

### APPENDIX 7A: Margin period of risk and scaling

Consider an exposure over a certain period such as the margin period of risk (MPoR) defined as  $\tau$  that linearly decreases to zero. Intuitively, the total exposure will be proportional to (considering either standard deviation or variance):

$$\int_0^{\tau} \frac{\tau - u}{\tau} du = \tau/2.$$

The exposure is therefore equivalent to the same constant exposure for half of the length of the MPoR.

In the discrete case, the variance of a position that decreases linearly at the end of each day will be proportional to:

$$\left[ \left(1 - \frac{1}{n}\right)^2 + \left(1 - \frac{2}{n}\right)^2 + \dots + \left(1 - \frac{n-1}{n}\right)^2 \right] = \frac{n}{3} \left(1 - \frac{1}{n}\right) \left(1 - \frac{1}{2n}\right).$$

Compared to a constant position, the standard deviation of the linearly amortising position will be smaller by the following multiplier:

$$\sqrt{\frac{1}{3} \left(1 - \frac{1}{n}\right) \left(1 - \frac{1}{2n}\right)}$$

This multiplier converges to  $\sqrt{1/3}$  as  $n$  becomes large which is expected since:

$$\int_0^{\tau} \left(\frac{\tau - u}{\tau}\right)^2 du = \tau/3.$$

Using the discrete formula: for example, a 10-day constant exposure is roughly equivalent to a 5.3 day linearly amortising one.