## Internal model requested to be used for the calculation of the exchange rate risk

The MNB is of the opinion that the required economic capital is reflected the best by the calculation based on the Value at Risk (VaR), and thus we deem it necessary that within the framework of ICAAP all banks should define its exchange rate risk capital requirement relying on a uniformly formulated (supervisory) model calculated on data referring to the same period, and the result of the model calculation – depending on the calculation methodology selected by the institution – should appear for the banks as add-on capital requirement determined within the framework of the supervisory review process.

The requirements related to the calculation of the capital requirement relates solely to the exchange rate risk, and not to position risk of foreign currency-denominated securities, commodity risk, and other (e.g. default) risk. In accordance with Article 351 of CRR, if the sum of a given institution’s total net foreign currency position and net gold position – calculated in line with the procedure specified in Article 352 of CRR (including all those currency positions and gold positions for which the capital requirement is calculated in accordance with the internal rating based approach) – exceeds 2 percent of its own funds, the institutions must determine their capital requirement related to foreign exchange risk.

Since we deem this relatively easy to implement in technical terms, we request that the result of the model detailed below should be quantified also by those institutions that otherwise apply a significantly different internal model.

The MNB does not intend to reject the methodologies selected by the institutions; however, in respect of the foreign exchange risk it wishes to set potential limit for the related portfolio segment when calculating the economic capital.

As regards the practical application, during the ICAAP-SREP dialogue the MNB expects that compared to the target date[[1]](#footnote-1) the institution should have quantified capital requirement values for each trading day retrospectively for at least 60 trading days quantified based on both the selected (if any) and the following foreign exchange risk model, and present, upon request, the time series of the results returned by the two models to the Supervisory Authority.

***The model***

Please use the MNB’s official exchange rates as exchange rate data. The institution should store its **consolidated** daily currency positions in a manner that permits subsequent audit for at least 2 years, and also all other data (except for the MNB’s official exchange rates) necessary for the reconstruction of the calculations. (Namely, the institution must be able to ensure the control/reconstruction of the model calculations for at least 2 calendar years retrospectively.)

The internal model requested to be applied is the variance-covariance model, which assumes the normal distribution of yield, with 0 expected value (drift). As regards the technical parameters, we expect a 10-day holding period and one-sided confidence interval of 99 percent confidence level, and thus the capital requirement is multiplied the 1-day standard deviation of the portfolio constituted by the currency positions by 2.326 and the $\sqrt{10}$.

Accordingly, the capital requirement should be calculated as follows:

Capital requirementt = max (VaRt-1 , k x VaRaverage of the previous 60 days),

where k is a constant, the minimum value of which is 3, but depending on the errors committed by the model in a specific past period (1 year) it may rise to max. 4. For the purposes of standard treatment the MNB calculates with a multiplier of 3.

## Technical steps

The technical/calculation methodological steps described below are primarily for the those entities that to date have not calculated VaR in their institutions for their various portfolios/risks.

The capital requirement of the foreign exchange risk should be established for the individual business days as follows:

* The outstanding **consolidated** daily aggregated position in the respective currency is created. The (forint equivalent) value of the position outstanding in currency is indicated as wi.
* The covariance matrix is updated. The covariance matrix can be calculated by taking the forint equivalent exchange rate of the currency as a random variable, where we propose to calculate the 1-day covariance between the individual (i, j) currency pairs using the following formula:

$$σ\_{ij,t}=λ∙σ\_{ij,t-1}+\left(1-λ\right)∙r\_{i,t}∙r\_{j,t}$$

where the value of λ, referred to as alignment factor should be set as 0.94, while the ri,t yield should be defined as logarithmic yield. (The calculation of the covariance values in this way is merely a proposal; if the institution has its own covariance calculation method differing from this, the results of that may be used here.)

* The covariance matrix should be multiplied on the left with the row vector consisting of wi values, and then the resulting row vector should be multiplied on the right with the column vector consisting of wi values. The square root of the value returned by the multiplication is referred to as the 1-day standard deviation of the portfolio of the day.
* The 1-day standard deviation is to be multiplied with 2,326 and $\sqrt{10}$; this value is regarded as the portfolio’s 10-day value at risk of 99 percent confidence level with one-sided confidence interval. The daily capital requirement of the foreign exchange risk is the larger of this risk and 3 times the average value at risk of the past 60 trading days.
1. Reference date of the ICAAP calculation. [↑](#footnote-ref-1)