely by the rise of quantitative risk parity-type strategies that span multiple asset classes. Such strategies usually don't hold individual stocks; rather they get their equity exposure via ETFs. The decline in quant use of ETFs since 2013 can be pinned on those same players, who have reduced their U.S. equity exposure over the past couple of years.

**Exhibit 29: Hedge Funds' U.S. ETF Holdings Share Held by Quant Hedge Funds 1999 Through Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

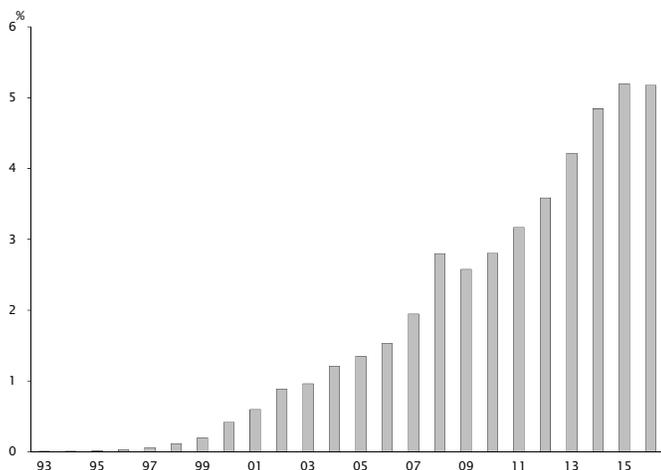
**Exhibit 30: Hedge Funds ETFs as Share of U.S. Equity Holdings<sup>1</sup> 1999 Through Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

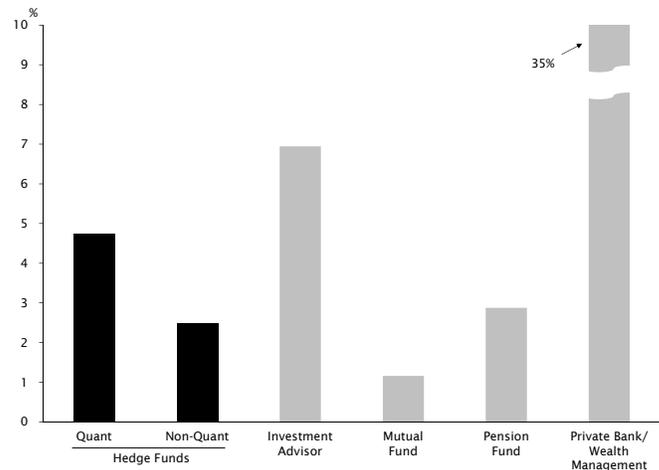
<sup>1</sup> Data smoothed on a trailing four-quarter basis.

**Exhibit 31: ETFs Investing Primarily in U.S. Equities Share of U.S. Market Capitalization 1993 Through Q1 2016**



Source: Strategic Insight Simfund, Factset Research System, Empirical Research Partners Analysis.

**Exhibit 32: Investment Managers' Share of U.S. Equity Holdings in ETFs As of Q1 2016**

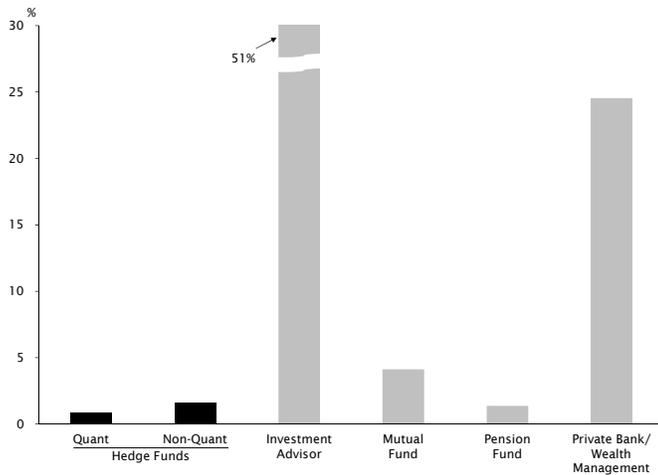


Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers with U.S. equity holdings who filed a 31 March 2016 13F report.

Overall the use of ETFs by hedge funds isn't that different from ETFs' share of overall U.S. market capitalization, which is around 5% currently (see Exhibit 31 overleaf). Hedge fund ETF use isn't much of an outlier compared to other types of investors either, with both investment advisors and wealth managers much more likely to turn to an ETF than hedge funds (see Exhibit 32 overleaf). Because hedge funds assets are relatively small in the grand scheme of things their share of the overall U.S. ETF market is negligible (see Exhibit 33). We also cut the data by the domicile of the investment managers and somewhat surprisingly found that offshore investors are *less* likely to access the U.S. through ETFs than domestic managers, an opposite result to what we expected (see Exhibit 34). But that's a tale for another day.

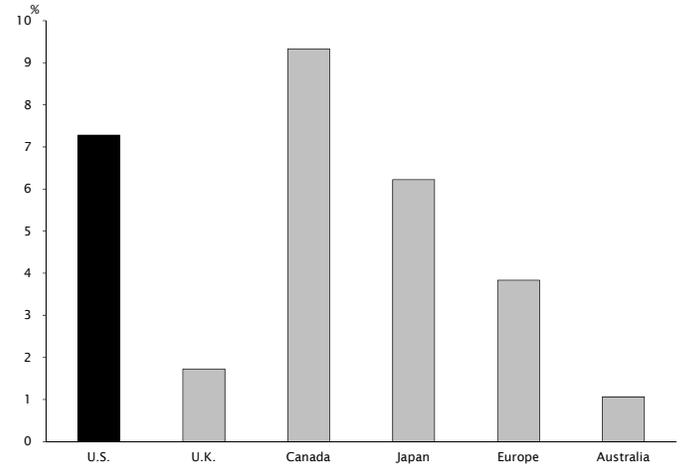
**Exhibit 33: Investment Managers<sup>1</sup>**  
**Share of Total U.S. Equity ETF Market**  
**As of Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers with U.S. equity holdings who filed a 31 March 2016 13F report.

**Exhibit 34: Investment Managers<sup>1</sup>**  
**Share of U.S. Equity Holdings in ETFs**  
**by Manager's Country**  
**As of Q1 2016**



Source: FactSet Research Systems, Empirical Research Partners Analysis.

<sup>1</sup> Includes investment managers with U.S. equity holdings who filed a 31 March 2016 13F report.

**Conclusion: It's the Economy, Stupid**

Putting everything together, quant hedge funds do account for a significant share of U.S. equity turnover. Plus, their U.S. equity assets are concentrated in a handful of big players so the decisions of a few can potentially impact the many to a greater degree than with fundamental hedge funds. However, because quants make little bets across lots of stocks their impact on a single stock is likely to be lower than non-quant hedge funds, which tend to run concentrated portfolios with big positions in a few stocks. Where quant hedge funds matter is at the factor level and their exposures are worth keeping an eye on, particularly given their share of hedge fund equity holdings is back to where it was in the Quant Crisis of 2007.

Despite their growing influence, our read of the data is that quant hedge funds aren't the root cause of the topsy-turvy markets this year. Rather, they've suffered in a macro-dominated world just like many others. The momentum leadership of stable, bond-like stocks trading at rich multiples has hurt their models too; it's hard to find a backtestable period where buying expensive stocks with mediocre fundamentals was the right thing to do. Perhaps the New Economy era is the closest analog. Furthermore, quant hedge funds aren't disproportionately big ETF users, and even if they were their share of the whole U.S. ETF market is so small that they still wouldn't be deterministic to the outcome.

The robots may have the coolest spaceships and the fastest hoverboards, but ultimately they're not that different from you or me. Which is something science fiction writers have known all along.

**Appendix 1: Large-Capitalization Quant Hedge Fund Favorites**  
**Highest Quintile of Quant Hedge Fund Ownership and Lowest Two Quintiles of Non-Quant Hedge Fund Ownership**  
**Sorted by Core Model Rank and Capitalization**  
**As of Mid-July 2016**

Symbol	Company	Price	Quintiles (1=Highest; 5=Lowest)					Quintiles (1=Best; 5=Worst)					YTD Return	Market Capitalization (\$ Billion)
			Hedge Fund Ownership		Select Metrics			Super Factors						
			Quant	Non-Quant	Growth Score	Stability Score	Free Cash Flow Yield	Valuation	Capital Deployment	Earnings Quality and Trend	Market Reaction	Core Model Rank		
ADM	ARCHER-DANIELS-MIDLAND CO	\$43.48	1	5	5	2	2	2	1	3	3	1	20.6 %	\$25.5
VLO	VALERO ENERGY CORP	47.73	1	4	5	4	1	1	1	3	5	1	(31.0)	22.4
HIG	HARTFORD FINANCIAL SERVICES	43.58	1	4	5	4	na	2	1	na	4	1	1.2	17.2
ETR	ENTERGY CORP	80.88	1	4	5	3	5	1	2	5	3	1	21.1	14.5
TSS	TOTAL SYSTEM SERVICES INC	54.01	1	4	2	3	2	3	1	1	1	1	8.9	9.9
WYN	WYNDHAM WORLDWIDE CORP	72.35	1	4	1	3	1	1	1	2	4	1	1.0	8.1
RE	EVEREST REINSURANCE GROUP LTD	181.72	1	5	4	2	na	1	1	na	4	1	0.5	7.7
AXS	AXIS CAPITAL HOLDINGS LTD	53.98	1	5	5	2	na	1	1	na	3	1	(2.7)	5.0
HFC	HOLLYFRONTIER CORP	22.72	1	4	5	5	4	1	4	4	5	1	(41.8)	4.0
PWR	QUANTA SERVICES INC	24.36	1	4	4	1	1	1	1	4	2	1	20.3	3.9
JBL	JABIL CIRCUIT INC	18.76	1	4	4	4	5	1	2	3	5	1	(18.7)	3.6
MXIM	MAXIM INTEGRATED PRODUCTS	36.88	1	4	3	2	2	4	1	3	2	2	(1.2)	10.5
INGR	INGREDION INC	132.40	1	4	4	2	2	3	4	2	1	2	39.2	9.5
DOX	AMDOCS	58.26	1	4	3	1	1	2	2	4	3	2	7.5	8.7
HII	HUNTINGTON INGALLS IND INC	172.52	1	4	2	3	1	2	2	3	1	2	37.0	8.1
UGI	UGI CORP	44.74	1	4	4	2	1	2	2	3	2	2	34.0	7.7
PPC	PILGRIM'S PRIDE CORP	25.79	1	4	1	1	1	2	3	5	2	2	29.7	6.6
LLTC	LINEAR TECHNOLOGY CORP	47.31	1	4	2	1	2	5	2	1	2	3	13.1	11.3
MAS	MASCO CORP	32.22	1	4	4	5	2	4	1	1	2	3	14.9	10.7
TCNA	TEGNA INC	23.64	1	4	4	5	1	3	4	3	3	3	(6.3)	5.1
EWBC	EAST WEST BANCORP INC	33.54	1	4	4	3	na	2	4	na	4	3	(18.4)	4.8
SNA	SNAP-ON INC	160.16	1	4	3	2	2	4	4	2	3	4	(5.8)	9.3
ORI	OLD REPUBLIC INTERNATIONAL CORP	19.34	1	4	4	5	na	3	4	na	2	4	5.9	5.1
MANH	MANHATTAN ASSOCIATES INC	67.29	1	4	1	1	4	5	4	1	3	4	1.7	4.9
NYCB	NEW YORK COMMUNITY BANCORP INC	14.73	1	5	4	3	na	3	5	na	4	5	(7.7)	7.2
CBOE	CBOE HOLDINGS INC	67.64	1	5	1	1	na	5	2	na	2	5	5.0	5.5

Source: Empirical Research Partners Analysis.

**Appendix 2: Large-Capitalization Non-Quant Hedge Fund Favorites**  
**Highest Quintile of Non-Quant Hedge Fund Ownership and Lowest Two Quintiles of Quant Hedge Fund Ownership**  
**Sorted by Core Model Rank and Capitalization**  
**As of Mid-July 2016**

Symbol	Company	Price	Quintiles (1=Highest; 5=Lowest)					Quintiles (1=Best; 5=Worst)					YTD Return	Market Capitalization (\$ Billion)
			Hedge Fund Ownership		Select Metrics			Super Factors						
			Quant	Non-Quant	Growth Score	Stability Score	Free Cash Flow Yield	Valuation	Capital Deployment	Earnings Quality and Trend	Market Reaction	Core Model Rank		
ALLY	ALLY FINANCIAL INC	\$16.63	4	1	na	4	na	1	4	na	5	1	(10.8) %	\$8.0
SC	SANTANDER CONSUMER USA HLDGS	10.83	4	1	4	3	na	1	4	na	5	1	(31.7)	3.9
HES	HESS CORP	56.81	4	1	5	5	5	2	3	2	2	2	18.3	18.0
PXD	PIONEER NATURAL RESOURCES CO	153.72	4	1	3	5	5	5	5	1	3	3	22.6	26.0
TDG	TRANSDIGM GROUP INC	269.81	5	1	1	1	3	4	5	2	1	3	18.1	14.3
FLT	FLEETCOR TECHNOLOGIES INC	143.79	5	1	2	3	2	3	5	1	4	3	0.6	13.3
COG	CABOT OIL & GAS CORP	25.44	4	1	2	5	5	5	5	1	1	3	44.1	11.8
NBIX	NEUROCRINE BIOSCIENCES INC	48.58	4	1	1	4	5	5	4	5	1	3	(14.1)	4.2
FCX	FREEPORT MCMORAN COPPER & GOLD -CL	11.20	4	1	5	5	5	3	5	2	4	4	65.4	14.0
MGM	MGM RESORTS INTERNATIONAL	22.96	4	1	5	5	5	4	5	3	1	4	1.1	13.0
AA	ALCOA INC	9.82	5	1	5	5	5	2	3	5	5	4	0.2	12.9
KSU	KANSAS CITY SOUTHERN	90.20	4	1	3	2	4	4	4	4	2	4	21.7	9.7
RRC	RANGE RESOURCES CORP	44.13	4	1	5	5	5	4	4	5	1	4	79.5	7.5
ZAYO	ZAYO GROUP HOLDINGS INC	28.49	4	1	2	5	5	4	4	3	3	4	7.1	6.9
ZG	ZILLOW GROUP INC	36.86	5	1	1	5	5	5	5	5	1	4	41.6	6.6
FANG	DIAMONDBACK ENERGY INC	89.16	4	1	2	5	5	5	5	2	1	4	33.3	6.4
SGEN	SEATTLE GENETICS INC	41.45	5	1	1	4	5	5	5	5	1	4	(7.6)	5.8
AVGO	BROADCOM LTD	155.14	5	1	2	3	4	5	5	5	2	5	7.6	61.4
NFLX	NETFLIX INC	97.06	4	1	1	5	5	5	2	5	5	5	(15.1)	41.6
CP	CANADIAN PACIFIC RAILWAY LTD	133.35	4	1	2	4	4	4	4	4	4	5	5.0	20.4
VMC	VULCAN MATERIALS CO	123.61	4	1	2	5	4	5	4	3	1	5	30.6	16.5
WDAY	WORKDAY INC	75.71	5	1	1	5	4	5	4	3	3	5	(5.0)	14.9
BMRN	BIOMARIN PHARMACEUTICAL INC	91.49	4	1	1	5	5	5	5	5	5	5	(12.7)	14.9
IBKR	INTERACTIVE BROKERS GROUP	35.39	5	1	1	4	na	5	5	na	4	5	(18.4)	14.4
PNR	PENTAIR PLC	61.43	5	1	4	5	2	3	4	5	2	5	25.7	11.1
TRIP	TRIPADVISOR INC	67.13	4	1	1	4	4	5	5	2	4	5	(21.3)	9.8
FMC	FMC CORP	46.48	4	1	4	4	5	5	4	5	1	5	19.7	6.2
SSNC	SS&C TECHNOLOGIES HLDGS INC	29.64	5	1	1	4	4	4	5	5	5	5	(12.8)	6.0
HHC	HOWARD HUGHES CORP	113.93	4	1	3	5	na	3	4	na	3	5	0.7	4.5

Source: Empirical Research Partners Analysis.