18 May 2021

TO ALL AUTHORISED DEPOSIT TAKING INSTITUTIONS - MARKET RISK MODELLING: RISKS-NOT-IN-VAR (RNIV)

Introduction

This letter sets out APRA's expectations for the market risk modelling of risks not in VAR (RNIV). The aim is to improve the consistency of the application, capitalisation and reporting of RNIV for ADIs accredited to use the internal model approach (IMA) to traded market risk.

RNIV modelling

APS 116 Market Risk, Attachment C Paragraphs 17-18 outlines requirements for IMA ADIs to include an appropriate set of risk factors in their market risk management system, sufficient to capture the risks inherent in the ADI's trading positions. In particular, the standard specifies that the "*VaR model must capture nonlinearities beyond those inherent in options and other relevant products (e.g. mortgage-backed securities, tranched exposures or nth loss positions), as well as correlation risk and basis risk*".

APS 116 Attachment C Paragraph 19 recognises that there may be situations where an ADI's risk system fails to capture in VaR risk factors that are incorporated in the pricing model. This may be due system weaknesses or model limitations. In such event, APS 116 requires that ADIs are to justify to APRA's satisfaction the omission of risk factors from their risk system (risk factor gaps). Where risk factors are omitted from VaR framework, ADIs are still required to identify and capitalise those risk factors in a manner comparable to their VaR framework.[1]

An ADI's RNIV framework encompasses methods and processes to identify, quantify, manage and, where appropriate, capitalise risk factor gaps. APRA expects IMA ADIs to use RNIV capital add-ons as temporary adjustments that remain in place until the ADI incorporates the corresponding risk factor gap into its internal model, in a manner compliant with APS 116. However, in some cases, obstacles to satisfactory modelling of some risk factors may result in their permanent capitalisation under the RNIV framework.

APRA has observed weaknesses in ADI RNIV frameworks and inconsistencies in the calculation of RNIV capital add-ons applied. As a result, this letter seeks to:

- Improve consistency in risk factor gap reporting and capitalisation across the industry, to promote a better market practice; and
- Clarify APRA's expectations for the management of RNIV.

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[1] APS 116 Market risk, Paragraph 5 of the Attachment C

Identification of RNIV, Governance and Control processes

The RNIV framework is an important component of the APS 116 internal model approach (IMA). Therefore, the internal governance of the framework is to be commensurate with APS 116 (in line with the expectation in Attachment C paragraph 5). An ADI's risk appetite towards RNIV should be at least as conservative as comparable risk factors under the IMA.

APRA expects an ADI to hold sufficient capital for RNIV, to deal with risks which are not captured by the risk engine, as well as event risks that could adversely affect the relevant bank business. It is APRA's expectation that ADIs continually monitor existing RNIV, as well as systematically identify and measure new risk factor gaps on an ongoing basis.

To meet these expectations, ADIs should independently validate their RNIV framework, both periodically and when the framework materially changes. Additionally, a change to the framework should be treated as a material change to an internal model and subject to the same requirements, governance and notifications to APRA that a material model change request would attract.

IMA ADIs should be able to explain how each risk factor gap is identified and defined through various means, including (but not limited to) profit attribution analysis and back-testing. Profit attribution test compares historical profits generated by the desk's front-office pricing models and by the bank's risk models. Measuring the gap between the two provides an insightful understanding of RNIV, both from a regulatory supervision and internal risk management point of view.

Quantification of RNIV

At the reporting end date of each quarter, ADIs are required to capitalise all RNIV under APS 116, irrespective of their materiality. The capital add-on of RNIV for VaR and SVaR is to be calculated as the product of their aggregate RNIV impact on VaR (or SVaR) with the multiplication factors to be based on APS 116 Attachment C Paragraph 3 and 83-86. For further details, refer to the *Technical Attachment*.

For ARF 116 regulatory reporting purposes, APRA requests ADIs to use the stand-alone RNIV method, defined in the *Technical Attachment*. This is for reporting purposes only. ADIs may choose to use the incremental RNIV approach in their internal models and then convert it to the stand-alone RNIV for reporting purposes.

To reduce the operational burden of immaterial RNIV, APRA allows ADIs to define an immaterial set of risk factor gaps, which are updated at least triennially. However, RNIV within the immaterial set is to meet the following conditions:

- the aggregate impact of RNIV in an ADI's immaterial set must not exceed 2.5% of VaR;
- ADIs are required to continuously monitor their exposure to each immaterial RNIV;
- If the ADI's exposure to an individual RNIV in the immaterial set increases by 15% over four consecutive quarters, the RNIV impact is expected to be updated; and
- When new risk factor gaps are introduced (or re-introduced) to the immaterial set, their impacts are expected to be updated as of the inclusion date.

Better practice is for ADIs to identify trigger points for review of their models that activate when an RNIV's impact on VaR exceeds the bank's internally defined threshold. Reviews would be independently validated according to the ADI's Model Risk Policy. APRA expects IMA ADIs to treat trigger events as strong evidence that a model may not adequately satisfy the requirements of the internal model approach, as set out in Attachment C of APS 116.

IMA ADIs are to remove any offsetting benefit that may arise between risk factor gaps. Refer to the *Technical Attachment* for further information.

Quarterly Reporting of RNIV

To improve consistency of regulatory reporting across the industry, IMA ADIs are requested to exclude reporting RNIV in their base VaR and SVaR figures in ARF 116.0.13, when reporting Traded Market Risk (TMR) capital. Instead, the relevant scaling multipliers should be calculated, according to Equation (4) of the *Technical Attachment*. These are to be added to the bank's multiplication factor prescribed in APS 116 Attachment C Paragraphs 3 and 83-86.

We also request that banks provide a detailed breakdown of their quarterly RNIV impact as part of the quarter-end Additional Market Risk Supplementary Information pack. At a minimum, the RNIV information should include:

- For VaR and SVaR scalar multipliers greater than three, a breakdown of the attribution of the RNIV to the multiplier;
- A list of all risk factor gaps, regardless of materiality;
- Individual impact of each RNIV, according to the *Technical Attachment*;
- The total impact of RNIV in the immaterial set, according to the *Technical Attachment*; and
- The last estimation date for each RNIV.

For any quarries in relation to this letter, please contact your Supervisor.

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Technical Attachment

This technical attachment provides additional guidance on the reporting of RNIV for ARF 116.0.13.

For a given portfolio, there are two main methods of estimating the impact of RNIV: *incremental* and *stand-alone* RNIV VaR. For ARF 116 regulatory reporting purposes, APRA requests ADIs to use the stand-alone RNIV method. ADIs may also choose to use the incremental RNIV approach in their internal models and then convert it to the stand-alone RNIV. If using the incremental RNIV approach, we will request detailed calculations to ensure consistency in calculation is applied across the industry.

Incremental RNIV

Incremental RNIV VaR, $R_{VAR}^{inc}(U; t)$, calculates the RNIV impact as the difference between the VaR calculated using P&L vectors from the product system and the calculated VaR in the risk system. This is represented by the following expression:

$$R_{VAR}^{inc}(U; t) = VaR(F; t) - \widehat{VaR}(W; t), \quad F = W \cup U$$

where

- F denotes a set of all risk factors in the product system;
- W denotes risk factors captured in the risk system;
- U denotes risk factor gaps not captured in the risk system;
- t denotes time period;
- $VaR(F; t)$ denotes VaR calculated using holding period profit (HPP) vectors from the products system; and
- $\widehat{VaR}(W; t)$ denotes VaR calculated using holding period profit (HPP) vectors from the risk system.

Stand-alone RNIV

Stand-alone RNIV VaR $R_{VAR}^{s}(U; t)$, on the other hand, calculates the RNIV impact as the VaR of the difference between the holding period profit (HPP) vectors from the product and the risk systems.

In order to calculate stand-alone RNIV, we first define the gap in HPP, $D(U; t)$ as:

$$D(U; t) = HPP(F; t) - \widehat{HPP}(W; t) \tag{1}$$

Then the stand-alone RNIV is:

$$R_{VAR}^{s}(U; t) = \text{PERCENTILE}(D(U; t), \alpha) \tag{2}$$

where

- PERCENTILE denotes the percentile function; and
- α is the number representing the percentile value (e.g. 0.01 for 99% VaR)

The stand-alone RNIV for the SVaR period is defined in a similar way to Equation (2), except that the SVaR observation window is to be used. Therefore, we generalise our notations as follows:

$$R_N^s(U; t) = \text{PERCENTILE}(D(U; t), \alpha), \quad N \in \{VaR, SVaR\} \tag{3}$$

At the reporting end date of each quarter, ADIs are required to capitalise all RNIV under APS 116, irrespective of their materiality. The capital add-on RNIV for VaR $c_{VAR}(U; T)$, and SVaR, $c_{SVAR}(U; T)$, calculated at quarter-end date T respectively is given by:

$$c_N(U; T) = m_N(T) \times I_N(U; T), \ N \in \{VaR, SVaR\} \tag{4}$$

where

- $m_N(T)$ denotes the multiplication factors based on APS 116 Attachment C Paragraph 3 and 83-86, subject to a minimum value of three; and
- $I_N(U; T)$ represents the aggregated impact of RNIV for VaR or SVaR, identified by its subscript where $N \in \{VaR, SVaR\}$.

The aggregated impact of RNIV is to be estimated using the simulated profit distribution of the portfolio of all in-scope products, as follows:

$$I_N(U; T) = \frac{\sum_{g_i \in U} \max(0, R_N^s(g_i; T))}{N(W; T)}, \ N \in \{VaR, SVaR\} \tag{5}$$

where

- $R_N^s(g_i; T)$ is a stand-alone estimate of RNIV defined per Equation (3); and
- $U = \{g_1, \cdots, g_M\}$ denotes a collection of risk factor gaps, $g_i \ i \in \{1, \dots, M\}$, that are not adequately reflected in the VaR Framework– i.e. that correspond to risk factor gaps.

I_{VAR} (or I_{SVAR}) is to be calculated using the VaR (or SVaR) observation window consistent with the window used for total portfolio VaR (or SVaR).

ADIs are to update the values for $I_{VAR}(U; T)$ and $I_{SVAR}(U; T)$ at least semi-annually, except for RNIV in the *immaterial set*, which banks must update at least triennially. The immaterial set IS is the set of RNIV selected by banks, such that, at each quarter end date T:

$$I_{VAR}(IS \subseteq U; T) \leq 2.5\% \tag{6}$$

The left hand-side of the above inequality is defined according to Equation (5).