

In Defense of VAR

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In a recent interview in *Derivatives Strategy*, Nassim Taleb delivered a blistering attack on value at risk (VAR). The gist of the message was that VAR is utterly useless as a risk management tool, as is much of the field of financial engineering. This view is somewhat unusual given the widespread interest in VAR. VAR is now widely used by U.S. financial institutions. It will be extended further following the recent Securities and Exchange Commission ruling that public corporations must disclose quantitative information about their derivatives activity. All of this effort would be wasted if VAR was indeed useless.

In his discussion, Nassim Taleb brings up some important points, which are too often ignored and should be re-emphasized. I want to take issue, however, with a number of other arguments, to which I turn first.

First, the purpose of VAR is not to describe the worst possible outcomes. It is simply to provide an estimate of the range of possible gains and losses. Many derivatives disasters have occurred because senior management did not inquire about the first-order magnitude of the bets being taken. Take the case of Orange County, for instance. There was no regulation that required the portfolio manager, Bob Citron, to report the risk of the \$7.5 billion investment pool. As a result, Citron was able to implement a big bet on interest rates which came to a head in December 1994, when the county declared bankruptcy and the portfolio was liquidated at a loss of \$1.64 billion. Had a VAR requirement been imposed on Citron, he would have been forced to tell investors in the pool:

"Listen, I am implementing a triple-legged repo strategy that brought you great returns so far. However, I have to tell you that the risk of the portfolio is such that, over the coming year, we could lose at least \$1.1 billion in 1 case out of 20."

The advantage of such a statement is that this quantitative measure is reported in units that anybody can understand--in dollars. Whether the portfolio is leveraged or filled with derivatives, its market risk can be conveyed to a non-technical audience effectively.

It is fairly clear that, had such an announcement been made, investors would have been more careful about investing in the pool (or would have disciplined Citron). In addition, it would have been harder for investors to claim they were misled. Fewer lawsuits would have been filed. Perhaps other embarrassing debacles such as Barings, Procter & Gamble or Gibson Greetings would have been avoided. Derivatives disclosure should increase transparency and stability in financial markets.

VAR has other benefits, too. By now, all U.S. commercial banks monitor the VAR of their trading portfolios on a daily basis. Suppose a portfolio VAR suddenly increases by 50%. This could be due to a variety of factors. Market volatility could have increased overnight. Or, a trader could be taking inordinate risks. Or, a number of desks could be positioned on the same side of a looming news announcement. More prosaically, a position could have been entered erroneously. Any of these factors should be cause for further investigation, which can be performed by reverse-engineering the final VAR number. Without it, there is no way an institution could get an estimate of its overall risk profile.

The Orange County example, however, points out one of the limitations of VAR, which is inherent in the definition. We would expect situations where the range of VAR is exceeded, for instance in 5% of the cases using a 95% confidence level. This was the case in Orange County, for instance, where a particularly volatile bond market led to a loss of \$1.6 billion, in excess of the VAR estimate. Practically speaking, there is no way to provide an estimate of the absolute worst outcome (in the same sense that the tails of continuous probability distributions are unlimited.) Nor should we expect an institution to be protected against all possible losses, however unlikely. As Chairman Greenspan stated, "when market forces... break loose of economic fundamentals,... sound policy actions, and not just bank capital, are necessary to preserve financial stability."

Still, VAR must be complemented by stress-testing. This involves looking at the effect of extreme scenarios on the portfolio. This is particularly useful in situations of "dormant" risks, such as fixed exchange rates, which are subject to devaluations. Stress-testing is much more subjective than VAR because it poorly accounts for correlations and depends heavily on the choice of scenarios. Nevertheless, I would advocate the use of both methods.

A second misconception raised in the discussion is that VAR involves a covariance matrix only and does not work with asymmetric payoffs. This is not necessarily the case. A symmetric, normal approximation may be appropriate for large portfolios, where independent sources of risk, by the law of large numbers, tend to create normal distributions. But the delta-normal implementation is clearly not appropriate for portfolios with heavy option components, or exposed to few sources of risk, such as traders' desks. Other implementations of VAR do allow asymmetric payoffs.

A third, more specific, point is that the VAR approach is useless because volatilities and correlations change over time. This is debatable. Even when changes occur, the degree of precision in daily volatilities is much higher than that in expected returns. Traders routinely take positions based on views that are even less reliable than risk measures. It is hard to tell whether traders are right or wrong; we do know, however, when they are taking large risks. Also, we have successfully learned to model volatilities that change over time (e.g. using GARCH models and related acronyms). Even better, we can use risk measures implied from option data, which are the best forecasts one could expect. It seems to me that our goal should be to try to improve our forecasts of risk, instead of discarding the whole VAR approach and relying on "market lore."

Nassim Taleb also discusses a more general issue, which is that of the usefulness of scientific improvements. His point is that VAR is useless because it is not perfect (unlike measures in the physical sciences). Admittedly, VAR is not perfect. However, our world is constructed by engineers, not physicists. And engineering has been described as the "art of the approximation." The same definition applies to VAR. In fact, risk managers are less concerned about precision than traders who have to price derivatives. The advent of derivatives has been compared to allowing us to drive at a faster speed in financial markets. VAR is like a wobbly speedometer. Even so, it gives a rough indication of speed. Derivatives disasters have occurred because drivers or passengers did not worry at all about their speed. Of course, there can be other sources of crashes. Like blown tires, for instance. Such accidents can be compared to operational risks, against which VAR provides no direct protection. Still, a wobbly speedometer is better than nothing.

Finally, let me turn to one issue on which we agree (at last). Nassim Taleb points out an important problem, what I would call the "VAR dialectic" issue. If a risk manager imposes a VAR system to penalize traders for the risks they are incurring, traders may have an incentive to "game" their VAR. In other words, they could move into markets or securities that appear to have low risk for the wrong reasons. For instance, currency traders in 1994 could have taken large positions in the Mexican Peso,

which had low historical volatility but high devaluation risk. Or, traders exposed to a delta-normal VAR could take short straddles with zero delta (like Baring's Leeson); this position appears profitable, but only at the expense of future possible losses which may not captured by VAR.

This response explains why the actual benefits from technical innovations are generally less than hoped for. Going back to the driving example, the addition of safety features such as anti-lock brakes and airbags has saved fewer lives than initially expected, because some drivers may be lulled into a false sense of safety. Even so, the net effect of these innovations is beneficial. My car has both antilock brakes and an airbag.

In the context of portfolio management, gaming by traders can be compared to the general problem of in-sample portfolio optimization, which is well known to create optimistic views of risk. I fully agree that this is a serious limitation of VAR. This is why risk management is not simply a black box, but a dynamic process where a competent risk manager must be aware of the human trait for adaptation.

To conclude, it seems premature to describe VAR as "charlatanism". In spite of naysayers, VAR is an essential component of sound risk management systems. VAR gives an estimate of the potential losses due to market risks. In the end, the greatest benefit of VAR lies in the imposition of a structured methodology for critically thinking about risk. Institutions that go through the process of computing their VAR are forced to confront their exposure to financial risks and to set up a proper risk management function. Thus the process of getting to VAR may be as important as the number itself. These desirable features explain the widespread view that the "quest for a benchmark may be over".

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