BALLAST EQUITY MANAGEMENT, LLC

STABLE INVESTING IN GOOD WEATHER AND BAD

Volatility – A Key Hurdle to Building Long-Term Wealth

"If I lose 20% of my money this year, but I'm up 20% next year, I'm back to even, right?"

At first glance, this may seem correct, but it doesn't accurately reflect the effect of losses on an investment portfolio. Understanding the difference between arithmetic and geometric returns and how they relate to portfolio value is essential to understanding what volatility means to your long-term investment success.

Consider a $100,000 portfolio that experiences a 15% decline this month and a 15% rebound next month, producing an arithmetic return of zero. You might think that a return of zero means your portfolio value didn't change. But in reality, the geometric return determines any increase or decrease in wealth. This $100,000 portfolio fell to $85,000 due to the 15% drop. It then rebounded 15%, which took the value to just $97,750, for a loss of $2,250 (or -2.25%). ***A loss followed by the same percentage gain does not return a portfolio to its original value. Instead, any loss requires an even larger gain to break even.***

Arithmetic Return = (r1 + r2 … + rn) / n = (–15% + 15%) / 2 = 0%
Geometric Return = (r1 ∗ r2∗ … rn) –1 = (0.85 ∗ 1.15) –1 = –2.25%

Building wealth is a marathon, not a sprint and many investors don't appreciate how volatility negatively affects the stamina of their portfolios. Compound returns are "dragged down" by high levels of downside volatility to the point that overall results can be negative even with a high arithmetic return. In this paper, we hope to help investors understand the detrimental effect volatility can have on creating long-term wealth.

Volatility Drag

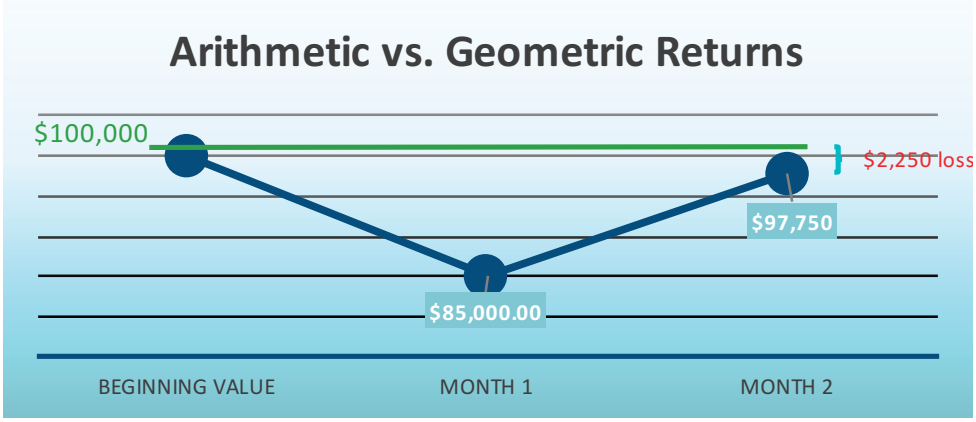
Let's first review the concept of volatility drag. In simple terms, volatility drag is defined as the additional expected return required to justify an increased level of volatility in a portfolio. It represents yet another hurdle that investors must overcome in order to build long-term wealth. Volatility drag is approximated as one half of the volatility squared, as shown in the following equation:

Volatility Drag = -0.5 * (Volatility)2

As volatility increases, the drag it imposes accelerates. Consider the following two portfolios:

- Portfolio A has volatility of 10%, and thus is expected to have a volatility drag of -0.5%.
- Portfolio B has volatility of 25% and an expected volatility drag of -3.2%.

Figure 1



All other factors being held equal, an increase from 10% volatility to 25% volatility decreases a portfolio's growth rate by 2.7% annually. In other words, you would need an additional 2.7% in expected annual return to justify the increased level of volatility.

When comparing two portfolios with the same average return, the one with the greater volatility, or variance, will have a lower compound return, all other things being equal. below sums up the impact volatility has on a portfolio. As you can see, the higher the portfolio volatility, the greater the performance hurdle. Since the relationship between portfolio returns and volatility is exponential, it does not take much of an increase in volatility to have a meaningful detrimental impact on portfolio returns.

1Volatility Drag = −0.5∗(.10)2 = −0.5%

So, where does "volatility drag" come from? Given a series of returns, the difference between the geometric mean and the arithmetic mean of that return series represents "drag." This "drag" occurs because the return in any given year is not independent of the returns in other years. If you have a sizeable loss in one year, you have less capital to generate returns going forward.

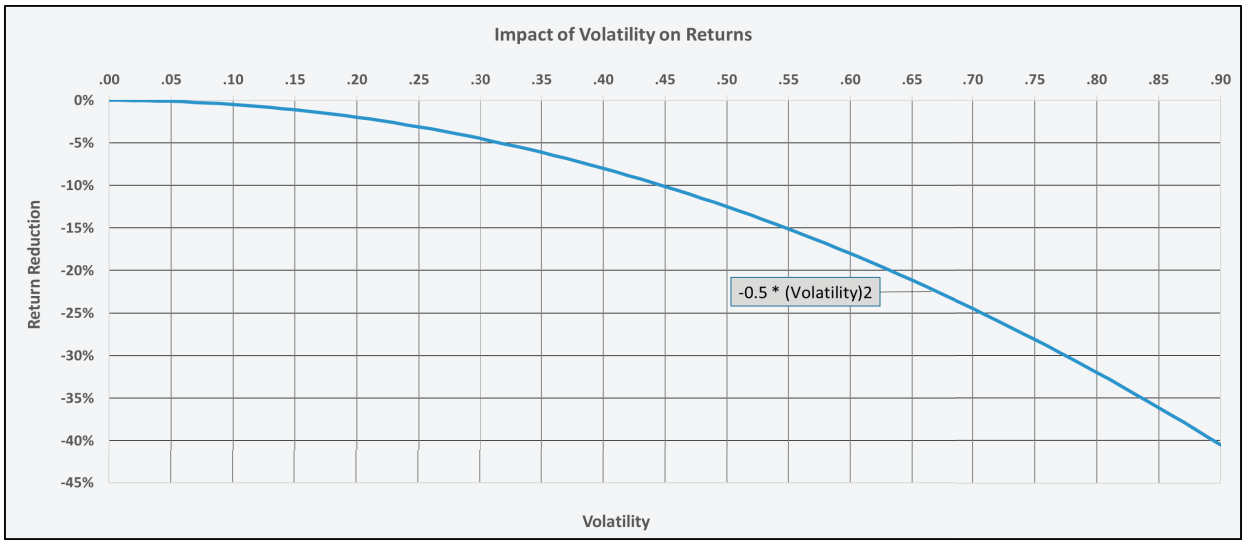
Figure 2

	Volatility	Beginning Portfolio Value	Year 1 Return	Year 2 Return	Ending Portfolio Value	**Volatility Drag**
Portfolio A	10%	$100,000	-10%	10%	$99,000	**-0.50%**
Portfolio B	25%	$100,000	-25%	25%	$93,750	**-3.20%**
Performance Impact					($5,250)	**-2.70%**

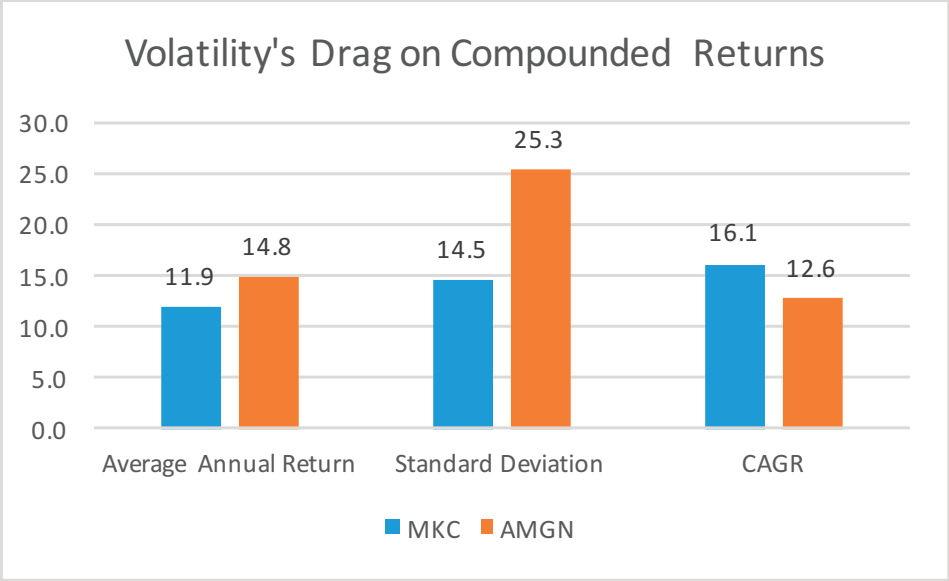
Consider the following real world example, where we look at historic returns for two companies: Biotech darling Amgen (AMGN) and spice manufacturer McCormick & Co. (MKC).

The first set of bars shows the average annual arithmetic returns for both companies over the last 10 years. At first blush, it appears that Amgen would have been the better holding as its excess arithmetic return is almost 300 basis points annually. However, arithmetic returns do not take into account how those returns were generated. Recall, returns are not independent

Figure 3



Source: Ballast Equity

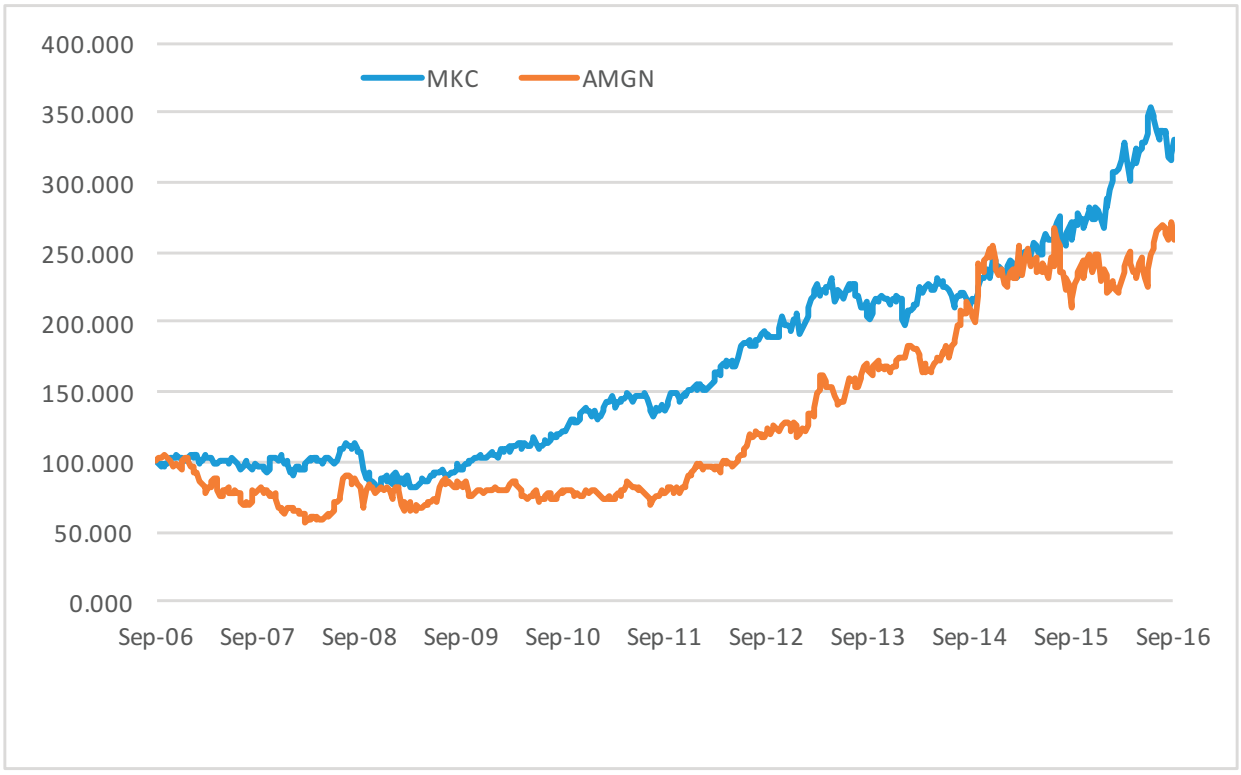


Source: Factset and Ballast Equity (data represents 10 years through Sept 30, 2016)

of one another. Any loss reduces the amount of capital available to generate returns going forward. Amgen is significantly more volatile than McCormick, as evidenced by the higher standard deviation. So much so, that the geometric return (represented by the compounded annual growth rate or CAGR) is much higher for the boring spice company. In the chart below, we see how, over time, the effects of compounding enable McCormick to generate greater returns for investors with significantly less volatility.

Upside and Downside CaptureRatios

This concept also applies to portfolios. You will often hear investment managers use the terms upside capture ratio and downside capture ratio when discussing their portfolios. This is a statistical measure of managers' overall performance in up and down markets relative to their benchmarks. By



Source: Factset and Ballast Equity (data represents 10 years through Sept 30, 2016)

comparing how managers perform versus an index in up and down markets, we can begin to get a sense for how much risk they are taking on in their portfolios. The upside capture is calculated by dividing a manager's returns by the index's returns on up days, and multiplying by 100. For downside capture we divide the managers' returns by the index's returns on days when the index is negative.

$$\text{Upside Capture Ratio} = \frac{\text{Manager Returns (up index days)}}{\text{Benchmark Returns (up index days)}} \times 100$$

An upside capture ratio above 100 means that, on average, the manager has outperformed the benchmark on days when the returns were positive. Conversely, a downside capture ratio above 100 indicates that the manager underperformed the benchmark on down days.

A New Way to Invest

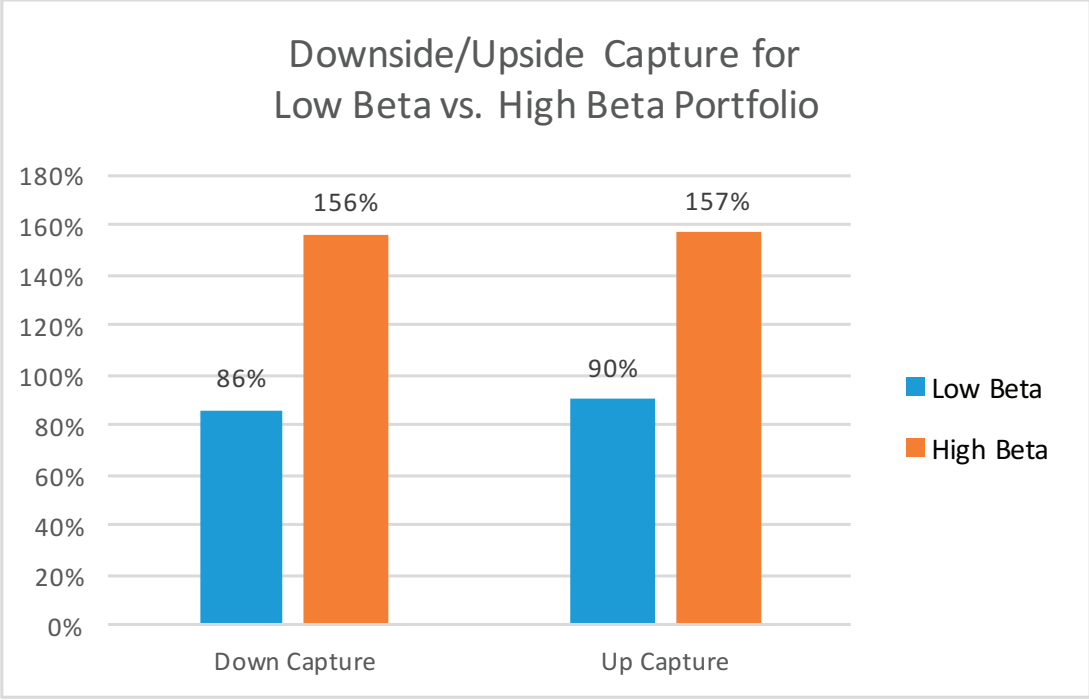
The concept of low volatility investing is not new. Various studies – some dating back to the 1970s –argue the merits of adopting this investment strategy. (Refer to the Appendix at the end of this paper for studies we find particularly instructive.)

One of the more compelling arguments comes from Ang, Hodrick, Xing and Zhang, who found that stocks with high idiosyncratic (stock-specific) volatility tended to have normal returns during both U.S. and international bull market periods, but lower returns during bear market periods or recessions. On average, the returns were negative, earning -0.02% per month during the 1963 to 2000 study period (Ang, et al., 2006). The pattern of negative returns associated with the volatility factor was also noted by Xiaowei Kang, who found that portfolios tilted to low-risk securities had higher returns than those tilted to high-risk stocks (Kang, 2012).

In "The Volatility Effect: Lower Risk Without Lower Return," Blitz and van Vliet (2007) present empirical evidence that stocks with low volatility earn high risk-adjusted returns. Global low volatility decile portfolios had an annual alpha advantage of 12% over high volatility decile portfolios during the study's 1986-2006 time frame (Blitz, et al., 2007).

The concept of low volatility investing has been gaining traction with investors. Within the broad low volatility category, the current flavor of the month appears to be "smart beta" strategies, which attempt to capture investment factors or market inefficiencies in order to deliver risk-adjusted returns above traditional

Figure 4



Source: S&P and Ballast Equity

capitalization-weighted indexes. One such alternative weighting scheme focuses on targeted volatility. S&P has attempted to capitalize on this trend through the introduction of its Low Beta US Index and S&P 500 High Beta Index.

Figure 4 illustrates the downside and upside capture of the two indexes compared to the S&P 500 Index.

Much like the Amgen/McCormick example presented earlier in this paper, in Figure 5 below, we see that the S&P Low Beta US Index has outperformed the S&P 500 High Beta Index over time with less volatility. These historical results are just one more piece of evidence supporting a case for low volatility investing. From individual stocks like Amgen and McCormick, to a widely used index like the S&P 500, to the numerous pools of US and international stocks evaluated in academic studies, the evidence for low volatility investing is quite persuasive.

that volatility creates on investment returns can assist investors in making better allocation decisions and put them on a smoother path toward achieving their long-term financial goals. As we said at the beginning of this paper – investing is a marathon, not a sprint. Minding the hurdles, particularly volatility, will help ensure you cross the finish line!

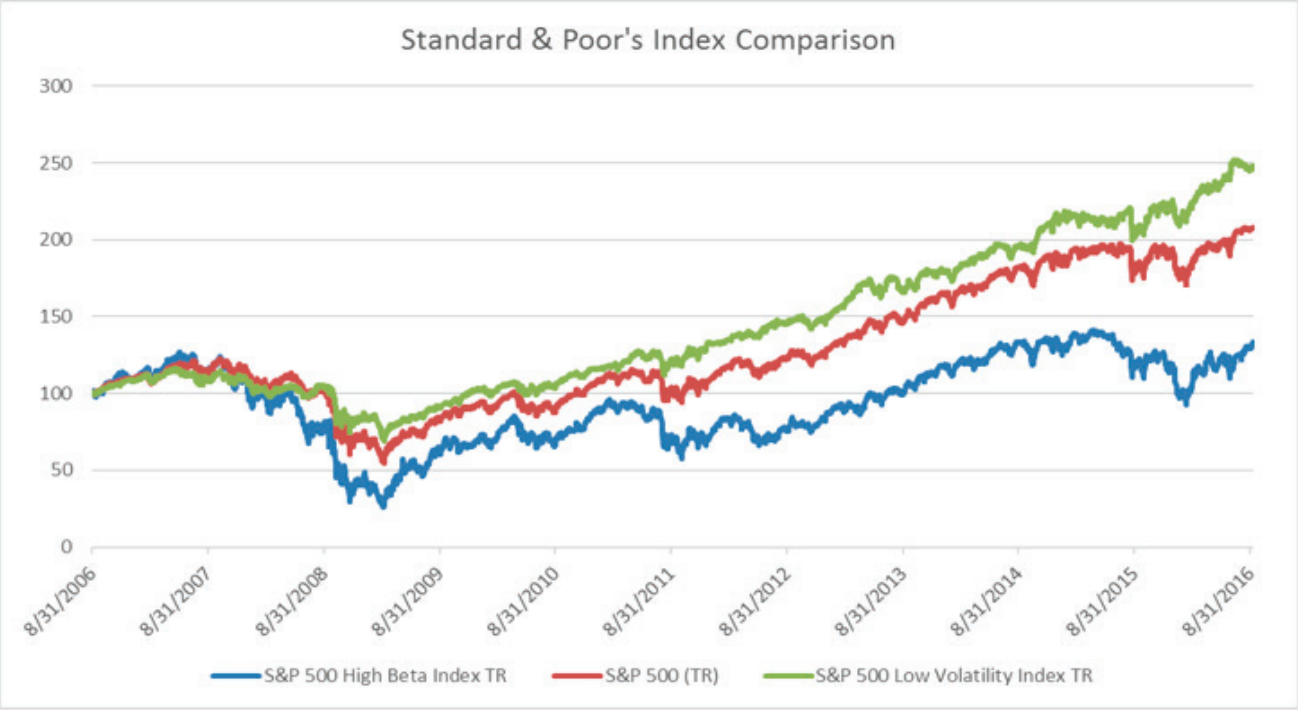
Appendix

Low Beta and Low Volatility Studies

- "Benchmarks as Limits to Arbitrage: Understanding the Low Volatility Anomaly," Malcolm Baker of Harvard Business School and co-authors Brendan Bradley of Acadian Asset Management and Jeffrey Wurgler of NYU Stern School of Business found that selectively investing in portfolios of either low-beta or low-volatility stocks over the 41-year period spanning 1968 through 2008 would have resulted in annualized alphas of 2.6% and 2.1%, respectively. The swings these portfolios experienced were also far less extreme than those of the broader market.

Based on the study, "low-volatility and low-beta

Figure 5



Conclusion

There is no shortage of hurdles on the path to successful long-term investing. Added volatility need not be one of those hurdles. Understanding the drag

portfolios offered an enviable combination of high average returns and small drawdowns. This outcome runs counter to the fundamental principle that risk is compensated with higher expected return." The study's authors state, "We believe that the long-term outperformance of low-risk portfolios is perhaps the greatest anomaly in finance. Large in magnitude, it challenges the basic notion of a risk-return trade-off. Blitz and van Vliet (2007) present empirical evidence in their paper, "The Volatility Effect: Lower Risk without Lower Return" that "stocks with low volatility earn high risk-adjusted returns. The annual alpha spread of global low versus high volatility decile portfolios amounts to 12% over the 1986-2006 period." (Blitz, et al., 2007)

- Frazzini and Pedersen (2014) demonstrate in their paper, "Betting Against Beta," that the beta anomaly also exists in other classes such as Treasury bonds, corporate bonds, and futures (Frazzini, et al., 2014). They also find that the beta anomaly exists in 19 other developed stock markets from January 1989 to March 2012.

- Haugen and Baker (1996) in "Low Risk Stocks Outperform within All Observable Markets of the World" concluded that stocks with lower risk have higher expected and realized rates of return than stocks with higher risk, and the results seem to reveal a major failure in the Efficient Markets Hypothesis (Haugen, et al., 1996).

- Clifford Asness, Andrea Frazzini, and Lasse H. Pedersen (2013) in their paper, "Quality Minus Junk," define a quality security as "one that has characteristics that, all-else-equal, an investor should be willing to pay a higher price for: stocks that are safe, profitable, growing, and well managed." The study's authors found that "high-quality stocks have historically delivered high risk-adjusted returns while low-quality junk stocks delivered negative risk-adjusted returns." (Asness, et al., 2013)

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