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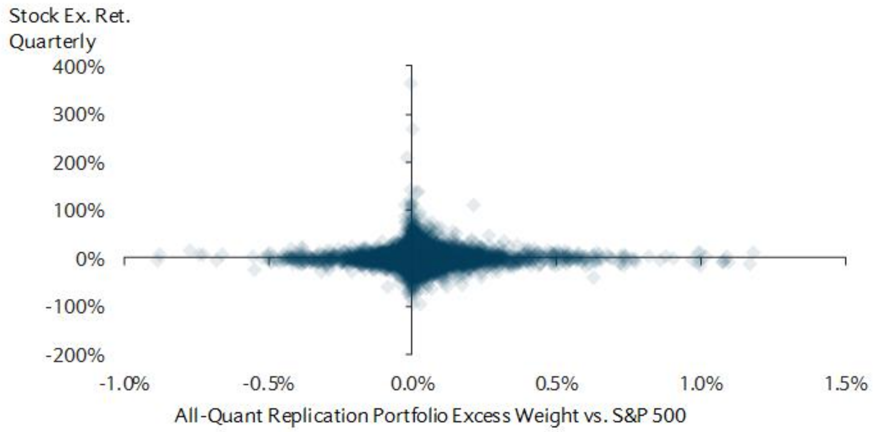
Over the past decade, quantitative funds have become an increasingly important component of the equity fund landscape. That has led to a surge of interest in what quants are holding in their portfolios, for at least two reasons: discretionary investors may hope that quant demand will be a source of outsized returns, or fear that quant ownership or herding presents a risk of volatility not explained by fundamentals.

The fear of unexpected risks appears to be unfounded, as quant funds have historically taken their most off-market positions in less volatile stocks (Figure 1). That applies to both longs and shorts – quant funds have historically selected less volatile stocks among both their greatest overweights and underweights.

The most quant-owned stocks have outperformed the market in risk-adjusted terms, but as a group quants have not owned (or shorted) the biggest gainers or losers. An all-quant portfolio that replicates the weights of the aggregated holdings (at quarter-ends only) of quant funds would have outperformed the S&P 500. That gain in risk-adjusted returns was in part a function of quants' tilt toward stocks that had a lower dispersion of returns. For discretionary investors that are seeking to use their fundamental insights to capture outsized gains, it may be more promising to look at the names that quants have the least off-market, as these are where the big gains (and big losses) have lived.

FIGURE 1

Quant Funds Have Taken Their Most Off-Market Positions in the Least Volatile Stocks



Source: Barclays Research, Refinitiv. Past performance is not a guarantee of future results.

Quant Investors' Most Off-Index Positions Are Less Volatile

Quant hedge funds base investment decisions on systematic signals of stock performance, generated using mathematic models and algorithms. Over the past decade, quants have become an increasingly important part of the equity investor landscape – accounting for the largest share of trading volumes[1], and raising assets under management to about $1tn[2].

This rise has resulted in discretionary investors having a high degree of interest in which stocks quants own. We see multiple causes for that attention. On the upside, discretionary investors are interested in situations where quant attention may create additional demand in names. To the downside, some investors are concerned that crowding and herding among quants might cause stocks to move below fundamental value – concerns that have been broadcast across the financial press[3]. In both cases, these risks are seen as being distinct from fundamentals, and therefore a challenging risk for discretionary investors to manage.

A look at public disclosures about quant holdings suggests that neither the downside fears nor the upside hopes are consistent with what the data tells us. Instead, we see that quants have tended to both overweight and underweight less risky stocks. And while their implied portfolio has outperformed the S&P 500 in both absolute and risk-adjusted terms, investors looking for stocks with big upside or downside would be better off looking among the tickers where quants have taken the least off-market positions.

The Data

Institutional investment managers with investment discretion over $100M are required to report their holdings (stocks and number of shares) on Form 13F within 45 days of the end of a calendar quarter. Refinitiv collects these filings and makes them available in near real-time as an "Ownership" dataset, with history back to 1997.

The Ownership dataset has information on investment fund structure and style, but it does not reliably identify the systematic investors that we believe are generally considered to be "quants." To identify these firms, we used text features of the fund's self-provided descriptions, searching for firms that used the work "quantitative" along with either the "strategies" or "models" investors. This generated a list of 89 funds, which included most of the best known quantitative investors, as well as many smaller firms. There are also some likely non-quant funds included, but we believe the bulk to the holdings in this case belong to quant funds.

There are a few points worth nothing here. The Ownership data does not only contain holdings on these funds' own books, but the consolidated holdings of all accounts they have investment discretion over, which we believe reasonably reflect the overall investment strategy of these funds. These reports are only for the holdings at quarter end, so are not representative of all the trades a fund might make within the quarter. Funds are also not required to report short positions in the same way, so what we see here is an incomplete snapshot of the trades each fund has on.

Replicating the Holdings

To understand the implications of quant ownership for stocks, we create a "replication" portfolio to identify which equities they are most overweight and underweight relative to the S&P 500 index. We use this method:

[1] THE RISE OF QUANTS IN 5 CHARTS, Wall Street Journal, https://www.wsj.com/graphics/the-rise-of-quants-in-5-charts/

[2] Quant hedge funds set to surpass $1tn management mark, Financial Times, January 8, 2018

[3] Behind the Market Swoon: The Herdlike Behavior of Computerized Trading, Wall Street Journal, December 25, 2018

- Start by extracting quarterly equity holdings data from the each of the quant funds selected out of the Ownership dataset. In practice, hedge funds typically file Form 13F at the very end of the 45-day period, so we set that as the portfolio rebalancing dates.
- In order to minimize the impact of outliers and guarantee tradability and proper benchmarking, we only select those stocks that are in the S&P 500 index, and combine them into one portfolio. The weight assigned to each security is based on its aggregated share value from all funds divided by total equity asset value of all funds for a quarter.
- We then assume the portfolio is purchased at the close of the next trading day, and held for 90 days. For each position, we then calculate the excess return over S&P 500 during this period.
- We do not account for transaction costs, and assume a portfolio that does not use leverage.

Performance of Quants' Holdings

We backtest the performance of the quant positions starting in Q4' 2006; and ending in Q3' 2018, the last quarter we have data available and a sufficient trading window to calculate returns. Over that timeframe, the quant funds aggregate portfolio (All-Quant Portfolio) would have outperformed the S&P 500 by ~80bp, with volatility that was 30bp higher (giving the strategy a 6% higher Sharpe ratio).

FIGURE 2

Sharpe Ratios Since 2006

	Annualized Return	Annualized Std.	Sharpe Ratio
All-Quant Portfolio Backtest	11.4%	20.2%	56.4%
S&P 500	10.6%	19.9%	53.5%

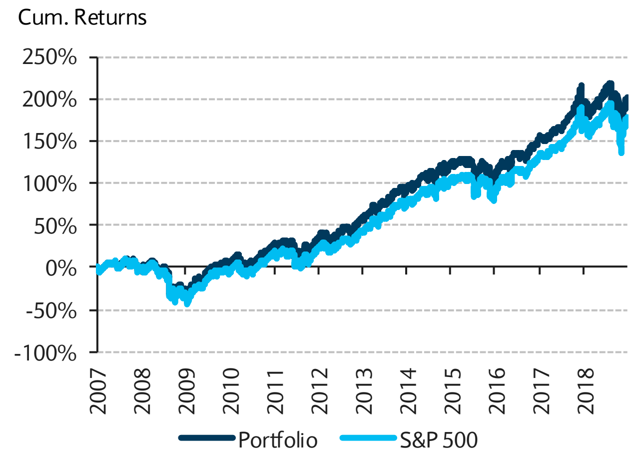
Source: Barclays Research, Refinitiv. Past performance is not a guarantee of future results.

The details of the performance of stocks within the portfolio indicate some interesting things about the aggregate of quant investment processes (keeping in mind that there are many firms with many different methods gathered together here).

The stocks that have the most, and the least, excess weight (the weight of a stock in the All-Quant Portfolio less its weight in the S&P 500) have a lower dispersion of returns than stocks that have an excess weight close to zero (Figure 1). If we split the universe of stock quarterly performances into three groups based on excess weight (Figure 4), the top weighted third had the highest excess returns with the lowest dispersion of returns, followed by the middle third (those weighted closest to the benchmark). The bottom third actually generated negative excess returns, with a return dispersion between the other two. That suggests that across quant funds, the investment process is generating information about both volatility and returns, and quant funds are using that information to select a higher risk-adjusted return portfolio, in part by limiting off-market positions in the most unpredictable stocks.

FIGURE 3

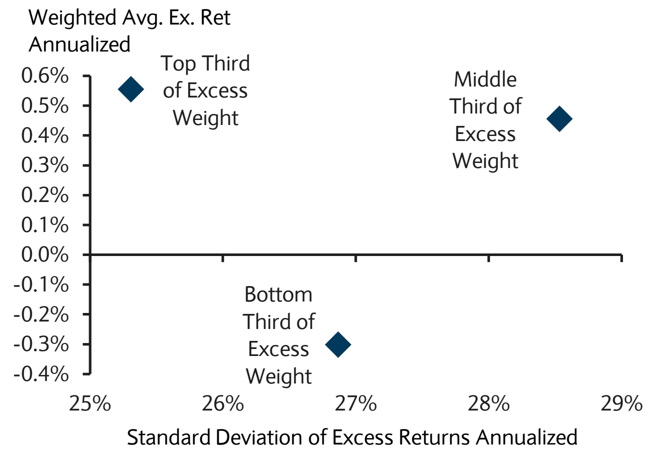
A Portfolio Weighted by Aggregate Quant Holdings in Each Stock Modestly Outperformed the S&P 500 Since 2007



Source: Refinitiv, Barclays Research
Past performance is not a guarantee of future results.

FIGURE 4

The Top Third of Excess Weighted Stocks Have Higher Returns and Lower Risk Than the Bottom Third



Source: Refinitiv, Barclays Research.
Past performance is not a guarantee of future results.

A few other interesting performance notes stand out:

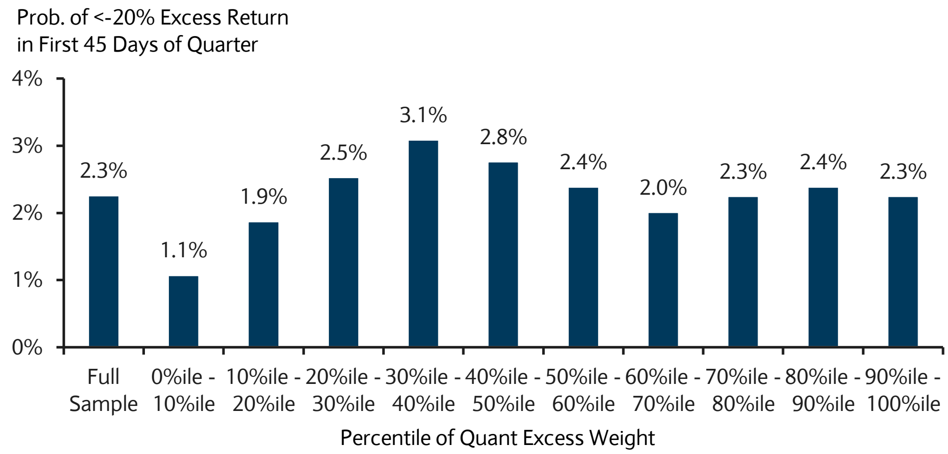
First, the quant holdings don't dramatically outperform in the window between the end of each quarter and the day the quarter's holdings are disclosed. So it does not appear that high frequency trading decisions are inherently critical to quant outperformance.

Second, constructing simple long/short portfolios from the quant's disclosed holdings doesn't perform that well – close to zero excess returns. Given that they are required to disclose only their long holdings, not their shorts, we're probably missing a part of the picture.

Third, neither total attention, nor changes in attention, from quants has tended to be indicative of higher volatility or sharply worse performance in a stock. So while quants might account for a lot of trading volume, we do not see evidence from this ownership data that there is herding or crowding that is the cause of selloffs in stocks. Figure 5 illustrates that even during the period of the quarter when their ownership remains confidential (used here because we believe that would be when herding-related volatility would be most likely), the most heavily owned quant stocks are no more likely to have short drops than stocks in general.

FIGURE 5

The Stocks Most "Over-Owned" by Quants Are No More Likely to Experience Sudden Sell-Offs than Stocks in General



Source: Refinitiv, Barclays Research. Past performance is not a guarantee of future results.

Finally, constructing long-only portfolios based on Q/Q changes in quants' holdings does not outperform the replication strategy presented in this report, but it still outperforms the S&P 500 on a risk-adjusted basis. But because it is simpler to just look at the levels of their holdings, we think that is a more useful basis of presentation for this report.

On net, here is what we take away from this analysis:

- Quant ownership does tell us something about the expected risk and return of stocks, even when it is 45 days stale. The stocks that are most heavily overweighted in the All-Quant Portfolio have better risk-adjusted returns than the most heavily underweighted ones.
- Quants' underweighted names are "safe" underweights – not only do they have lower returns, they have a lower than average likelihood of making the kind of dramatically positive move that upends a short.
- The biggest overweights generally have not contained the biggest outperformers (nor the biggest underperformers). So if an investor is looking to identify stocks with potential for big wins, they need to look in the group that the All-Quant Portfolio weights closest to their SPX index weights.

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