

## ABR Dynamic Funds' Portfolio Construction Series: Part 4

### *Measuring and budgeting risk*

Most investors reject the notion of “market timing,” even though many of those same investors time the market but just call it “keeping dry powder” or “moving into defensive sectors.” At the end of the day, does it really matter what label is given to a particular investment behavior, so long as it works? **This installment will explain how, over the past 70 years, measuring the amount of RISK in an investment has been much more effective than just measuring the amount of MONEY in an investment.** And the key measure of risk is volatility.

This installment is organized into two sections, prefaced by our best definition of risk – volatility – which is a necessary step in setting a fixed amount of risk. The first section will provide an abbreviated calculation of risk using both volatility and another popular method, along with a comparison of the results. It will also contain some general observations of the strengths and weaknesses of volatility as a measure of risk. The second section will explore some consequences of using volatility as a measure of risk, beyond simply having a better idea of risk.

#### **Volatility is Risk**

Volatility is the best measure of risk we are aware of in the published literature, and we will test its accuracy in Section 1. We know that this can be a controversial topic and that we are likely to receive several replies expressing cordial disagreement. We welcome new information and various points of view, and we will respond to as many of them as we can.

#### **Section 1**

##### *Introduction*

The first thing we need is a well-defined and quantifiable statement to test. “What is riskier?” is a subjective, non-falsifiable (non-scientific) question. Additionally, even when that question is satisfactorily answered, the answer does not actually quantify risk, but instead just allows a ranking of investments by riskiness.

The question we will ask is the one facing risk departments everywhere: What is the amount of money which encapsulates 95% of the 1-day losses? Any measure of risk that cannot answer a question such as this one is not, in fact, a measure of risk at all. Again, it may allow for the ranking, or even scaling, of the riskiness of multiple investments, but it does not quantify the risk of an investment.

The 95% and 1-day figures can vary, while noting that it is important for the time frame to be short for several reasons. For example, when it comes to strategies with rebalances, the holdings today may not precisely reflect the holdings very far into the future.

##### *Methodology*

In the interest of keeping this installment from becoming too dry, quantitatively testing this question across every possible measure of risk, not just limited to volatility, is beyond the scope of this brief

overview. However, we will provide an abbreviated test of volatility vs. the sorting method of VAR (value at risk) using the S&P 500 (without dividend reinvestment). Here are the two methodologies:

### Volatility (“VOLR”)

- 1) Calculate the volatility of the S&P 500 as the average of the trailing 1-month and 3-month standard deviations of the daily returns.
- 2) Then use a normal distribution to calculate the 5th percentile (i.e. determine the daily return which corresponds to a -1.645 standard deviation move).
  - No, volatility is not normally distributed, and a power law distribution may make more sense than a normal distribution. However, as the results will demonstrate, it is not necessary to complicate things in order to make a strong case.

### Sorting VAR (“SVAR”)

- 1) Sort the 1-day returns of the S&P 500 from the trailing 20 years from lowest to highest (most negative to most positive) and locate the 5th percentile.

Each of these two measures of risk produces an estimated daily threshold below which only 5% of the actual daily returns are projected to lie. We then count how many of the actual S&P 500 daily results lie below that 5% threshold for each method for each year from 1948 through 2018. We begin in 1948 because the S&P 500 officially began in 1928, and SVAR uses the trailing 20 years of data.

### Results

**VOLR missed the 5% target by an average of just 1.3% of days per year with a maximum miss of 5.3% of days. SVAR missed the 5% target by an average of 4.0% of days per year with a maximum miss of 17.2%.** The following bar chart shows the amount by which each method missed the 5% target for each year. Here are two examples of how to interpret each bar in the chart:

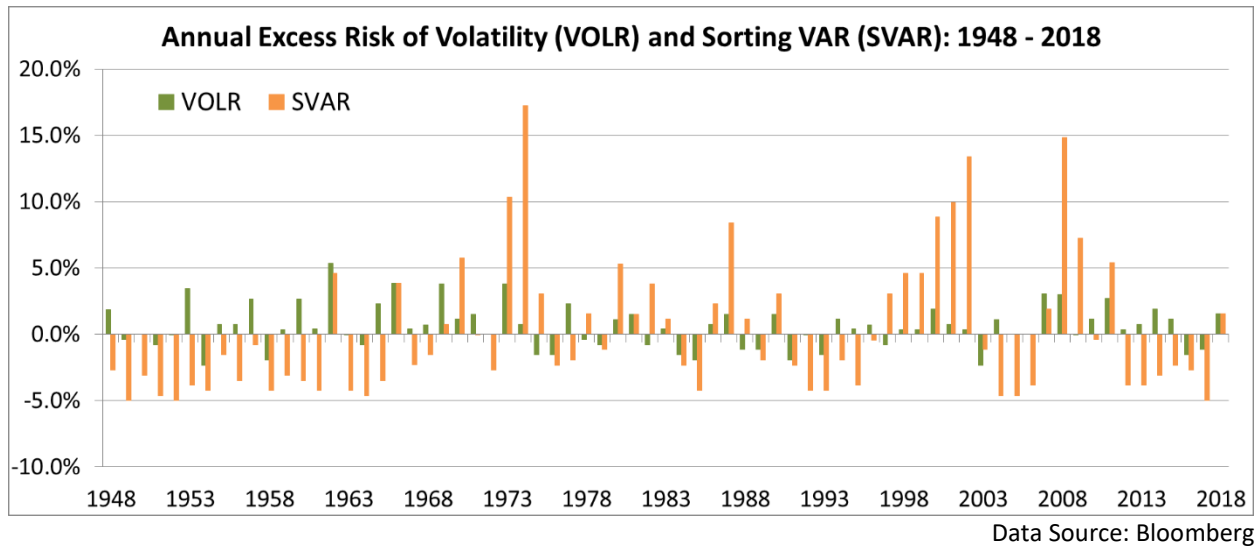
2008

- The bar for SVAR is +14.8% because 19.8% of the days exceeded the 5% threshold.
- The bar for VOLR is +3.0% because 8.0% of the days exceeded the 5% threshold.

2017

- The bar for SVAR is -5.0% because 0.0% of the days exceeded the 5% threshold.
- The bar for VOLR is -1.2% because 3.8% of the days exceeded the 5% threshold.

SVAR missed the target by more, on average, and missed by larger amounts in both directions.



Overestimating risk and underestimating risk are both flaws when the goal is an accurate assessment of risk. However, for those readers only interested in scenarios when the risk was higher than estimated, VOLR was still the clear winner. In years when SVAR underestimated risk, its average miss was +5.5% (i.e. 10.5% of days exceeded the 5% threshold). Meanwhile, in years when VOLR underestimated risk, its average miss was only +1.6% (i.e. 6.6% of days exceeded the 5% threshold).

### Observations

### Strengths of Volatility

- VOLR doesn't require very much data. Recall that we only used the trailing 3 months of data for VOLR in this example. Many other methods of assessing risk require more data.
- VOLR responds to current market conditions. Many methods of risk assessment are static. Recall that VOLR did a much better job of adapting to the very low risk of 2017 and the very high risk of 2008 than did SVAR.
  - As a tangent to this idea, VOLR may also be more adaptable in responding to new situations because a new situation becomes the current market condition.
- VOLR is not affected by the direction of results. *A large upward move is often an indication of significant risk that just didn't happen to result in a loss.* VOLR recognizes this risk, whereas many other measurements of risk fail to identify how risky something was simply because that risk did not happen to result in a loss in a certain instance.
  - Some strategies, by their construction, have the potential for larger gains than losses, and so the largest gains are not indicative of the risk. However, this possibility is easily accounted for within the framework of VOLR by using downside volatility.
  - Many investors don't care about gains and only consider losses to be a manifestation of risk. Simply put, this is a mistake. Of course gains and losses matter, but that is why result is also evaluated, not just risk. Risk and result can then be balanced in selecting

investments. However, risk and result are two very different things, and it is important not to let result affect the assessment of risk.

### **Weaknesses of Volatility**

- VOLR is useful in estimating an accurate threshold below which only 5% of losses occur. However, that does not address the question of how large those losses may be. Using a power law distribution instead of a normal distribution within the framework of VOLR may help, but the bottom line is that this question mostly relates to how large an outlier may be. By the nature of outliers there isn't a very reliable statistical answer to this question. This weakness exists in all methods of quantitatively assessing risk, not just VOLR.
- As useful a tool as VOLR is, there is no substitute for understanding a strategy before investing in it. Related to the above point, there are strategies for which the daily swings do not reflect the worst-case-scenario risk. One example is selling insurance on very unlikely catastrophes. These strategies can collect a little bit on a regular basis with little sign of risk for years on end before blowing out one day when the catastrophe strikes. The blowout risk of these strategies is not manifest in the historical data, and so this weakness also exists in all other methods of quantitatively assessing risk based on historical data, not just VOLR.

Section 1 briefly demonstrated that volatility is a good measure of risk. Section 2 will go a step further and show that a good measure of risk can do more than just set expectations.

## **Section 2**

### *Introduction*

Now that we have a fairly accurate measure of risk, let's explore a consequence of letting it inform investment decisions, not just expectations of losses. We are going to introduce a concept that has several names and is utilized in a number of strategies. We will call it **risk budgeting**, with the understanding from Section 1 that VOLR is risk for this purpose. The basic idea of risk budgeting is that fully invested doesn't mean having the same amount of money TIED UP in in the market at all times, but rather fully invested means having the same amount of money AT RISK in the market at all times. As a brief example of how to pursue this objective, we have used the following methodology.

### *Methodology*

- 1) Calculate VOLR, just as in Section 1, as the average of the trailing 1-month and 3-month standard deviations of the daily returns.
- 2) Then calculate the trailing 20-year average VOLR.
- 3) Finally, determine the current portfolio exposure to the S&P 500 as the trailing 20-year average VOLR divided by the current VOLR.
  - If the trailing 20-year S&P 500 VOLR (annualized) is 20% and the current S&P 500 VOLR is 18%, then the portfolio exposure to the S&P 500 would be 111% ( $= 20/18$ ).

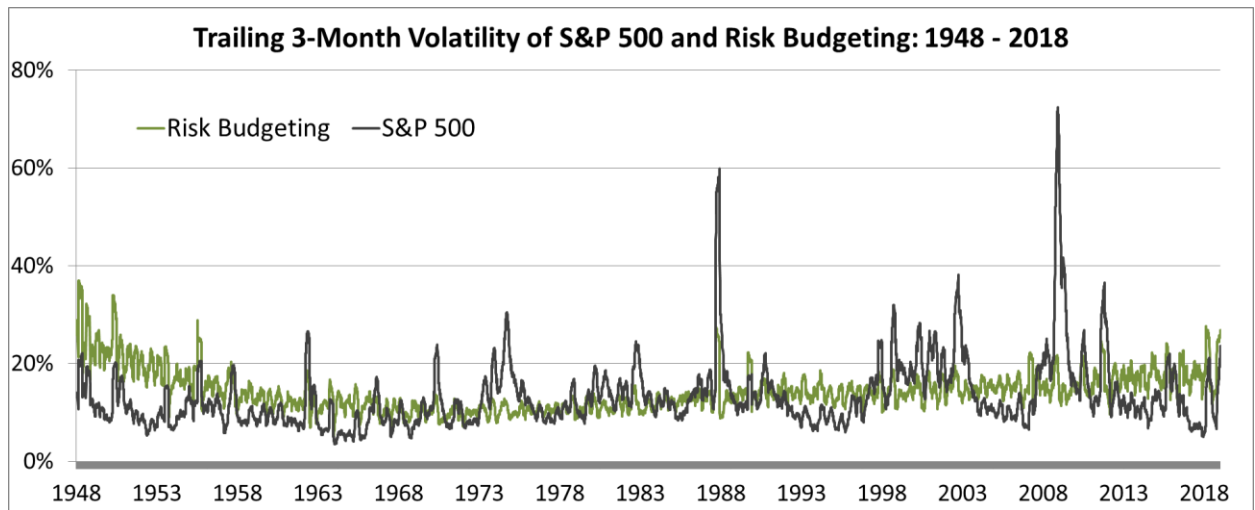
- If the trailing 20-year S&P 500 VOLR is again 20%, but the current S&P 500 VOLR is now 25%, then the portfolio exposure to the S&P 500 would be 80% (= 20/25).

This methodology dynamically adjusts the S&P 500 exposure level to target relatively stable portfolio volatility equal to the trailing 20-year average S&P 500 VOLR.

The budget in risk budgeting doesn't have to be the S&P 500 20-year volatility. Investors can choose any level of risk with which they are comfortable and replace the S&P 500 20-year average VOLR with that volatility in this methodology.

*Results*

**Risk budgeting has worked rather well.** The following graph shows the trailing 3-month S&P 500 volatility along with the trailing 3-month volatility of the risk budgeting portfolio. As the graph demonstrates, and in-line with the objective of risk budgeting, the volatility of the risk budgeting portfolio was much more stable than the volatility of the S&P 500.



Data Source: Bloomberg

Additionally, because this portfolio tended to increase its investment in calm times (generally associated with bull markets) and decrease its investment in turbulent times (generally associated with crises), it achieved a better result while taking the same amount of risk:

1948 - 2018	Risk Budgeting	S&P 500
Return	8.7%	7.4%
Volatility	15.0%	15.0%
Sharpe ratio	0.58	0.50
Max drawdown	45%	57%

\*excludes any estimate of trading costs

Data Source: Bloomberg

The compounding effect of that extra 1.3% per year from risk budgeting is extraordinary. **Over the full time period from 1948 through 2018, the S&P 500 increased from 15.30 to 2,489, and the risk budgeting portfolio increased from 15.30 to 5,548.** And, again, they had the same amount of risk.

### *Market Timing*

Some investors may object to “market timing,” even though many of those same investors time the market but just call it “keeping dry powder” or “moving into defensive sectors.” However, risk budgeting is just as accurately viewed as **not** timing the market. Remember that the idea of risk budgeting is to have the same amount AT RISK in the market at all times, instead of having the same amount TIED UP in the market at all times. The more conventional method of having the same amount TIED UP in the market at all times is also very much a form of market timing, but it increases swings and potential losses during turbulent times and decreases them during calm times.

Furthermore, risk budgeting may make it easier to stay invested. We are all long-term investors until the depths of a crisis, at which time fear has gotten the best of many seasoned investors. In other words, good results require not just a good investing plan, but also the ability to stick to it. The risk budgeting form of remaining fully invested is designed to make swings and losses more consistent over time, likely increasing an investor’s ability to stick with the plan.

And, finally, if it works, what difference does the name make?

*Next Week’s Preview: Many market neutral alternative investments are simply core stock and bond exposure in an “alternative” wrapper.*