

Deep Concentration

A Review of Studies Discussing Concentrated Portfolios

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Many asset allocators today are debating whether it is possible to over-diversify portfolios. While diversification remains a central pillar in investment theory, many believe it can also dilute performance when an active portfolio owns securities to diversify rather than to add value. This, in turn, has led many observers to speculate that concentrated managers can offer investors superior performance.

To help inform investors and practitioners about this ongoing debate on diversification and concentration, we have reviewed empirical studies from academics, asset managers, and other industry practitioners on concentrated equity strategies. The collection of studies spans multiple time periods, definitions of concentration, and methodologies. We divide our paper in three sections corresponding to different types of studies: first, those that provide a conceptual framework; second, those that evaluate the potential benefits of concentration on its own; and third, those that appraise the performance of the highest conviction positions derived from an underlying diversified portfolio.

Our examination found that, in general terms, concentrated approaches offer many potential benefits. In the right context, these strategies may serve as valuable tools for asset allocators.

The first mutual fund in the United States (still active today), the Massachusetts Investors Trust, held only 45 stocks at its inception in 1924.¹ British economist John Maynard Keynes managed the King's College, Cambridge endowment from 1921–1946. The average number of stock holdings in the endowment's portfolio was around 46, but the portfolio's concentration was, on average, equivalent to a 17-stock equal-weighted portfolio.² In contrast, another early 20th century investor and the father of value investing, Benjamin Graham, ran a more diversified portfolio. From 1946–1956 the number of common stocks held by (investment company) Graham-Newman Corporation averaged 76.³ It is notable that all of these holdings are below the average we see today in the comparable US large-cap space.

We believe that active managers began increasing their holdings after the creation of the first index fund in the United States in the 1970s. These vehicles made broad-market benchmarks investable, leading to investable indexing strategies and a new emphasis on relative performance. With metrics such as tracking error, managers were evaluated on how closely their active return pattern tracked an index. Often, managers found it necessary to construct stock portfolios with dozens (or even hundreds) of holdings so that the pattern of performance resembled the index, while also attempting to add value—an inherently contradictory set of goals.

Since 1983, the average number of holdings in US large-cap mutual funds has steadily climbed. This remains valid whether index funds are excluded (left chart in Exhibit 1) or not (right chart in Exhibit 1). We believe that expanding our analysis to, for example, the small-cap or international equity universes would reveal even higher numbers given the breadth of these opportunity sets.

The concept of diversification based on Harry Markowitz's work on portfolio theory showed how investors can reduce risk without forgoing return by adding uncorrelated assets.⁴ This remains a central tenet of finance theory. However, it appears that some portfolio managers use the concept of diversification to justify holding too many stocks. It has been shown that mathematically, an investor obtains the biggest risk-reduction benefit (in terms of standard deviation) by adding 20–40 securities.⁵ The sharp drop in risk occurs early on; thus, raising

the number of holdings beyond a certain threshold has a negligible benefit on risk reduction. While it remains sensible to diversify across managers and asset classes, there is less support to over-diversify within an individual portfolio—especially in a stock-selection context.

Many asset managers appear to have realized this given the growing popularity of concentrated equity strategies. Concentrated portfolios make intuitive sense. Why construct a portfolio that extends beyond the manager's high conviction positions? In addition, since beta exposure can now be obtained cheaply through passive index funds, investors may now seek true alpha opportunities from active individual managers.

But has it worked? Many studies have directly compared the performance of concentrated versus diversified strategies. Other studies have investigated the performance of a manager's highest conviction positions (drawn from a more diversified portfolio), and have considered whether these positions are more likely to outperform. Several papers assert that concentrated portfolios that, by definition, represent top ideas would post favorable results.

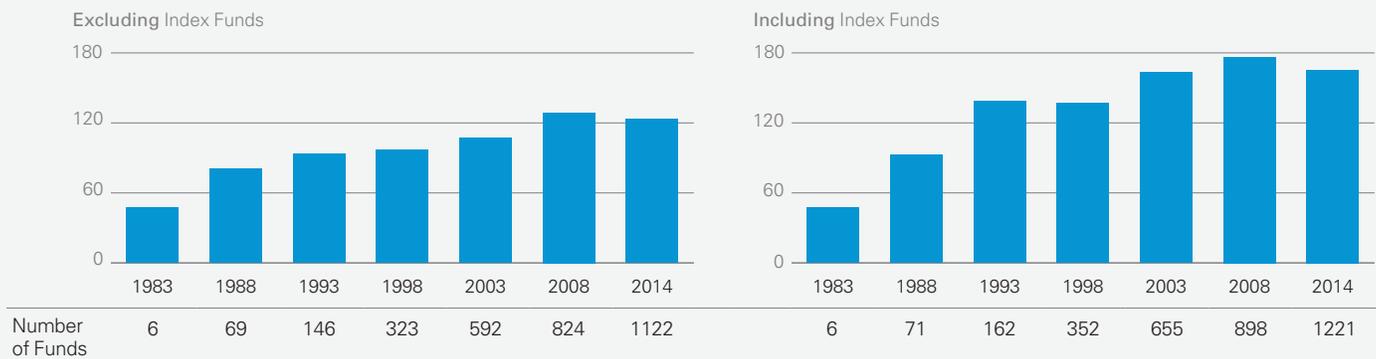
As part of our review of these studies, we have divided our paper into three sections. Each section corresponds to the type of studies and closes with our appraisal of their findings. In the first section, we review some fundamental concepts to our discussion on concentrated studies (the Appendix discloses our search criteria for papers).

1. Background and Related Concepts

In 1989, Richard Grinold introduced the Fundamental Law of Active Management (the Law). This concept provided a framework to judge an active manager's ability to add value. As measured by the information ratio, it can be expressed in terms of two dimensions: skill and breadth.⁶ (See Appendix for formulas.)

The *information ratio* (IR) assesses risk-adjusted performance by dividing benchmark-relative excess return over tracking error (standard deviation of excess returns). In the Law, the IR is decomposed into the *information coefficient* (IC), which is the correlation of return forecasts with realized returns, and breadth, which is the number of

Exhibit 1
Average Number of Holdings in US Large-Cap Mutual Funds



As of December 2014

Data include equity mutual funds in the Morningstar Category for US Large Cap with inception date prior to 31 December 2014, and excludes fund of funds.

Source: Morningstar

independent investment decisions. In turn, IC can be thought of as the “skill” component and breadth as the number of “bets” a given manager makes.

The Law prescribes an interesting interaction between these variables. That is, a highly skilled manager can have less breadth and produce the same IR than another one with more breadth, given differences in skill: to get an IR equal to 1 an IC of 0.15 implies breadth is 44; an IC of 0.05 implies breadth is 400 to reach the same IR of 1. This has direct implications for managers of concentrated portfolios, as it implies the necessity of very high skill to successfully manage a portfolio with very few holdings.⁷

Joint research between Lazard and Brandes in 2014 published as *The Predictive Power of Portfolio Characteristics*, adapted the Fundamental Law as a tool to rank managers. Active share and concentration coefficient (we discuss these in more detail below) are proposed as proxies for skill and breadth. Key takeaways from that study are that concentration will rank a manager favorably only as long as it can maintain a high (or increasing) level of active share. This ranking methodology exhibited some degree of predictive ability.

As noted earlier, research on the added value of active management centers on aggregating results of the universe of active strategies. However, looking deeper within the set of active managers results in interesting evidence. Cremers and Petajisto (2009) and Petajisto (2013) introduced active share to measure how much a portfolio’s holdings differ from its benchmark. Active share ranges from 0% (portfolio weights are identical to the benchmark) to 100% (portfolio holdings do not overlap at all with the benchmark).

The researchers found that high active share portfolios outperformed in a US equity mutual fund universe. Funds were sorted in quintiles by active share and subsequently by tracking error; depending on the ranking within these two dimensions funds were labeled to describe their type of active management.⁸ Those in the highest active share quintile and in the first four tracking error quintiles were labeled “stock pickers” and had favorable outperformance. In contrast, low active share funds that more closely resemble an index—dubbed “closet indexers”—performed poorly. The sample statistics for the fund categories in Petajisto (2013) indicate that the average number of stocks for the stock picker category was 66, and for closet indexers 161.

It is important to note that the link between active share and performance has recently been challenged by some asset managers; given that the high versus low active share comparison could be seen as a small cap versus large cap comparison.⁹ We would add that the only way to outperform a benchmark is to be different from it, but obviously these differences need to reflect accurate, sound decisions.

In *No Fear of Commitment: The Role of High-Conviction Active Management*, authors Siegel and Scanlan (2014) delved into several important concepts to evaluate concentrated (i.e., high-conviction) managers. This paper points out that as investors construct a portfolio of managers, their decisions about beta (asset classes) and alpha (how to beat benchmarks) should be kept separate. Beta decisions should focus on finding the combination of asset classes to meet return objectives. Alpha decisions should focus on active managers that have the skill to beat the benchmark. While identifying managers that will outperform is incredibly challenging, high-conviction managers can

signal their skill. The cognitive impossibility of attaining in-depth knowledge on hundreds, or even thousands, of securities, means that the specialization of high-conviction managers on a small number of names bodes well for adding value.

In addition to their insights on high-conviction managers, the authors draw some interesting conclusions about diversified managers. Diversified managers *can* add value, especially those from firms with deep resources and efficiencies in information gathering efforts. But from an investor’s standpoint, constructing a portfolio of diversified managers can mean that the active bets (which are smaller than the active bets of concentrated portfolios) are more likely to cancel each other out. Moreover, returning to our discussion on the Fundamental Law, the breadth of diversified managers is smaller than it appears by simply considering their investment universe. This follows because breadth in the Law implies independent bets, and it is often the case that shortcuts to screen a security universe are not independent (for example, eliminating groups of stocks based on market cap).

In our next section, we consider research on what makes a portfolio concentrated, and how that may benefit investors.

2. The Characteristics and Potential Benefits of Concentration

There is no consensus on how many stocks define a concentrated portfolio. Some practical approximations provide loose guidelines, such as 30 stocks or less for US equity portfolios or 40 stocks or less in a broader international/global portfolio. But this approach says nothing about the individual security weights. Other measurements are based on the weight of the largest 10–20 holdings, but this fails to capture overall concentration.

The lack of a strict definition of concentration complicates comparisons of results. However, economists and regulators have relied on widely known statistics such as the Herfindahl Index to evaluate industry or market share concentration—and even use it to assess monopolistic practices as a result of M&A activity. With this in mind, much of the research we will discuss next relies on different metrics (including variations on the Herfindahl Index), and it is important to understand them for more accurate interpretations of findings.

The Concentration Coefficient

One of the first papers to discuss concentration and performance is the Brandes Institute’s *Concentrated Portfolios: An Examination of Their Characteristics and Effectiveness* (2004). The authors tackle the problem of defining concentration by introducing a useful statistic: the concentration coefficient (CC). This is defined as the inverse of the sum of the square weights of all the stocks (i.e., the inverse of the Herfindahl Index).

The CC addresses the shortcomings of more simplified measures like the number of stocks and also provides an intuitive interpretation of concentration. The CC of any portfolio is equivalent to the number of stocks in an equal weighted portfolio that has the same level of concentration. Importantly, a lower CC indicates more concentration. For example, consider two 50-stock portfolios, where the first one is equal weighted (i.e., the least concentrated and most diversified) and the second portfolio is invested 51% in one stock and 49 stocks with

a 1% weight each. If these portfolios are considered according to the number of stocks they hold, both portfolios have the same concentration, when in reality the second one is much more concentrated. On the other hand, using the CC to compare the two portfolios helps make the actual concentration more apparent. The CC of the first portfolio is 50 (2% in each of the 50 stocks), that is—redundantly—a 50-stock equal-weighted portfolio. The CC of the second portfolio is 3.8, which means the 50-stock portfolio (51% in one stock and 1% in 49 names) is equivalent to a 4 stock equal-weighted portfolio.

Based on separate account data from 1992 to 2003, the authors divided the universe into several groups: US large cap value, US large cap growth, US small cap value, US small cap growth, and international. The researchers then set out to evaluate the relationship of the CC against relative returns, tracking error, and information ratio. The results showed no conclusive linear relationships—mostly the relationship proved to be flat. As a result, concentration could not be shown to lead to better (or worse) performance. This analysis was done for the aggregate universe and within the peer groups. Next, the study segmented each group into the “focused” or most concentrated versions within each group: those with a CC lower than 60. The relationship of performance metrics and CC within these focused groups was flat as well. The authors thoroughly explain the limitations of their data, which—among other things—restricted the analysis of comparing diversified and concentrated versions within a same strategy (i.e., compare the most concentrated holdings to the rest of the portfolio/benchmark or a similar analysis).

Industry Concentration

Another paper introducing an alternative measure of concentration is *On the Industry Concentration of Actively Managed Equity Mutual Funds* (Kacperczyk et al. 2005). This paper studies the relation between performance and industry concentration for a sample of US equity mutual funds. Industries are defined using SIC codes and aggregated into ten main industry groups as chosen by the authors, which would loosely resemble the ten GICS sectors widely used today in investment benchmarks.

The authors developed a measure of concentration named the Industry Concentration Index (ICI). The ICI measures how a mutual fund is concentrated in a few industries relative to the industry weights of the entire stock market. An ICI value of zero means that a portfolio has an identical industry composition as the market, and the value of ICI increases as the portfolio becomes more concentrated. Formally, the ICI is the sum of squared differences for each of the 10 industries in a mutual fund relative to the industry weight in the market.

The sample of mutual funds studied here included only actively managed US equity funds (i.e., bond, balanced, index, and sector funds were excluded). The performance period under review was from 1984 to 1999. Mutual funds were grouped in deciles based on the ICI, with decile 1 including the most diversified and decile 10 the most concentrated. Based on four-factor alpha performance, the most concentrated funds have better performance than the five most diversified deciles, before and after expenses (Exhibit 2). Before-fee returns for the most concentrated half are statistically significant. The study notes that the difference in performance between diversified and concentrated funds is smaller after fees, given that the concentrated funds had higher expenses in this sample.

Exhibit 2
Performance Based on Industry Concentration, 1984–1999



The performance quoted represents past performance. Past performance does not guarantee future results. Not intended to represent any product or strategy managed by Lazard. The number of funds in the study is 1,771.

Source: Kacperczyk, et al. (2005); Table II

Following these results, the researchers conducted several tests to control for other sources of performance. Among these were tests for fund size, style, and trades.¹⁰ Highly concentrated funds based on ICI performed better than diversified funds when sorted by fund size and along market cap and style (value-growth) combinations, except in the case for large value portfolios. Another important adjustment to highlight the “informational advantage” of ICI-based concentrated managers was to report industry-adjusted performance. That is, to ensure concentrated managers are picking favorable stocks within industries and not just high-performing industries. Results were favorable by this adjusted metric as well.

Number of Holdings

An easy metric of concentration would be to simply count the number of holdings. Sapp and Yan (2008) took this approach in their paper *Security Concentration and Active Fund Management: Do Focused Funds Offer Superior Performance?* The authors used US equity mutual fund data from 1984 to 2002 and evaluated performance based on the quintiles formed by number of holdings. The study did not find evidence of better performance by concentrated funds.

Fund performance was examined gross and net of fees. In terms of gross returns, the performance of the most diversified quintile versus the most concentrated was comparable. However, when fees were considered, it appeared concentrated funds were charging higher fees—this observation matches that of Kacperczyk et al. (2005) as noted above—as this gap was wider. Importantly, in these results the raw returns, as well as three- and four-factor alpha for the most concentrated quintile were the lowest (or tied for lowest) versus the rest of the sample.

To explain the returns, the authors did a regression of performance against fund characteristics (number of holdings, fund size, fund age, expense ratio, and others). The coefficient on the number of holdings was positive and statistically significant, which would indicate that, all else equal, funds with fewer holdings perform worse. In order to tie these results to practical considerations, the study suggests concentrated funds may be undertaking significantly more risk (on the expectation that flows into funds are asymmetric, that is, inflows following good performance are more meaningful than outflows after bad performance) or holding less liquid stocks.

Discussion of Findings

This first group of studies shows mixed results in favor of concentration. We think measures such as Brandes Institute's CC, and its link with performance naturally reflects drag from additional holdings. Put another way, a portfolio with high concentration based on CC may still have a large amount of holdings. One can have a CC of 20, but total holdings can be 100. In this hypothetical scenario while the manager has some high conviction positions, names with small weights can still have an impact on performance—with differing results versus a portfolio that holds only the largest weights. The same can be said of the ICI measure. But in that case Kacperczyk's results favored concentrated over diversified.

In the case of Kacperczyk et al. and Sapp and Yan, we think practitioners and investors would benefit from evaluating their performance against the mutual funds' prospectus benchmarks—which is ultimately the return investors care about. Favorable alpha over a factor model does not mean a portfolio is outperforming its benchmark. However, factor analysis reveals important details about the exposures portfolios are taking, as denoted by the factor loadings. For example, in Kacperczyk et al. concentrated managers seemed to be focused on small-cap growth stocks. This is important as perhaps the results are a reflection of a favorable period for the factors that drive the stocks and not of concentration. So isolating concentration becomes hard to disentangle.

In terms of comparability across these studies, time periods are similar (overlapping and spanning 1984–2003) but Brandes Institute focuses on separate account institutional data and the other two rely on mutual funds, which may muddle any conclusions.

These studies evaluated the performance of entire portfolios sorted by some measure of concentration. The papers that follow investigate the highest-conviction positions and their performance. This method addresses performance dilution from small positions in those portfolios that may have scored high on a concentrated metric.

3. Focusing on the Largest-Weight or Highest-Conviction Holdings

Big Bets

As mentioned earlier, there are statistics—such as the Herfindahl Index—for calculating concentration which are utilized in other aspects of economics or industry analysis to measure the degree of divergence from equal weighting. In a 2006 working paper, *Fund Managers Who Take Big Bets: Skilled or Overconfident*, Baks, Busse, and Green used four statistical measures of concentration and examined mutual fund performance. This paper has a section that appears to be one of the first to solely analyze the performance of the largest-weight holdings of a portfolio. We think this is a notable advance because, as we noted earlier, a portfolio can rank high on concentration, but small-weight holdings still influence performance.

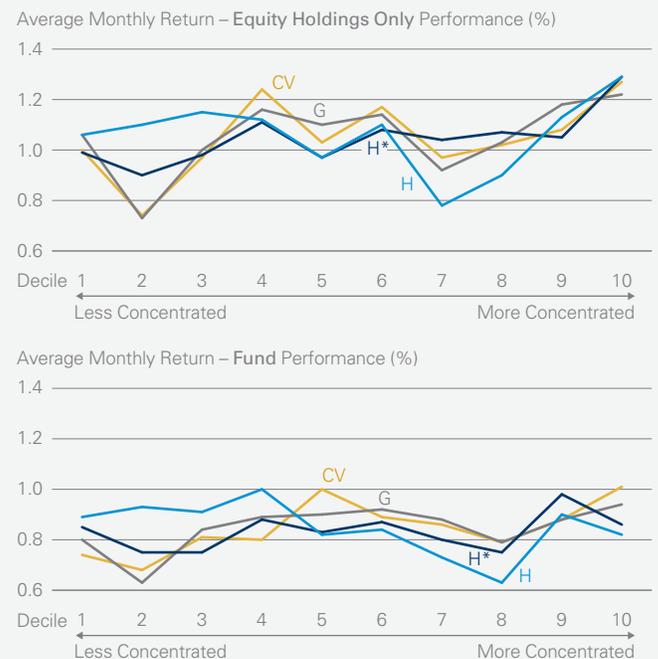
The four statistics are the Herfindahl Index, the normalized Herfindahl Index, the Gini coefficient, and the coefficient of variation. In the authors' view, none of the statistics is superior to the others, and each of them has been used in many other contexts. Essentially the goal is to rank a universe of funds by their level of concentration or, to quote the

paper, by funds which take “big bets.” All four metrics provide similar rankings, but for groups with fewer holdings rankings could differ—highlighting the ambiguity of how best to account for concentration. With this in mind, relying on four different concentration statistics can be helpful in drawing more robust conclusions when evaluating returns.

Data under review comprise the period 1979–2003 for US equity mutual funds. Funds were classified into deciles per each concentration statistic. Returns were calculated in two ways. First, returns were computed for the equity portion only of each fund based on quarterly fund holding snapshots. This method ignores transaction costs and fees. Second, performance was calculated for the actual mutual fund performance net of transaction costs and fees but excluding loads. These returns will differ from the equity-only method because, in addition to costs, there are intra-quarter trades and performance from non-equity holdings (i.e., cash or unidentified securities).

Results are shown in Exhibit 3. For the pure equity returns all four measures of concentration indicate that “big bet” funds perform better than their more diversified peers. In the case of actual fund returns, three of the four measures show that the most concentrated decile outperforms the least concentrated decile. In our view, these results indicate that the stock-picking ability of concentrated managers is strong—as shown by the equity-only returns. However, investors ultimately tie their assets to the actual fund returns where results are less decisive (Exhibit 3, bottom chart).

Exhibit 3
Mutual Fund Returns Sorted by Four Different Concentration Statistics, 1979–2003



Concentration measures: H = Herfindahl Index; H* = normalized Herfindahl Index; G = Gini coefficient; CV = coefficient of variation. The performance quoted represents past performance. Past performance does not guarantee future results. Not intended to represent any product or strategy managed by Lazard. The number of funds in this study is 2,080. The statistical significance for decile 10 minus decile 1: Top chart, H* significant at 10% level and CV at 5% level. Bottom chart, CV significant at 5% level.

Source: Baks, Busse, and Green (2006); Tables 3 and 4

When discussing concentrated portfolios, it is important, in our view, to consider how the highest-weight stocks would perform relative to other portfolios or within the same portfolio. This comparison was made across all four concentration statistics, sorting fund holdings by portfolio weights deciles. That is, the first decile would include the top 10% of stocks by portfolio weight in big-bet funds compared to the top 10% of stocks by weight of diversified funds (Exhibit 4). The data suggest once again that the stock picking ability of concentrated managers seems to add more value than that of more uniformly distributed portfolios.

The study then compared the top and bottom holdings *within* each portfolio. Overall—and perhaps surprisingly—bottom holdings outperformed. However, in the case of big bet funds, this difference was not statistically significant. The dispersion of bottom versus top-holdings performance in diversified funds was wide—suggesting poorer stock-picking. In the authors’ view the general outperformance of bottom-weight holdings may be attributed to a favorable period for smaller, less-liquid stocks, as the high-conviction weights may be subject to constraints to hold more liquid large cap stocks—thereby a period favoring small over large cap can explain this.

Best Ideas

Best Ideas (Cohen, Polk, and Silli, 2010) further explores the notion of evaluating the performance of managers’ high conviction positions. The authors developed a methodology to define a manager’s best idea based on what CAPM alpha is implied from the way a manager has built a portfolio. The stock with the highest estimated alpha will be labeled a “best idea” and then performance tests will be done on grouping individual stocks in a best ideas portfolio. Similar to the other empirical studies, the sample of managers was composed of US equity mutual funds for the period 1984 to 2007.

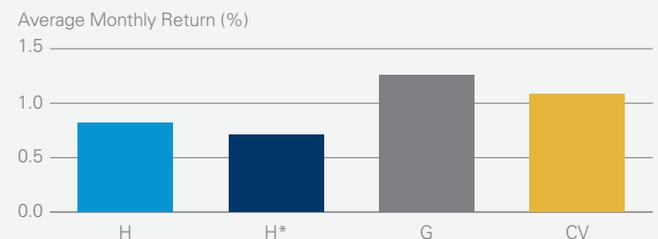
The methodology assumes each manager weights stocks to maximize the portfolio’s Sharpe ratio, which would allow for some simplification for defining a best idea as the stock with the highest expected alpha. Following other assumptions,¹¹ the definition of expected alpha is simplified: requiring only the stock-specific variance and the active weight (“tilts” in the paper) relative to a market portfolio. This is labeled “market alpha” in the paper. A second measure of expected alpha uses the active weights relative to a capitalization-weighted portfolio of the managers’ holdings—this is named “portfolio alpha.” The next part of the methodology would scan the fund universe for best ideas. For a given manager, his/her best idea can involve a very small tilt that would not imply high conviction and could point to a closet indexer. To eliminate this issue, only the top 25% of best ideas across the fund sample are considered for the main findings (this restriction is later softened, for interesting results).

A first takeaway disproves the notion of professional investors chasing “hot stocks” by looking at the distribution of best ideas. At any point over the sample period there could be as many best ideas as there are managers or as few as one—in the unrealistic case where everyone has the same stock as best idea. The researchers found little overlap of best ideas over the entire period. This implies that fund managers’ views differ considerably. Roughly 60% of best ideas do not overlap and less than 18% of best ideas are considered by two managers at the same time.

In terms of performance, best ideas turn out favorably. Best ideas produce positive four and six factor alpha that is statistically significant in most cases.¹² The researchers initially considered only the top 25% of best ideas, however, running the span from all best ideas to the top 5% (i.e., the largest alpha tilts as defined earlier, which would imply the highest conviction positions). Exhibit 5 illustrates how the collection of all best ideas—even if tilts are small—produce good results that are strikingly amplified when one considers the top 5%.

Another facet of performance evaluation in this study compared the best idea for each manager versus the rest of his/her portfolio, for a “best minus rest” spread. Then this was extended to include the three and five best ideas versus the rest of the portfolio. Performance was favorable but declined as lower-ranked ideas were added. We think this highlights a good methodology for ranking top ideas, thus supporting the observation that the size of tilt reflects the manager’s conviction.

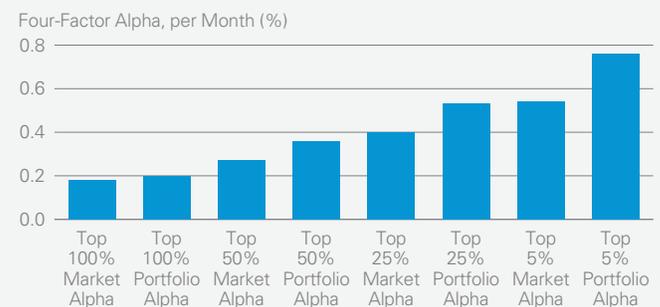
Exhibit 4
Top Holdings’ Performance Difference, Big Bet vs. Diversified Funds, 1979–2003



Concentration measures: H = Herfindahl index; H* = normalized Herfindahl index; G = Gini coefficient; CV = coefficient of variation. The performance quoted represents past performance. Past performance does not guarantee future results. Not intended to represent any product or strategy managed by Lazard. The number of funds in this study is 2,080. Data uses 10% of the biggest bet funds and 10% of the most diversified funds. Statistical significance: H and H* significant at 10% level, G and CV significant at 1% level.

Source: Baks, Busse, and Green (2006); Table 6

Exhibit 5
Performance of Best Ideas, January 1985 to December 2007



Market alpha ranks best ideas vs. the market portfolio; portfolio alpha ranking does so versus the each manager’s portfolio. The performance quoted represents past performance. Past performance does not guarantee future results. Not intended to represent any product or strategy managed by Lazard. The number of funds in 2007 is 1,348 we did not find an indication of the number of unique funds throughout the entire period. Statistical significance: market alpha top 25%, at 10% level. Portfolio alpha top 100%, at 10% level; top 50%, at 5% level; top 25%, at 1% level; and top 5%, at 1% level.

Source: Cohen, Polk, and Silli (2010); Tables 2 and 3

A natural follow up question is: are best ideas more effective in concentrated funds? By sorting funds' level of concentration using the normalized Herfindahl Index, the paper showed results indicating that best ideas in more concentrated funds have better performance, in terms of four and six factor alpha. The authors neatly summarize this intuition, concluding that "...managers who concentrate in the investing sense may also concentrate in the mental sense – that is, they may put greater effort into selecting their best ideas."

Are Concentrated Portfolios Riskier?

In a working paper, *Diversification versus Concentration ...and the Winner is?* (Yeung et al. 2012) the authors examined US equity mutual funds (holding 40 or more stocks) with different styles, asset levels, and client bases. Using quarterly data from 1999 to 2009, the authors created concentrated portfolios by measuring the active weights of each diversified mutual fund (a fund with 40 or more stocks), and then sorting by these active weights. Concentrated portfolios were then built by using the largest active weights, which the authors interpreted as the fund manager's highest conviction stocks. The concentrated portfolios ranged from 5 stocks (top 5 active weights) to 30 stocks (top 30 active weights), and the position sizes were then equal and conviction weighted (more weight attributed to stocks with larger active weight). The results of the conviction-weighted method, in which more weight was attributed to larger active weights, are displayed in Exhibit 6. The findings show that the absolute returns from the concentrated portfolios outperformed the diversified funds from which they were derived as well as their corresponding benchmarks. Additionally, the performance of the concentrated funds improved as they became more concentrated.

Exhibit 6
Concentrated Portfolios Outperformed the Diversified Portfolios from Which They Were Derived

Portfolios	Total Returns (Annualized; %)	Standard Deviation (Annualized; %)	Sharpe Ratio
Top 5	10.77	26.33	0.28
Top 10	9.39	23.40	0.26
Top 15	8.67	21.83	0.24
Top 20	8.12	20.65	0.23
Top 25	7.78	19.79	0.22
Top 30	7.44	19.13	0.21
All Funds	6.30	19.51	0.17
Own Index	5.05	19.96	0.08

For the period 1999 to 2009

The performance quoted represents past performance. Past performance does not guarantee future results. Not intended to represent any product or strategy managed by Lazard. The number of funds in this study is 4,723.

Source: Yeung et al. (2012)

The exhibit also displays that while the standard deviation of the concentrated portfolios increased as the number of holdings declined, so did the corresponding Sharpe ratio, meaning better risk-adjusted results. Another interesting takeaway is that while standard deviation increased as the portfolios became more concentrated, at the 25 to 30 holdings range the standard deviations remained very close to that of the diversified portfolio.¹³

Discussion of Findings

This group of studies evaluated the performance of high-conviction positions drawn from US equity mutual funds for different time periods. In these instances, results suggest that the performance of the highest conviction positions indicate stock picking skill and imply that certain portfolios would do better by holding only these stocks.

Notably, Yeung et al (2012) directly report the volatility of concentrated portfolios, and it is important to consider other risk dimensions. Aggregate volatility over a time period may be comparable between concentrated and diversified funds; however, considerations such as drawdowns can be very important. Drawdowns can cause investors to abandon a strategy, which can impact a long-term investment plan. We did not find such discussions in the articles surveyed, so it appears a compelling topic for more research. But on the subject of risk control, we believe it becomes clear that investors must understand each firm's risk management framework that supports the stock picking activities.

Conclusion

Most studies we reviewed show the efficacy of concentration, but the empirical results for concentrated portfolios are not unanimous. This does not, in our view, invalidate the case for concentration, but it is a reminder that all investment strategies are not meant to work in every instance.

Regarding concentrated strategies, there are many facets for investors to consider, which is to be expected when examining a collection of evidence from empirical studies. Data sources, time periods, investment universes, and methodologies can differ considerably across studies. Perhaps more importantly, there is no consensus on the best metric to assess the degree of concentration; therefore, it is useful to draw upon the multiple approaches in use.

We would emphasize that while it may seem obvious that 20 stocks are easier to research in depth than 200, concentrated investing still requires deep resources, especially careful risk management.

Investing is a complex process where straightforward solutions are rare. With this in mind, concentrated strategies may not be the sole approach to active equity investing, but they can be a very valuable tool for asset allocators.

Additional Studies

We believe this paper covers key studies on the topic. However, there are other related papers, which we briefly address here. Most of the methodologies in the papers that follow share some similarities with the ones we have discussed elsewhere. Of note, we found at least a couple of instances where concentration was used to imply a concentrated exposure to a systematic factor (e.g., sector), thereby measuring concentration through tracking error. While we sought to explore concentration in the sense of portfolio holdings and weights, it remains important to discuss other interpretations of the term “concentrated.”

- **Brands, Brown, and Gallagher** (2005) study concentration for Australian equity funds from 1995 to 2001. Results are favorable for more concentrated funds—concentration is positively related to benchmark relative returns as well as one and four factor alpha measures.
- **Ely** (2014) compared data from institutional managers based on the number of holdings and using eVestment data. More concentrated managers perform better in both US and international equity universes.
- **Huij and Derwall** (2011) examine global equity funds, defining concentration via higher tracking error (i.e., as an exposure rather holdings/weights). Higher tracking error funds outperform low tracking error funds, and this is enhanced when funds have more “breadth” in terms of positioning related to style and country factors.
- **Ivkovic et al.** (2004) studied performance of individual investors based on brokerage account data. Households with more concentrated portfolios showed evidence of better stock selection than households owning more stocks.
- **J.P. Morgan** (2014) documents individual stock performance for all companies that have been members of the Russell 3000 Index from 1980–2014. The findings indicate that 40% of stocks have experienced a “catastrophic” decline; defined as a 70% decline from peak value with minimal recovery. We think these results highlight the importance of some degree of diversification and careful risk management.
- **Nielsen et al.** (2012) found that higher tracking error funds outperform low tracking error funds for global equity funds.
- **Sebastian and Attaluri** (2014) find that higher conviction strategies show greater skill, and also provide a short summary table on high-conviction articles. Interestingly, this paper also calls for high-conviction from investors (i.e., asset allocators seeking active strategies should seek truly active ones).
- **Wermers** (2003) found that mutual funds taking bigger bets—as measured by larger benchmark-relative risk—are generally compensated for undertaking these bets.

Appendix

Formulas

Fundamental Law of Active Management

$$IR = IC \cdot \sqrt{B}$$

Concentration Coefficient

$$CC_t^P = \left(\sum_{i=1}^N (w_{i,t}^P)^2 \right)^{-1}$$

Herfindahl Index

$$H = \sum_{i=1}^N w_i^2$$

Industry Concentration Index

$$ICI_t = \sum_{j=1}^{10} (w_{j,t} - w_{market_{j,t}})^2$$

Normalized Herfindahl Index

$$H^* = \frac{H - \frac{1}{N}}{1 - \frac{1}{N}}$$

Gini Coefficient

$$G = \frac{\sum_{i=1}^N \sum_{j=1}^N |w_i - w_j|}{2N^2 \cdot \mu(w_i)}$$

Coefficient of Variation

$$CV = \frac{\sigma(w_i)}{\mu(w_i)}$$

Search Criteria

The principal source for articles was the reference section of the papers we have cited. However, we also searched for the terms “concentrated portfolios” and “portfolio concentration” in the sources indicated next. We relied on the first group of results only in each case, as we noted little relevance to the topic beyond the default number of results.

- The Journal of Finance
- Journal of Financial Economics
- The Review of Financial Studies
- Journal of Financial and Quantitative Analysis
- Financial Analysts Journal
- SSRN
- Google Scholar
- Institutional Investor Journals
- Factiva

Diversification and the Number of Stocks

The table below illustrates how the portfolio standard deviation declines significantly from the first to the tenth stock. After this the rate of risk reduction slows down significantly. Keep in mind these calculations are hypothetical; they are based on the theoretical calculation for portfolio standard deviation, use assumptions for standard deviation and correlation, and do not take into account any transaction costs.

Hypothetical Portfolio Risk Reduction

Number of stocks	Portfolio Standard Deviation (%)
1	49.2
2	36.2
3	30.6
4	27.4
5	25.3
6	23.8
7	22.6
8	21.7
9	21.0
10	20.4
20	17.5
30	16.4
40	15.8
50	15.4

The calculations assume the standard deviation for a single stock is 49.2% and the average correlation between individual stocks is 0.08 and the portfolio is equal weighted. The assumptions are described in Statman (2004), which draws from various other papers.

This information is for illustrative purposes only. Not intended to represent any product or strategy managed by Lazard.

Source: Lazard

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Notes

- 1 MFS. "America's First Mutual Fund: A guide for long-term investors." October 2014
- 2 Chambers and Dimson (2012)
- 3 We counted the number of common stocks shown in annual letters. Source: <http://www.hedgefundletters.com/graham-newman/>
- 4 See Markowitz (1952)
- 5 See the Appendix for a brief explanation on these results.
- 6 Important practical portfolio constraints on the results of the Law are discussed in Clarke, de Silva, and Thorley (2002).
- 7 To get a sense of the practical values that can be attained for IC, Siegel and Scanlan (2014), mention that based on history an IC of 0.05 would be reached by the very best managers, with most falling below this value.
- 8 The five groups are: closet indexers, moderately active, factor bets, concentrated, and stock pickers. Importantly, "concentrated" in the study's context was applied to funds in the highest tracking error quintile that were also in the highest active share quintile, and not in the context related to the number of holdings. These funds are thought to be stock pickers which concentrate in one particular industry, thus the higher tracking error.
- 9 See AQR "Deactivating Active Share."
- 10 To complement their four-factor analysis, the authors conducted the characteristic and timing-based attribution described in "DGTW." (DGTW = Daniel, Grinblatt, Titman, and Wermers, 1997)
- 11 Simplifying assumptions include: the aggregate market risk aversion and each manager's risk aversion is the same, and each fund has a beta of 1.
- 12 The six-factor model used by the authors adds a high versus low volatility factor and a short-term reversal factor to the traditional four-factor model. We present only four-factor results, as the six-factor model is not widely used.
- 13 This study is discussed in greater detail in our Investment Focus, Less Is More: A Case for Concentrated Portfolios.

Important Information

Published on 14 September 2017.

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