



## Computation of the prudential risk charge for market risk under the IFPR / ICARA

# How not to leave money (in form of prudential capital) on the table? – Part 2

### Summary

Investment Firms Prudential Regime (IFPR) presents an ideal opportunity to review methods for computing prudential risk charge which potentially can be expensive. Gone are the days when capital was cheaply available. The recent increase in the cost of capital implies that using conservative methods for estimating capital charges will result higher costs and lower returns. As this technical note shows an internal method for calculating the firm's fund or capital requirement from own assets' market exposures (i.e., market risk) can be as simple as the well-known Value at Risk (VaR) model, which will tick all the boxes. 1. It is superior to the old 8%-method; 2. It is a more capital-efficient method; 3. It is risk-sensitive, i.e., unlike the old fixed 8% method, it is dependent on economic conditions; 4. Finally, it demonstrates 'use-test'. This technical note demonstrates that firms can substantially reduce market risk charge under ICARA by moving away from the '8%-method' and adopting the relatively simple but effective internal method.

### VaR Method

When market prices of assets change, the value of assets and the value of the holding positions change. The amount of change can be best modelled as a function of the market value, holding period and the volatility of the asset. The most-widely used methodology in order to assess the risk of change in the value of its positions is the so-called Value at Risk (VaR) model. For each asset, the VaR method predicts the potential loss under adverse circumstances. Formulaically, the value at risk for each asset  $i$  can be computed as follows.

$$\text{VaR}_{\text{asset}_i} = \text{Value of asset}_i * \text{daily vol of asset}_i * \sqrt{t} * 2.58$$

where  $t$  stands for number of holding days. It is a mathematical formula – i.e., a function which relates the potential loss of an asset, to its value or size, volatility and its holding period (at a statistical) confidence level. For ICARA purposes, we compute the potential loss at the 99.5% confidence level. Put it differently, the VaR method predicts that there is only 1 in 200 chance that the potential loss could be larger than the formula predicts.

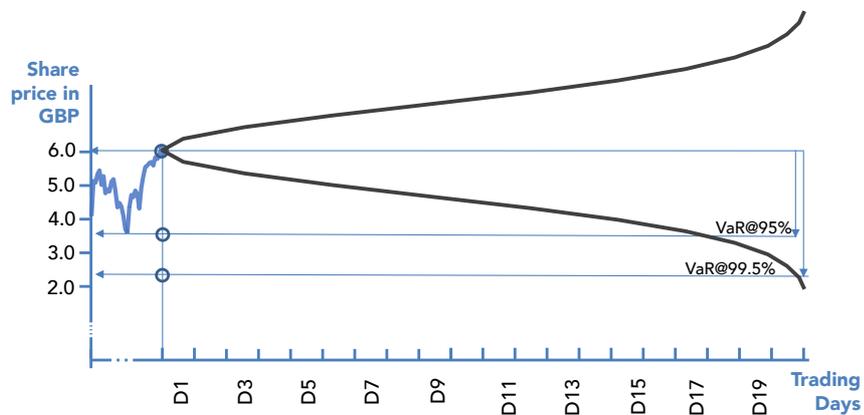
VaR -  
expressed as  
relationship  
between asset  
price, its  
volatility and  
holding period

VaR predicts losses at confidence levels

As can be seen from the formula, VaR is simply a multiplication of the value of an asset with its daily volatility and square root of the holding period and a factor of 2.58 (To be precise this number is 2.575829304.). The holding period is known and the daily volatility can be obtained using market data. The multiplication of the volatility with the factor of 2.58 ensures that the change in the value of the asset over the holding period  $t$  potentially as large as the 99.5% confidence level, i.e., at the tail of the potential loss distribution (at a lower confidence level of, say 95%-tile, this factor is only 1.65).

For example, what would be the VaR of a share currently trading at 6 GBP and has a daily volatility of 5% over a 20-day holding or trading period? At a 99.5% confidence level the potential loss is 3.62 (i.e.  $6 \times 2.58 \times 5\% \times \sqrt{20}$ ).

FIGURE 1: VaR at various 95%-tile and 99.5%-tile confidence levels



Expected vs Unexpected Losses from Market Movements

As the figure shows, the “expected losses” (EL) and gains “on average” are zero. That is, the markets are as equally to go up as well as down. An investment firm, theoretically, therefore is not expected to make losses from market movements. This is in stark contrast to credit or counterparty risks where firms are expected to suffer losses from counterparty defaults. Therefore, expected losses from credit or counterparty risks are not zero. Then, why are regulators then requiring to hold capital for market risk?

This is because “unexpected losses”(UL) from market movements are real and, in worst case, they could wipe out the whole company. Therefore, for a 1m exposure, the prudential charge from market risk should be a sufficiently and reasonably high number, but it cannot be whole asset size, i.e., 1m in this case. Based on observations of historical market events, the international regulators, the Basel Committee on Banking Supervision(BCBS) came up with 8%. In our example,  $8\% \times 1m = 80k$ . From prudential regulatory perspective, the 8% is a crude method of estimating a reasonably high number, away from ‘average’ towards the ‘tail’ from a distribution of potential loss outcomes.

Unexpected Losses: 8% versus the VaR Method

The 8% is a basic method to estimate 'unexpected losses' from potential events. BCBS introduced it as a reasonable compromise as charge for unexpected losses from market (and credit) risks.

TABLE 1:  
Capital or  
fund  
requirement –  
VaR versus  
the 8%  
method

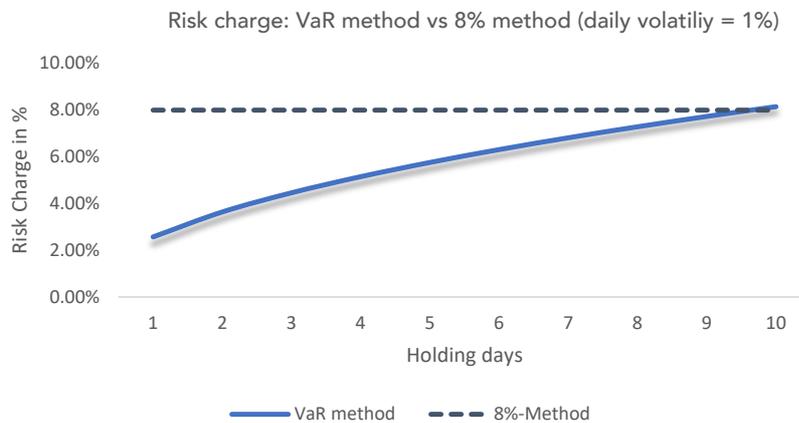
Exposure	Daily Volatility	Holding Period	Fund Requirement	VaR method	8%-Method	Savings
1,000,000	1.00%	1	25,758	2.58%	8.00%	54,242
1,000,000	1.00%	2	36,428	3.64%	8.00%	43,572
1,000,000	1.00%	3	44,615	4.46%	8.00%	35,385
1,000,000	1.00%	4	51,517	5.15%	8.00%	28,483
1,000,000	1.00%	5	57,597	5.76%	8.00%	22,403
1,000,000	1.00%	6	63,095	6.31%	8.00%	16,905
1,000,000	1.00%	7	68,150	6.82%	8.00%	11,850
1,000,000	1.00%	8	72,855	7.29%	8.00%	7,145
1,000,000	1.00%	9	77,275	7.73%	8.00%	2,725
1,000,000	1.00%	10	81,455	8.15%	8.00%	-1,455

Note

1. The values have been computed using the online VaR tool at <https://mr.riskplus.net/>
2. The holding period refers to trading days. The confidence value chosen is 99.5%.

As can be observed from the table, an investment firm can make substantial savings on risk charges by moving from the old 8%-method to the VaR method. Using the example of an asset with a current value of 1m, where the daily volatility is 1%, the VaR increases when the holding period increases. In this example, up to a holding period of 9 days, the VaR method results in a lower capital charge than the conventional 8%-method.

FIGURE 1:  
VaR as a  
function of  
holding  
period



VaR is increasing with an increasing number of holding days. Similarly, a higher volatility implies a higher VaR. The table below shows that the fund or capital requirement grows with an increase in daily volatility. For a constant holding period of 5 days, for example, the requirement implied by the VaR method is below the flat 8%-method if the volatility for an instrument is below 1.30%.

Cursory look at daily volatilities for rates, FX, commodities and equities shows lower daily volatilities. Therefore, this suggests that an investment firm's funds requirement from holding assets in those asset classes will be lower than 8% if they adapt the VaR method.

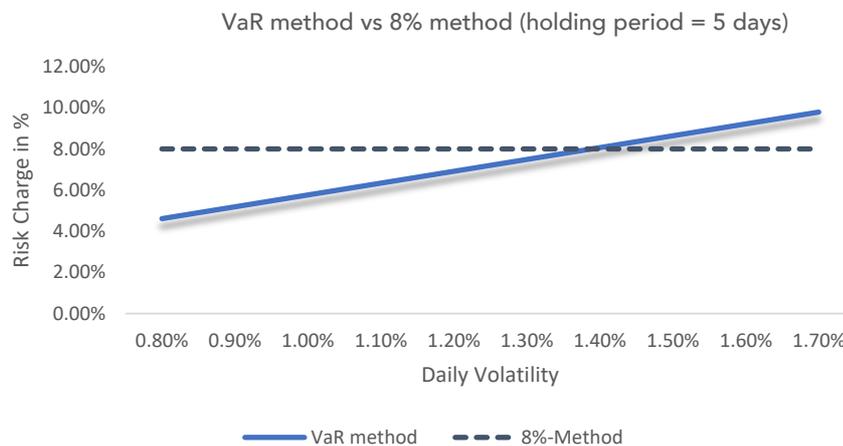
TABLE 2:  
VaR a  
positive  
function of  
volatility

Exposure	Daily Volatility	Holding Period	Fund Requirement	VaR method	8%-Method	Savings
1,000,000	0.80%	5	46,078	4.61%	8.00%	33,922
1,000,000	0.90%	5	51,838	5.18%	8.00%	28,162
1,000,000	1.00%	5	57,597	5.76%	8.00%	22,403
1,000,000	1.10%	5	63,357	6.34%	8.00%	16,643
1,000,000	1.20%	5	69,117	6.91%	8.00%	10,883
1,000,000	1.30%	5	74,876	7.49%	8.00%	5,124
1,000,000	1.40%	5	80,636	8.06%	8.00%	-636
1,000,000	1.50%	5	86,396	8.64%	8.00%	-6,396
1,000,000	1.60%	5	92,156	9.22%	8.00%	-12,156
1,000,000	1.70%	5	97,915	9.79%	8.00%	-17,915

Note

- The values have been computed using the online VaR tool at <https://mr.riskplus.net/>
- The holding period refers to trading days. The confidence value chosen is 99.5%.

FIGURE 2:  
Capital  
Requirement  
for different  
volatilities -  
VaR vs 8%



Advantages of a risk-sensitive method

Dynamic  
method of  
instead of  
insensitive  
flat 8%

The VaR method is risk-sensitive. It links an instrument’s risk charge to its current volatility and holding period. The relationship is roughly linear. It is easy to understand. Furthermore, it can form the basis of risk-related policies and comparison of exposures to risk appetite statements. A risk policy could define the types of assets and their holding periods and could be formulated as simple as “don’t invest in assets with a daily volatility larger than x%; don’t hold assets longer than x days”.

Satisfies  
the ‘use-  
test’  
requiremen  
t

Failing to address market risk analytically leaves money (in the form of unnecessary prudential capital allocation) on the table. Using a relatively simple model such as this VaR method, presented here, provides both analytically meaningful and managerially useful information for firms. The VaR model:

- improves analysts’ understanding of market risk;
- eliminates unnecessary prudential capital provisions;
- derives a meaningful and defensible number for prudential capital requirements for market risk that will satisfy regulators; and
- provides important and useful management information to support decision-making.

## Technical implementation

The VaR model implemented can be found here: <https://mr.riskplus.net/>



## Contact

To find out more about technical solutions to this and other risks, visit us at [www.montecarloplus.com](http://www.montecarloplus.com)

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