

VaR from Perfect: The Unintended Consequences of Setting a Limit to Calculated VaR

I. Introduction

Recent regulatory moves¹ to control portfolio risk may, in times of crisis, have the opposite effect to what was intended. Across Europe, mutual fund (UCITS) companies are now required to calculate, every two weeks, their estimated fund Value at Risk (VaR) exposures. Specifically, for *funds with absolute return objectives, an upper limit of 20% has been set to the value of calculated VaR* which cannot be exceeded.

In practical terms, this means quantitative models must now be used to estimate, with a 99% confidence level, the maximum loss a mutual fund may incur over a 1 month horizon. A VaR estimate of 10%, for example, implies that there is a 1% chance of losing more than 10% of a fund's value over the following month. If the calculated VaR breaches 20%, a fund management company must take action to reduce calculated VaR back below 20%, i.e. by selling some of the funds risky securities.

For funds with relative return objectives against a given benchmark, e.g. index, a different rule applies. Specifically, for *funds with relative return objectives, estimated VaR cannot exceed twice that of the benchmark*. Again, if calculated VaR exceeds this limit, a fund management company must take action to reduce the calculated VaR.

This submission doesn't seek to highlight the many weaknesses of calculated VaR², but rather the flaw in setting an absolute limit of 20% to the calculated VaR (the so called 'absolute VaR approach' under CESR guidelines). In particular, the *inherent similarities of the current absolute VaR limit (and to some extent the relative VaR limit) with the now discredited theory of Portfolio Insurance*.

II. 'Portfolio Insurance' Revisited

Portfolio Insurance (otherwise known as Portfolio Immunization) was a risk control theory whose application became very popular with the advent of the personal computer in the 1980's. In essence, the theory stated that funds could invest more of their money in 'risky' but



potentially higher returning assets, such as equities, so long as they were prepared to switch their money quickly back into safe assets, such as US Treasuries, should the value of a fund fall to a pre-defined level. For a pension fund, or insurance company, that level might be the minimum assets required to meet future pension or other liabilities. For a mutual fund, it represents a pre-defined 'stop-loss'. Handily, this risk management innovation coincided with two other innovations: index futures and the widespread adoption of the personal computer. The resultant ability to execute 'program' trades across a large number of securities, made the theory ever more popular with the upcoming generation of computer literate risk managers.

Although good in theory, Portfolio Insurance proved to have severe practical drawbacks. In fact, Portfolio Insurance is now credited with causing, or at least severely aggravating, the 1987 stock market 'crash'. During the week immediately prior to the 1987 crash, the US stock market experienced a decline of around 10%. Over the weekend and following Monday morning, the decline in the US and some other markets caused a large number of sell orders to be generated as pre-defined limits were reached and fund managers *en masse* attempted switch out of 'risky' equities into 'safe' assets. Overwhelmed with sell orders, market makers immediately marked down the prices of equities, which in turn caused more risk limits to be breached and more sell orders to be generated. This 'vicious circle' continued until the market was down more than 20% in what has now been dubbed 'Black Monday'. As an aside, many funds were never able to sell at their pre-defined limits due to the dramatic mark-down in stock prices before markets opened. Other market makers just didn't pick-up their phones.

Chart 1: 'Risk Control' Turned a Stock Market Decline into a Rout



Source: Bloomberg



III. VaR Limits Vs Portfolio Insurance

From the descriptions of ‘Portfolio Insurance’ and ‘VaR limits’ it is immediately apparent that they have many similarities. Both concepts are reassuringly dressed-up as somehow ‘controlling risk’. The application of Portfolio Insurance and VaR limits requires access to the latest computing power/risk modeling. Both ideas have spurred the development of indices (e.g. for index futures in ’87 and risk ‘benchmarks’ now). Significantly, both ignore the practical difficulties in dealing during times of ‘market stress’, e.g. low liquidity, high spreads.

The most worrying aspect of setting ‘VaR limits’ is that the practical mechanics are almost identical to ‘Portfolio Insurance’. Namely, both theories **force selling when markets drop**. Portfolio Insurance forces selling when markets breach price limits set by fund managers. VaR limits forces selling when estimated fund volatility breaches volatility limits set by regulators (though fund managers may of course target a lower estimated VaR). However, given that falling equity markets have tended to coincide with a rise in volatility, setting VaR limits looks almost identical to Portfolio Insurance. To all practical purposes, the **VaR limit is Portfolio Insurance by a different name**.

IV. VaR Limits: “The Wolf in Sheep’s Clothing”

Of course, history never repeats itself in exactly the same way. It could be argued that while share prices can fall sharply, estimated VaR will change only slowly because most VaR models use volatility and correlation data going back a number of years (typically 5 years). The experience of 2008/9 however showed that estimated VaR can rise very rapidly, especially if it follows a period of particularly low volatility (Chart 2).

Chart 2: *Calm before the Storm* – S&P 500 Implied Volatility



Paradoxically, for long-term investors, the safest times to commit new capital to equity markets have been when volatility has been high (say over 40 on the chart). The use of VaR limits therefore makes the additional error of confusing short-term volatility (variability of return) with risk (defined as the probability of a permanent loss of capital).

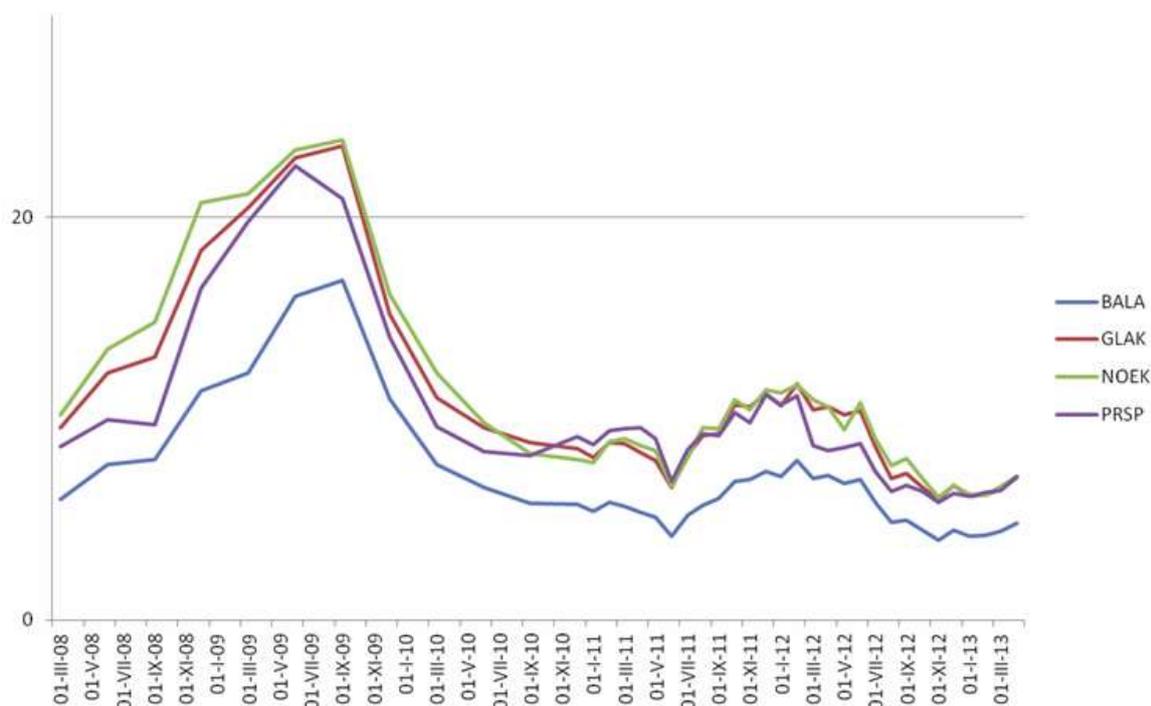
V. The 2008/2009 Financial Crisis with VaR Limits

It is interesting to speculate: *What would the impact of the current 20% VaR limit (or relative VaR limit) have been had the limit been in place during the financial crisis of 2008/9?* At the start of the US recession, in November 2007, few funds would have been impacted by the requirement. As 2008 progressed however, funds with a financial focus would have been amongst the first to see a significant rise in their VaR estimates. Banks and insurers were, after all, at the epicenter of the crisis. As their VaR estimates rose towards 20% they would have been forced sellers of their holdings in banks and insurers. Many would have been unable to participate in the many ‘rescue’ rights issues by banks and insurers because of the fear of breaching the legal VaR limits. Eventually, even more generalist and mainstream multi-asset funds would be forced sellers of equities.

By way of illustration, Chart 3: shows the estimated VaR’s for 3 equity focused funds and the Balanced fund, all with absolute return objectives (“long-term capital growth”), managed by AKRO investiční společnost, a.s. during the financial crisis. The rapid rise in estimated VaR’s during the crisis (and dramatic decline post crisis) is readily apparent with all 3 equity orientated funds estimated VaR’s breaching 20% and even the Global Balanced Fund coming near to the limit following the collapse of Lehman Bros. **All the equity focused funds would have been forced sellers of equities during late 2008, early 2009, i.e. at the bottom of the market.** They had in fact been net buyers during the period, switching out of cash and money market investments and buying into equities at ‘bargain basement prices’. Now imagine a situation where, instead of 3 mutual funds selling, hundreds, possibly thousands of mutual funds (there are more than 30,000 mutual funds in Europe) are trying to sell, all at the same time! There would also have been a ‘buyers strike’ with many mutual funds fearful that the rapid rise in estimated VaR would lead to a breaching of regulatory limits.



Chart 3: Estimated VaR's for 3 Equity Funds and a Global Balanced Fund



Source: AKRO investicni spolecnost, a.s./Bloomberg/Riskmetrics

Key: GLAK = Global Equity Fund
 NOEK = New Economies Fund (Emerging & Faster Growing Developed Markets)
 PRSP = Progressive Companies Fund (Global Small & Mid. Cap Fund)
 BALA = Global Balanced Fund

The author makes no claims that these funds are representative. They are merely used to illustrate how rapidly estimated VaR can rise (and subsequently fall) in a crisis. Calculated VaR's may vary considerably between funds and models used. As an aside, none of these funds had exposure to any US bank or insurer during the crisis so the estimated VaR's would most certainly be higher for many other equity focused funds. The funds are all Czech Crown denominated, have absolute, rather than relative, return objectives and are already classified as 'high risk'. Note the rapid decline in estimated VaR's from 2010 onwards while the portfolios holdings and asset allocation remained essentially the same.

If the VaR limits had been strictly applied in 2008/9 the following would have occurred:

- After coming close or breaching their VaR limits, many absolute return funds (and possibly some relative return funds) would have been forced sellers (or prevented from buying) at the bottom of the market (Q4, 2008 and Q1, 2009) probably causing the market to bottom at a lower level.
- The higher volatility, resulting from a steeper market decline, would have caused more funds to breach their VaR limits; in effect creating a 'vicious circle' of volatility induced selling.
- Many companies, especially those at the epicenter of the crisis, e.g. banks, would have faced even more difficulty finding new investors or retaining existing investors (their securities contributed the most to calculated fund VaR).
- Difficulty raising equity funds would have deepened an already severe crisis and further raised the cost of capital for companies.



Chart 4 illustrates the probable impact of the current VaR limits, had they been in force. Scenario 1 incorporates the gradual impact of the points listed above. VaR related selling (or non-buying) would have caused the equity markets to be weaker for longer.

However, the cascade effect of numerous funds being forced sellers in late 2008 early 2009 would have risked a stock market crash of the kind seen in 1987. In reality, ***fund managers don't wait to breach regulatory limits – they see the trend in their VaR estimates and take pre-emptive action.*** They also look over their shoulders and try to anticipate what others will have to do. Furthermore, hedge funds, and many other investors, have the opportunity to 'short' individual securities (and entire markets) where they sense there will be forced selling. Taking these factors into account, had the 20% absolute (and 2 x relative to benchmark) VaR rules been in place, it's possible that the failure of Lehman Bros. in September, 2008, would have led to a cataclysmic pre-emptive sell-off in equity markets. Scenario 2 illustrates the impact of a pre-emptive sell-off. Arguably, ***superimposing an additional 1987 event onto the 2008/9 financial crisis would have sent the World into a 1930's style depression*** and effectively destroyed any hopes of rescuing the financial system.

Chart 4: The US S&P 500 Index – Scenarios if Current VaR Limits Had Been In Force



Source: Bloomberg/ AKRO investicni spolecnost, a.s.

For those who think such scenarios are unduly alarmist, bear in mind that the only reason that markets didn't sink lower in 2009 was a policy mix that included: ultra loose monetary policy, selective bans on short-selling, and governments stepping in directly to provide equity capital. In effect, the authorities had to provide artificial support for the markets. If mainstream mutual funds had been forced sellers (or non-buyers), due to fears of breaching VaR limits,

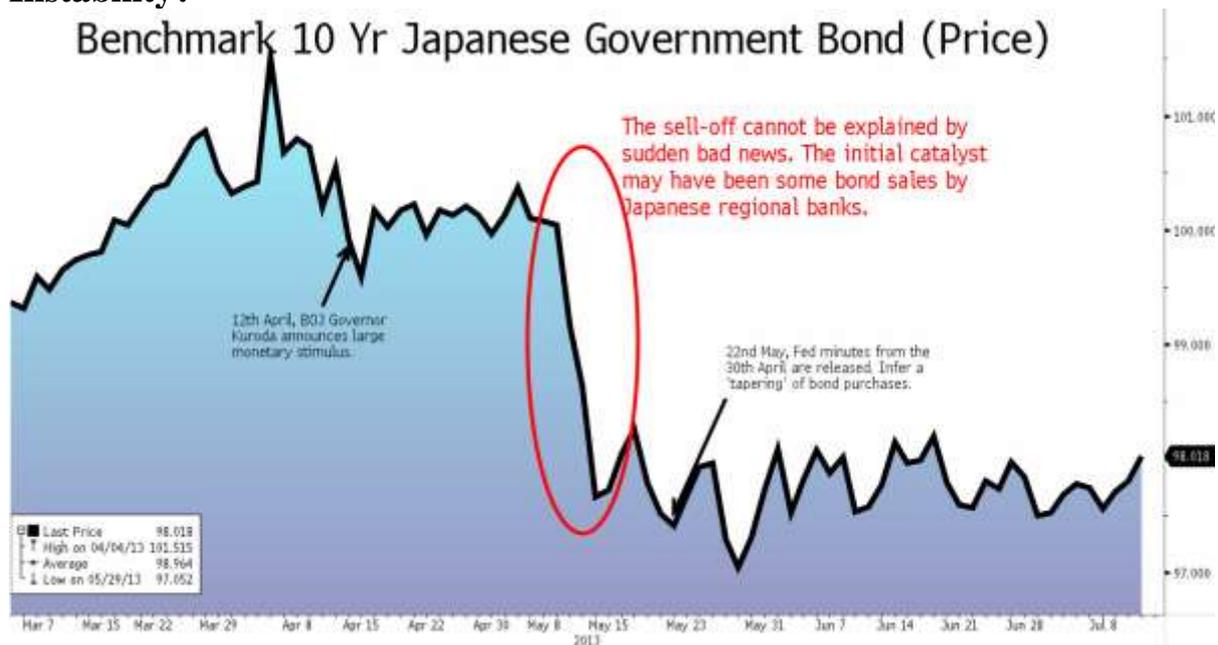


the consequences would have been dire. As it was, former Bank of England Governor, Mervyn King, has admitted that there was a point during the crisis when it looked like one of Europe's biggest banks, the Royal Bank of Scotland (RBOS), wouldn't survive. In these circumstances, the unintended consequences of regulation can be the deciding factor whether a crisis is containable or not. If a bank the size of RBOS would have failed, due to a VaR related investment boycott by mutual funds, other European banks may have toppled like dominoes. A depression era scenario.

VI. The Recent Sell-Off in the JGB Market Should Be a Warning.

In May this year, there was a dramatic decline in the Japanese government bond (JGB) market (Chart 5). The decline, over three consecutive trading days (Friday, Monday and Tuesday), took market participants by surprise as there was little in the way of 'breaking news' to explain the sudden price drop. In much the same way as it's difficult to explain the 1987 'crash' in terms of 'breaking news'. It appears that the some initial bond sales by Japanese regional banks may have initiated a 'vicious circle' of VaR related selling.

Chart 5: The JGB Market in May, 2013 – An Example of VaR Related Instability?



Source: Bloomberg

The following observations, contained in an analyst's research note [underlining added], are worth reflecting on: **"The unwind was violent. As historical volatility increased sharply, value-at-risk models forced the closing of positions. As it was difficult to close long JGB, other risk positions were reduced, i.e. long Japanese equities, short yen, EM debt, outperforming markets, etc."** Adrian Mowat, The Worst Year Since AFC..., 3 July 2013. JP Morgan.



The transmission mechanism, whereby a dislocation in one market impacts on others, was all too apparent. Indeed, the sell-off in the JGB market was associated with sharp moves in seemingly unrelated markets, e.g. equities, currencies, precious metals. ***The systemic risks associated with the widespread use of VaR limits would appear both current and sizable.***

VII. VaR Trading Limits: Playing With Matches

The VaR limits now utilized by funds need to be set against the backdrop of the VaR limits commonly utilized by investment banks when trading securities. VaR models used by investment banks sometimes use as little as one year's worth of historic data to calculate a one day VaR. This was the case with the *London Whale*, at JP Morgan, who last year ratched up a \$6bn loss while having a calculated VaR of just \$67m! Even when longer periods of historic data are used, e.g. 4 years, it is not uncommon for investment banks to give a higher weighting to recent time periods. In other words, the models used by traders would appear even more prone to sudden changes in calculated VaR than the ones used by fund managers. This raises a disturbing possibility. Any sudden market shock could quickly cause investment banks to sell securities as their trading VaR limits are breached. As markets decline, a second wave of selling by investment funds would kick-in; as their fund VaR limits are breached. Once short selling by hedge funds is included, it's possible to envisage a cascade of selling by different classes of institution: investment banks, hedge funds, mutual funds, etc. Financial markets would therefore appear to be ***sitting on a VaR powder keg***, while all around investment banks are playing with matches. You just know it's going to end badly.

VIII. Relative VaR: From the Mad Crowd

Is relative VaR the answer? Under the current VaR rules, ***funds which hug a pre-defined benchmark, e.g. index, are placed at a huge advantage over absolute return funds.*** Relative funds may have an estimated VaR far in excess of 20%, so long as it's less than twice the estimated VaR of a chosen benchmark. The CESR's guidance on risk measurement explains "*relative VaR is the most transparent way for the investor, who is in general aware of the benchmark and who might have at least implicitly, an idea of the risk of this benchmark.*" This is, of course, a nonsense definition of risk.

Few investors or market professionals would have had much idea about the risk characteristics of the Markit ABX.HE index in 2008 (index inception 2006) prior to the financial crisis, the Neuer Markt All Share index in 2000 (inception 1997) prior to the 'dot com' bust, the FTSE100 in 1987 (inception 1984) prior to the 'crash', or the Dow Jones in 1929 (first quoted in the WSJ 1928) prior to the 'great crash'; yet alone the plethora of 'bespoke' and esoteric benchmarks which have emerged in recent years. Just because a benchmark is created, it doesn't alter a fund's risk characteristics or make a fund more understandable. By way of example, just prior to the Wall St. crash of 1929, the Dow Jones index had only the previous year been reconstituted to include 30 stocks and begun to be published in the WSJ. How would risk, measured relative to the Dow, have helped anyone?



Even where there is a long index history and an index has high investor awareness, VaR calculations usually look back no further than 5 years. Put another way, it's like entering a recently opened asylum and being reassured you're only twice as mad as the other patients. Well, how mad is that?

IX. VaR: Better Off Without It

It seems pretty clear that when markets next experience a crisis, the 20% absolute VaR limit (and possibly the relative VaR limit) would quickly have to be relaxed or scrapped entirely; least another financial panic occur. However, keeping the current limits in place risks markets being over-taken by events. Natural disasters, nuclear accidents, wars, terrorist attacks, etc., by their nature, come without warning and market participants must make decisions based on the regulations in place at the time.

Recently, Japan came very close to a nuclear disaster. Had large areas of Japan been turned into a nuclear wasteland and the Japanese equity market collapsed in value, would we want to discourage equity investment to re-build Japan or recapitalize the global re-insurance sector? "Sorry, we can't invest there... the VaR contribution is too high." No, of course not, we would be encouraging investment for perfectly good commercial (and societal) reasons. VaR limits effectively discourage investment into industries/countries when the investment is needed most and, paradoxically, when it is often the most commercially sensible and least risky time to invest. VaR limits therefore represent a dangerously pro-cyclical rather than contra-cyclical policy tool: they add to systemic risk rather than reduce it. They make a crisis worse, not better.

X. Concluding Remarks

Recent moves by regulators and professional bodies to increase investor awareness of financial history are to be welcomed. The 2008/9 crisis drew numerous parallels with the 1929 crash and subsequent depression. The age old problems of over-leverage, complex financial structures and outright criminality are recurring issues, yet important lessons are often forgotten with each new generation of investors³. The author believes that history may once again be repeating itself. Current guidelines, placing limits to estimated VaR, effectively reintroduce a form of the discredited 'Portfolio Insurance' theory and, as such, risk a repetition of the mistakes made in 1987.

Where investment limits are applied, they should be simple, understandable and contra-cyclical in nature.

Jeremy Monk, MBA, ASIP, BSc(Hons), DIC
Investment Director,

AKRO investicni spolecnost, a.s.
Prague
12th July, 2013



¹ Committee for European Securities Regulators (CESR's) Guidelines on Risk Measurement and the Calculation of Global Exposure and Counterparty Risk for UCITS s, 28 July 2010, Ref.: CESR/10-788. These guidelines have been incorporated into national regulations, for example, CNB Guideline 194/2011 par. 39 point (6).

² Many market professionals were surprised to see VaR survive after the financial crisis. It's well known that banks with high calculated VaR's, e.g Goldman Sachs, survived the crisis in better shape than many others. The failure of Quant models also inspired numerous books. Nassim Nicholas Taleb, author of *The Black Swan*, describes VaR as simply wrongheaded and positively dangerous. It also seems somewhat odd that, when looking at risk, VaR takes a 1 month risk horizon, whereas most mutual funds stress a return horizon of at least 5-7 years. There would therefore seem to be a huge mis-match in time frames.

³ see author's biography. Nor can one ignore the impact of commercial interests shaping our capital markets; not always for the better. Simple, sensible and understandable limits have now been supplemented by complex, illogical and opaque limits which somehow involve the bought services of risk modelers and index providers. It was those same interest groups which benefitted from the adoption of portfolio Insurance in the 1980's and the development of complex financial structures prior to 2008.

Biography:

Jeremy Monk, MBA, ASIP, BSc(Hons), DIC is the Investment Director at AKRO investicni spolecnost, a.s., an independent mutual fund company based in Prague, Czech Republic. Jeremy's first 'City' job in 1986, just prior to the 1987 crash, was as a summer intern in the research department of a leading market-making firm where, amongst other things, he battled on his PC to help the firm price program trades for clients. The firm became the first major casualty of the 1987 'crash' (though Jeremy denies any responsibility!). Jeremy's educational credentials, in the field of discredited theories, are second to none. At two leading business schools (which will remain nameless) he attended a *Financial Markets* course taught by a visiting arbitrage and derivatives expert who "was let go" after he was unable to hedge his employer's open-trading positions during the '87 'crash'. Valuable insights were also gained from attending a *Corporate Strategy* course taught by a visiting professor and non-executive director at the Royal Bank of Scotland (RBOS). During the 2008/9 financial crisis RBOS reported the largest loss, and required the largest publicly funded 'bailout', in British history [he was the only professor Jeremy knows who drove to lectures in a Rolls Royce]. The educational highpoint, however, came in 1987 when Jeremy had the chance to hear a well-rehearsed lecture given by a director at the Bank of Credit and Commerce International (BCCI) which focused on *Business Ethics and Responsible Banking*. In 1991, BCCI was closed by authorities after the bank was implicated in money laundering (and other crimes) on a massive scale. These and other insights gained during 25 years working in the financial markets have resulted in a somewhat jaded view of finance and financial theory, and hair a 'whiter shade of grey'.



