

Investment Diversification

By Steve Valentor

“We think diversification, is, as practiced generally, makes very little sense for anyone who knows what they’re doing.” – Warren Buffett



This is a stark contrast to what is taught at virtually every business school. By constructing portfolios consisting of an increasing number of securities with varying correlations and business cycles, we can effectively eliminate diversifiable, firm-specific risk. Some refer to this with the folksy adage of investing in ice cream and umbrellas. On nice days, people buy ice cream. On rainy days, they buy umbrellas. If you own stock in both companies, you have likely reduced the risk due to the weather.

But this security comes at a cost. Diversification, like any hedge, will almost certainly protect against downside risk by trading away some upside potential. As Buffett also points out, diversification may simply be a protection against ignorance.

The astute money manager might pay attention to the number of sunny days compared to rainy days and balance their portfolio accordingly. They might want to adjust the portfolio mix seasonally. It is likely that less ice cream is sold in the winter. It is also likely that fewer umbrellas are sold in the winter. These seasonal, cyclical trends may well already be present in market prices.



Buffett would expect his managers to know that there is a coming surge of *Sesamia inferens* populations. This insect infestation will likely reduce sugar production by as much as 50%. This will drive up the cost of sugar, increase the cost of ice cream, and reduce profits for ice cream manufacturers accordingly. An astute fund manager may sell their ice cream shares, short additional ice cream stocks to earn profit as the stocks inevitably fall, then repurchase at a lower price before next season.

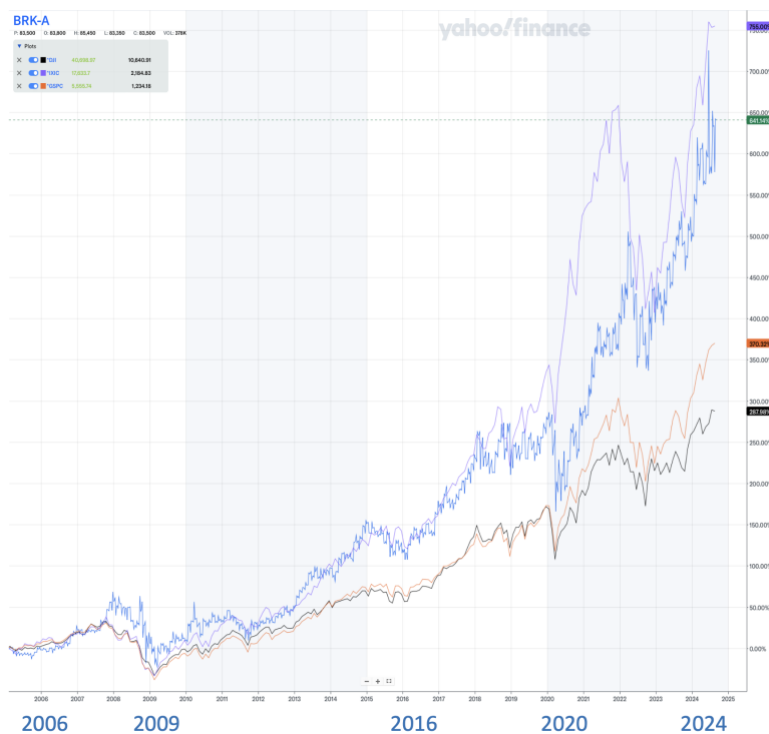
Most investors are unlikely to delve into this level of detail. Similarly, I doubt that owners of BRK.A (Berkshire Hathaway stock) are paying that level of attention to the 47 publicly traded firms in which BRK.A has a sizable interest, or the 71 private companies that it owns outright. Indeed, Berkshire has interests in bricks, insurance, underwear, jewelry, paint, financial services, real estate brokerage, clothing, energy, banking, furniture, food, beverage, construction, consumer goods, aerospace, business jets, sports equipment, consumer electronics, shipping, pharmaceuticals, communications, entertainment, and believe it or not – investment companies. More generally, Berkshire Hathaway can be categorized as holding significant positions in insurance, shipping, energy, manufacturing, distribution, and banking.

Would an investor who does not have intimate knowledge of each of these businesses be ignorant? Perhaps. But the owner of shares of Berkshire Hathaway certainly does not bear substantial specific risk.

Another famous quote from Warren Buffett is his rule number 11 “Do you understand how the product works?”

Interestingly Berkshire does not have substantial interests in medical services, semiconductors, alternative energy (including nuclear), electric vehicles, or defense. All are growth industries with many expert leaders available to guide competitive companies. They are difficult to understand.

So, is Berkshire diversified? At the corporate level, I would say “Yes.” An investor who owns BRK.A does indeed enjoy a portfolio with diverse correlations and unrelated business cycles.



Each of its companies is optimized to operate at the highest levels within their respective business segments. Each is managed by experts in their fields and certainly that they know which “insects” might influence production costs.

The chart shows that over the past 17 years, Berkshire outperformed both the DOW and the S&P 500, but fell short of the tech-heavy NASDAQ. BRK.A famously avoids tech stocks, perhaps because of their volatility.

Each of these plots can be described as a random walk with a positive skew. It is intuitive that

they are all subject to the same systemic risk. In 2008, all were equally squelched by the mortgage-backed-securities financial crisis. Moving forward, in 2011 they were all subject to Black Monday when S&P reduced the credit rating of the US government. In 2016, Brexit, the surprise election of Donald Trump, and a record dip in oil prices caused a systematic flattening. This was followed by a rapid rebound.

Between 2020 and 2023, COVID-19 shocked worldwide markets uniformly causing proportional declines in virtually all issues. This was followed by a systemic recovery, resulting in record highs.

What is the magic that diversification performs that causes these dissimilar portfolios to move in relative unison? There is math behind it. It turns out that reducing risk through diversification does not reduce projected returns. So what specifically is Warren Buffet's concern. It may depend on the type of diversification. More on that later. First let's prove that diversification reduces risk with no effect on expected returns.

When we construct a portfolio p , consisting of n assets, the expected return of a portfolio can be calculated as the sum of the weighted average of the expected returns of all of the individual assets in the portfolio.

$$E(r_p) = \sum_{i=1}^n w_i E(r_i)$$

The risk is measured as the variance or volatility associated with each asset. This is the square of the standard deviation. Volatility has two components. All assets are exposed to systemic risk which is measured through the commonly available, published parameter β for each asset. This captures sensitivity to the market average. This risk will always be present and cannot be reduced through diversification. We can ignore it for this discussion.

The one that we can reduce through diversification is the variance that is unique to each asset and is called idiosyncratic risk. This risk is given by the following formula.

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i^2 \sigma_i^2 + w_j^2 \sigma_j^2 + 2w_i w_j Cov(E_i, E_j)$$

Where E_i and E_j are the expected returns of assets i and j as part of a portfolio.

The math required to calculate the impact of the various weights of each portfolio component becomes quite complicated as the number of stocks increases. It can be easily solved with computer software or a spreadsheet.

For simplification, we can assume that each weighting is equal, and each asset makes up $1/n^{\text{th}}$ of the portfolio. We can replace w^2 with $1/n^2$ and the risk then becomes:

$$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n \frac{1}{n^2} \sigma_i^2 + \frac{1}{n^2} \sigma_j^2 + 2 \frac{1}{n^2} Cov(E_i, E_j)$$

Simplifying:

$$\sigma_p^2 = \frac{1}{n^2} \sum_{i=1}^n \sum_{j=1}^n \sigma_i^2 + \sigma_j^2 + 2Cov(E_i, E_j)$$

We can now see that idiosyncratic or firm-specific risk is reduced with the square of n . In fact, for a portfolio containing only 10 assets, diversifiable risk is reduced by 99% because $1/10^2$ is .01. When risk is multiplied by .01, it is reduced by 99%. A portfolio containing 30 diverse assets has its risk reduced by $1/30^2$, or $1/900$. Risk would be reduced by 99.9%.

Let's examine what effect diversification has on the expected return of the portfolio. If we substitute $1/n$ for w_i as we did to calculate risk, we get:

$$E(r_p) = \sum_{i=1}^n \frac{1}{n} E(r_i) \quad \text{or} \quad E(r_p) = \frac{1}{n} \sum_{i=1}^n E(r_i)$$

We saw that as the number of securities in a portfolio increases. At first glance, it might appear that expected returns might be reduced when they are divided by n . This is not the case because when we complete the summation on the right side of the equation, we have exactly the sum of n terms on the right side. The n in the denominator simply results in the average of the returns from each of the portfolio constituents. This is a proof that diversification to reduce risk does not affect expected returns.

It is true that the returns of the best securities in the portfolio will be diluted by those that did not perform as well.

In 1885, Andrew Carnegie advised students at a college in Pittsburgh. He said **“Don't put all your eggs in one basket is all wrong. I tell you put all your eggs in one basket, and then watch that basket.”**



This is the point, I believe, that Warren Buffett is making when he discourages diversification. It is likely that Buffett would advise to own one insurance company and make it more productive than its competitors rather than owning an index of insurance companies that compete with each other.

Berkshire's holdings are clearly diversified among unrelated industries. This is due at least in part to the sheer size of Berkshire. If they owned more insurance companies, they may well have a monopoly and the performance of their best company would be diluted by all of the others. Their philosophy is to reduce idiosyncratic risk through expert management and to demand superior performance of their companies within their industries.

Now recall the four example portfolios in the graph above, BRK.A, S&P 500, DJIA, and the NASDAQ Composite. The NASDAQ outperformed BRK.A over a 15 year period.

It becomes apparent that they all have similar exposure to systemic risk. While Berkshire normally avoids tech stocks, they did own a substantial amount of Apple. This year, they reduced their holdings by 55.8%. No reason was given for the sale, but Buffett did praise Apple as a better company than American Express or Coke.

It could be that since Berkshire started acquiring Apple stock in 2016, they have invested \$15.9 billion and have seen gains of 472%. Perhaps they are simply rebalancing their portfolio, or realizing the gains while capital gains tax rates are still favorable. Perhaps they feel that Apple's price to earnings ratio does not have as much head room going forward as it did in the recent past.

One final thought on diversification. We showed mathematically that the expected return of each stock in a diversified portfolio is not reduced through diversification. The potential return for the entire portfolio is reduced through diversification within industry segments. If an investor were able to limit their investments to only the issues that would go on to deliver the greatest returns, they clearly would have done better.

For a passive investor, diversification seems as if it may be the preferred strategy. If the investor is an activist however, they will exert influence on the management and operation of the companies in which they invest. This is especially true for venture capitalists making investments in new companies.

It is likely that the founders of startup companies would benefit not only from financial contributions that a VC can provide, but also from their guidance and experience as seasoned entrepreneurs. This increase in the probability for success is of the highest importance to investors with longer horizons who require returns that historically exceed those available in the public markets. Banks, universities, family offices, insurance companies, retirement funds, and corporate investors require these alternative investments to achieve returns necessary to accomplish their missions and at the same time exceed inflation to perpetuate their funds.

Active management can make a significant impact. This is what we offer at Polynomial Ventures. We provide wealth management with actively managed alternatives to accredited investors. Check us out at polynomial-vc.com.

Steve Valentor is a 40-year technology industry veteran who has worked in computer engineering, semiconductor R&D and software development for companies ranging from startups to the Fortune 200. He has held positions from entry level engineer to senior technical management, CEO and board chair. Currently the president of Polynomial Ventures and an adjunct professor at DePaul University, Valentor holds an M.B.A. in finance and a B.S. in math, both from the University of Illinois at Chicago.

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