RISK MANAGEMENT

Stabilizing The Volatility

The Portfolio Risk Dilemma: Let It Run Or Rebalance?

When volatility becomes too high, how can you reduce portfolio exposure without sacrificing your winners? Here is a smart solution you can consider.

This is a tricky problem, so I will make excuses up front. There are an unlimited number of portfolios, so any example needs to be examined for how it would apply to your own holdings. Then there are futures and equity portfolios, both very different. Futures can easily be leveraged, equities not so easily.

The issue here is that we start with a portfolio of defined risk, that is, we decide that each stock or futures market will be sized to have the same starting volatility, say 14%. That maximizes diversification and allows us to have a good expectation of the risk and reward.

But things change. Markets can get quiet or more active. Both affect the risk and returns of the portfolio. For now, we are interested in what we should do when volatility and risk increase to levels that make us worry.

Risk control choices

Futures traders have a lot more control over risk. Because of the implied leverage, professionals use only about 40% of available funds for margin, leaving the rest in reserve to lower the risk. It also allows them to take new positions at the same initial size even after a series of losses by drawing on those reserves.

Equities do not have the same leverage options. You can buy leverage by trading on margin, but you pay for that, while there is no cost in futures.

With both futures and equities, we can reduce our positions if risk gets too high. But do we want to do that? Risk can be high when prices are moving your way, when there is a demand for oil and you're long, or you are holding Apple, Tesla, or Amazon when they keep going higher and higher. Do we let the winners run or do we reduce our position to control risk? A winning position that is very volatile can turn into a volatile losing position. We just don't know when. That is the dilemma.

I don't like measuring risk by looking only at the drawdowns, which analysts call *semivariance*. My experience is that the upside volatility is a prelude to downside volatility. Volatility is not one-sided.

A sample futures portfolio

We will create a small macrotrend futures portfolio and start trading in 2000 to be sure we include enough volatility, bull and bear markets, and more than a few price shocks. For diversification, we choose one market from each of five sectors: 5-year notes (FV, interest rates), the euro (CU, currencies), the Nasdaq (NQ, index), crude oil (CL, energy), and copper (HG, metals). We will apply the same 80-day moving average to each, create a position size using volatility parity (1/5 of the investment divided by the dollar value of the 20-day ATR). For FV and NQ, we will only take long positions, as I do in my own portfolio. This will all be done in a spreadsheet that you can download. The columns for the spreadsheet are shown in the sidebar, "Portfolio Risk Spreadsheet."

Benchmark results

We need the results of this portfolio to compare with our future tests. Figure 1 shows the net asset value (NAV) based on using $25,000 for each position and a total investment of $1 million. That may seem very conservative but there is a lot of leverage in futures. We need that ratio of margin to investment in order

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to keep the portfolio volatility at 15%. The results were:

Target volatility:	14.0%
Annual rate of return:	10.7%
Annualized volatility:	15.2%
Return ratio:	0.706
Maximum drawdown:	33.9%

An annualized volatility of 15% means that there is a 16% chance of losing 15% and a 2.5% chance of losing 30%. Therefore, you should expect to lose between 15% and 30% at some point. Had we taken both long and short positions in FV and NQ, our returns would have been slightly higher, our drawdown 43%, and our ratio about 0.56. That gets you only a bit more return for a lot more risk.

Individual Market Results

If we take the daily profits of each market and divide by the investment of $1 million, we create the individual NAVs shown in Figure 2. NQ has the steadiest gains but the 5-year note has the largest.

What is more important is the risk. We find the risk by calculating the 20-day annualized volatility, the rolling standard deviation of the daily returns times the square root of 252. The results are pictured in Figure 3. We can see that copper (dark orange) spiked in 2006, crude oil (yellow) is generally high, and each of the other markets show high volatility from time to time.

The average and peak volatility over the full test period for individual markets and the sample portfolio were:

Market	Average	Peak
5-year notes	21.4%	90.7%
Euro	27.5%	73.6%
Nasdaq	17.5%	89.7%
Crude oil	35.9%	116.5%
Copper	30.6%	221.5%
Portfolio	14.2%	47.6%

Portfolio diversification clearly reduces volatility, and while an average of 14% is reasonable, a peak of 47%

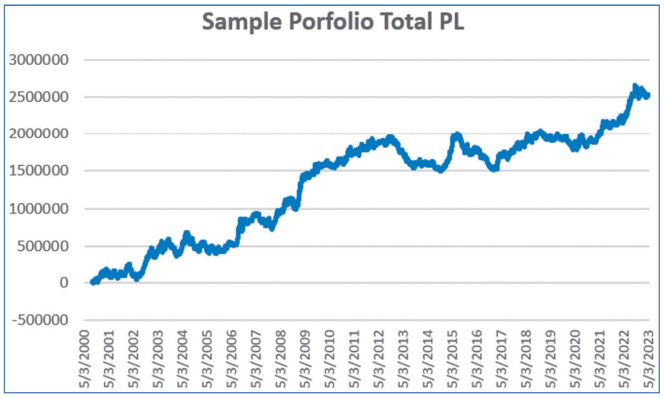

FIGURE 1: PORTFOLIO PROFIT & LOSS. To use as a benchmark for comparison in the test, here is the net asset value (NAV) of the portfolio based on using $25,000 for each position and a total investment of $1 million.

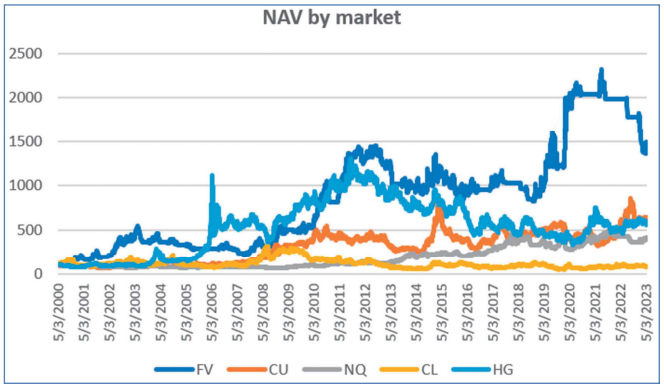

FIGURE 2: INDIVIDUAL MARKETS. The individual NAVs by market are shown. You can see that in the sample portfolio, NQ has the steadiest gains but the 5-year note has the largest gains.

PORTFOLIO RISK SPREADSHEET

A sample macrotrend futures portfolio is created in a spreadsheet for the test, with data starting in 2000 and using instruments that draw on five sectors (interest rates, currencies, indexes, energy, and metals). The columns for the spreadsheet are shown here. The spreadsheet can be downloaded from Traders.com in the Subscriber Area.

The instruments in the sample portfolio include: 5-year notes (FV), the euro (CU), the Nasdaq index (NQ), crude oil (CL), and copper (HG). Position size is determined using volatility parity (1/5 of the investment divided by the dollar value of the 20-day ATR).

A:	Date
B,C,D:	5-year notes high, low, close
E,F,G:	Euro high, low, close
H,I,J:	Nasdaq high, low, close
K,L,M:	Crude oil high, low, close
N,O,P:	Copper high, low, close
Q-U:	True range of the five markets
V-Z:	20-day average true range of the five markets
AA-AE:	80-day trend values
AF-AI:	Trend direction (1=Up, -1=Down, 0=No position)
AK-AO:	Position size
AP-AT:	Daily profit or loss
AU:	Average profit or loss (from AP-AT)
AV:	Total profit or loss
AW:	Daily return using AV
AX:	NAV
AY:	Peak profits
AZ:	Maximum drawdown

is too risky. All of the individual peak volatilities show extreme risk.

Reducing Portfolio Risk

Let's start by reducing the portfolio risk using *volatility stabilization*, a technique that I learned while working with some bright young quants at the Royal Bank of Scotland (RBS). We set a target volatility, in this case 14%. When the volatility is higher by 20% (that is, above 16.8%) we reduce our leverage back to 14%, reducing our position size by the same percentage in all markets. That maintains diversification. We will use fractional positions to show if it works. The 20% threshold is to avoid too many trades.

In the spreadsheet, I will add columns to show how we create a volatility adjustment factor (VAF). This allows us to multiply the benchmark daily return by VAF to get the adjusted return due to reducing leverage (position size). The calculation for VAF is done in the spreadsheet in the following cells:

BB2 is the target volatility, in this case 13%
BB3 is the threshold adjustment level of 20%
BB4 is BB2 × BB3, the volatility level to trigger the deleveraging event
BB109 (any calculation cell) is
=IF(BA109<BB$4,1,IF(BA109>BB$4,BB$2/BA109))

We then multiply the benchmark return by the adjustment factor in cell BB109 and lower to get the adjusted return. Using the adjusted return, we calculate the new adjusted NAVs. Using the adjusted volatility factors, the return profile of this new series is:

Target volatility:	13.0%
Annual rate of return:	10.2%
Annualized volatility:	12.8%
Return ratio:	0.791
Maximum drawdown:	31.6%

These results have a slightly lower return and drawdown, lower volatility, and a better ratio. Most important, the highest annualized volatility dropped from 47% in the benchmark to 22% in the adjusted NAV (you will see that in the spreadsheet). It reduced peak volatility substantially while only reducing returns slightly. Figure 4 compares the benchmark NAV to the volatility-adjusted NAV. While the NAVs look similar, the statistics are improved.

You may find that the average volatility of the returns is slightly higher than the target volatility. That is because the method allows the volatility to increase by 20% before pulling it back.

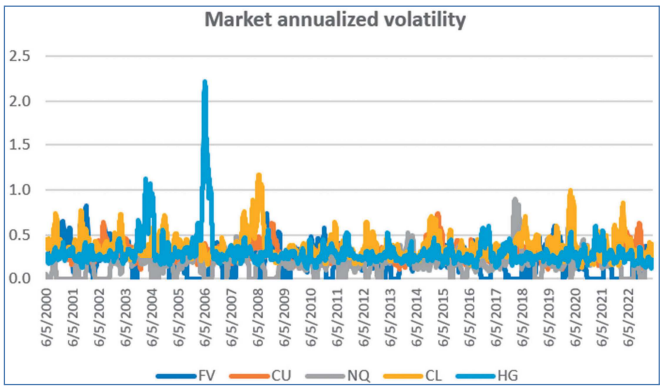

FIGURE 3: ANNUALIZED VOLATILITY BY MARKET. When calculating each market's volatility, you can see that copper (HG) spiked in 2006, crude oil (CL, in yellow) is generally high, and each of the other markets show high volatility from time to time.

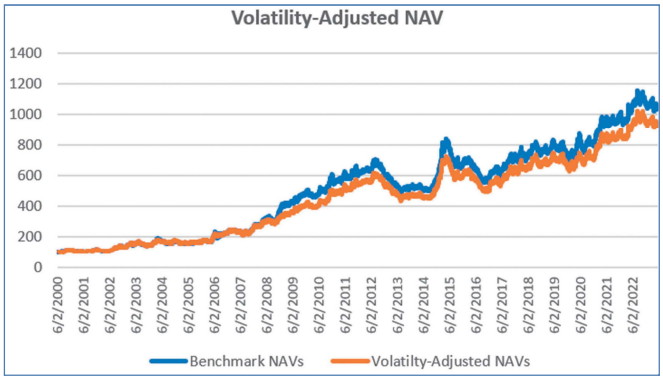

FIGURE 4: VOLATILITY-ADJUSTED NAVS. You can compare the benchmark NAVs to the volatility-adjusted NAVs. While the NAVs look similar, the statistics are improved. It reduced peak volatility while reducing returns only slightly.

Controlling Individual Market Risk

Now let's see what happens when we apply the same volatility adjustment to each market. In the spreadsheet, these calculations will be on the second tab. Instead of creating an adjustment factor for the portfolio volatility, we apply the same method to each market, reducing the position size whenever it exceeds the level of 15.6% (see Figure 5). When we combine the new adjusted returns,

A winning position that is very volatile can turn into a volatile losing position. We just don't know when. That is the dilemma.

we get a portfolio profile of:

Target volatility:	13.0%
Annual rate of return:	5.70%
Annualized volatility:	6.60%
Return ratio:	0.863
Maximum drawdown:	17.6%

Adding the new market-adjusted NAVs to the previous NAVs in Figure 4, we see that adjusting each market as it exceeds our target volatility can severely reduce the risk at the cost of much lower returns (Figure 6). In exchange, it has a better payout ratio.

RISK TOLERANCE

We all have our level of risk tolerance. If we want higher returns, we need to accept higher risk. Using the technique called *volatility stabilization*, we can reduce extreme volatility and improve our payout ratio, the return divided by the risk.

Applying the volatility adjustment to the portfolio returns allows each market to move on its own. Diversification will be reduced when one market moves farther or faster than another, but the volatility adjustment will not happen until the entire portfolio exceeds the threshold. That allows a market to run, a feature that I prefer because it can often generate enormous gains.

However, if you are more risk-averse, then capping the volatility of each market reduces risk further and improves the return ratio. For that, you need to accept lower returns.

There is no right or wrong way to reduce risk, only that extreme risk is dangerous. Either of these methods work. It is always your choice.

On another note, because we are reducing size when volatility is high, you can apply this method to stocks. Start by replacing the futures markets with your stock selection.

Using the technique called volatility stabilization, we can reduce extreme volatility and improve our payout ratio.

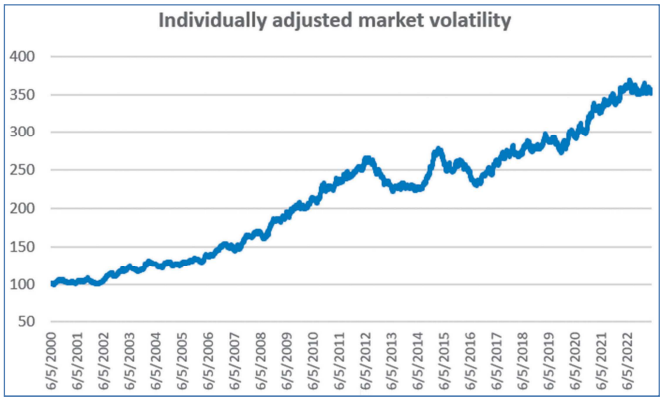

FIGURE 5: CONTROLLING INDIVIDUAL MARKET RISK. One approach to reducing position size is to apply the same volatility adjustment to each market.

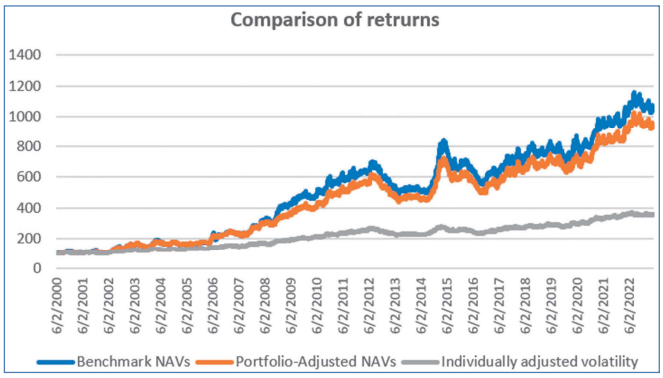

FIGURE 6: COMPARING RETURNS OF EACH APPROACH. Compare the benchmark NAVs against the individually adjusted and portfolio-adjusted NAVs.

Perry J. Kaufman is a trader and financial engineer. He is the author of many books on trading and market analysis, including the sixth edition (2020) of Trading Systems and Methods *(with the first edition published in 1978 as a seminal book in the field of technical analysis), as well as* Kaufman Constructs Trading Systems *(2020), and* Learn To Trade *(2022). For questions or comments, please go to www.kaufmansignals.com.*

The spreadsheet discussed in this article is available in the ***Article Code*** *section of our website, Traders.com.*

FURTHER READING

Kaufman, Perry J. [2022]. *Learn To Trade*, Amazon.

_____ [2020]. *Trading Systems and Methods*, 6th Edition, Wiley.

_____ [2020]. *Kaufman Constructs Trading Systems* (print and ebook editions), Amazon.

_____ [2022]. "What Is The Real Risk Of System Trading?" *Technical Analysis of* STOCKS & COMMODITIES, Volume 40: September.