

FOCUSED EQUITY PORTFOLIOS ARE UNDER-DIVERSIFIED

Some individual investors prefer focused equity portfolios over broad-market portfolios of hundreds or thousands of stocks. Since passive, broad-market portfolios are expense and tax efficient, the pursuit of alpha (risk-adjusted excess return) through skilled stock selection must be the main rationale for owning a more concentrated equity portfolio.

But true alpha is rare in public equities, even among professional investment managers before fees. In [Manager Performance and Persistence](#), we found only about 3% to 4% of investment managers produced non-random, positive gross alpha (before fees), and that past gross alpha did not reliably persist into the future. We found no evidence of non-random, positive net alpha (after fees). These results undermine the justification for holding focused equity portfolios, especially when broader diversification is readily available and cost-effective.

Conventional wisdom holds that a diversified equity portfolio can be achieved with just 20 to 30 stocks. This belief is based on the observation that the majority of volatility risk (standard deviation) is reduced when portfolio holdings reach 20 to 30 stocks. We will show that the conventional wisdom is flawed by evaluating multiple dimensions of risk relative to the opportunity cost – a passive, broad-market portfolio.

In addition to standard deviation, we evaluate drawdown risk and active risk (tracking error) by portfolio size (number of holdings). And perhaps more importantly, we investigate the spread of potential outcomes across risk statistics, rather than just focusing on the average outcome. This is a critical perspective of risk because there is significant variation in the returns of different 20 to 30-stock portfolios. This variation is driven by differences in sector exposures, risk-factor exposures (size or style biases), and idiosyncratic security risks across different 20 to 30-stock portfolios. For example, behavioral biases (e.g., familiarity and recency biases) may lead some individual investors to overweight large-cap growth stocks in the technology sector, reducing diversification and increasing the risk of an adverse outcome relative to the average 20 to 30-stock portfolio.

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Our sample includes all S&P 500 constituents from the 20-year period ending December 2021.¹ We use the S&P 500 as our sample universe because individual investors tend to build focused equity portfolios with well-known, U.S. large-cap stocks. For each portfolio size, we randomly select that number of stocks from the S&P 500 constituents available at the beginning of the sample period. For stocks that fall out of the S&P 500, a replacement stock is randomly selected from S&P 500 constituents at that point in time. This is done until there is a complete 20-year history for each stock in the portfolio, which is then equal-weighted using monthly returns. We run 5,000 simulations for each portfolio size. We evaluate portfolios formed with one to 30 stocks, and compare them to the standard capitalization-weighted S&P 500 and a version of the S&P 500 that equal weights its constituents.

Consistent with conventional wisdom, Exhibit 1 shows that the vast majority of average volatility reduction across simulations is achieved with just 20 to 30 stocks. The standard deviation of the average 30-stock portfolio is 17.9%, which is close to the 17.1% standard deviation of the equal-weighted S&P 500 (S&P 500 EW).

Importantly however, the standard deviation of the capitalization-weighted S&P 500 is materially lower at 14.6%. And it provided the highest risk-adjusted return (efficiency),² a result that is consistent with efficient-market theory. This suggests that both the number of holdings and their respective weights matter for diversification and efficiency.

EXHIBIT 1 – AVERAGE VOLATILITY AND EFFICIENCY BY PORTFOLIO SIZE

Number of Stocks	Standard Deviation	Efficiency
1	31.4%	0.43
5	21.1%	0.59
10	19.3%	0.63
20	18.2%	0.67
30	17.9%	0.67
S&P 500 EW	17.1%	0.69
S&P 500	14.6%	0.70

The average volatilities in Exhibit 1 do not tell the full story of risk for focused equity portfolios. As noted, differences in sector, factor, and idiosyncratic risks can drive significant variation in the returns of different focused equity portfolios of equal size. Exhibit 2 shows volatility by percentile outcome (quantile) across the distribution of all simulated outcomes. The median (50%) volatility outcomes by portfolio size are nearly the same as the averages in Exhibit 1. But the higher volatility quantiles (75% and 95%) show even more potential volatility risk across different focused equity portfolios of equal size. And all quantiles displayed in the table show more volatility risk than 14.6% of the S&P 500. In fact, less than 1% of our simulation results produce volatilities that are below that of the S&P 500.

1 Data from Bloomberg.

2 Efficiency is the arithmetic mean return divided by standard deviation.

EXHIBIT 2 – SPREAD OF VOLATILITIES BY PORTFOLIO SIZE

Number of Stocks	5%	25%	50%	75%	95%
1	18.2%	24.0%	30.2%	36.9%	48.7%
5	16.1%	18.8%	20.9%	23.0%	26.7%
10	15.9%	17.8%	19.1%	20.7%	23.0%
20	15.9%	17.2%	18.2%	19.2%	20.7%
30	16.0%	17.1%	17.9%	18.7%	19.9%

A second perspective of risk is the maximum drawdown over the 20-year period. Exhibit 3 displays the spread of drawdowns by portfolio size. Consistent with the volatility results, the spread of potential drawdowns tightens as more stocks are added to the portfolio. All of the median drawdown outcomes by portfolio size are more acute than the -50.9% drawdown of the S&P 500. And the lower drawdown quantiles (5% and 25%) show much more potential drawdown risk across different focused equity portfolios of equal size.

EXHIBIT 3 – SPREAD OF DRAWDOWNS BY PORTFOLIO SIZE

Number of Stocks	5%	25%	50%	75%	95%
1	-97.0%	-85.4%	-69.9%	-54.2%	-34.4%
5	-76.3%	-65.1%	-57.1%	-48.9%	-38.6%
10	-70.4%	-61.7%	-55.7%	-49.6%	-41.5%
20	-66.0%	-59.6%	-55.2%	-50.9%	-44.8%
30	-63.9%	-58.9%	-55.2%	-51.7%	-46.4%

Our third perspective of risk is active risk, or tracking error. It is a measure of return dispersion relative to a benchmark, or opportunity-cost investment (the S&P 500 here, which has an active risk of 0.0% by definition). Active risk is greatly reduced as the portfolio expands from one stock to 30 stocks. But there remains a lot of residual active risk with the 30-stock portfolio. Its 7.0% median active risk is materially higher than the 5.0% active risk of the average actively-managed mutual fund benchmarked against the S&P 500.³ The number of stocks needs to increase to more than 100 to approach the average fund's active risk. And again, the higher active-risk quantiles (75% and 95%) show even more potential active risk across different focused equity portfolios of equal size.

³ The average fund's active risk is based on 207 actively-managed mutual funds benchmarked against the S&P 500 with returns from Jan. '02 through Dec. '21.

EXHIBIT 4 – SPREAD OF ACTIVE RISK BY PORTFOLIO SIZE

Number of Stocks	5%	25%	50%	75%	95%
1	16.2%	20.4%	25.4%	31.9%	42.9%
5	9.8%	11.4%	12.9%	14.7%	18.0%
10	7.8%	8.9%	9.8%	11.0%	13.0%
20	6.3%	7.1%	7.8%	8.6%	9.9%
30	5.8%	6.5%	7.0%	7.7%	8.7%

All three perspectives of risk – standard deviation, drawdown, and active risk – show that focused equity portfolios are under-diversified relative to passive, broad-market portfolios. The risk of focused equity portfolios is even greater when considering the spread of potential outcomes across different portfolios of the same size. Concentration risk is uncompensated when alpha is unreliable, while passive, broad-market portfolios are more diversified, and expense and tax-efficient.

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