Annex 2: Supervisory benchmarks for the setting of Pillar 2 own funds requirements for market risk

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1. Introduction

This document is an Annex to *Common criteria and methodologies for SREP* (Ytri viðmið og aðferðafræði vegna könnunar- og matsferlis hjá fjármálafyrirtækjum) which describes the criteria, procedures and methodology applied in the FME's assessment of institutions' overall risk level and need for capital, i.e. SREP. The methodology of the FME is based on the European Banking Authority's *Guidelines on common procedures and methodologies for SREP*.[1]

Building on chapter 2.4.3 in the main text, this Annex further elaborates on specific supervisory benchmark calculations used by FME to inform the setting of Pillar 2 capital for market risk. Additional own funds requirements are determined on a risk-by-risk basis, using supervisory judgement, supported by the ICAAP calculations of institutions, the outcome of supervisory benchmarks and other relevant inputs, including those arising from dialogue with the institutions.

Supervisory benchmarks and *benchmark calculations* refer to risk-specific quantitative tools developed by the FME to provide an estimation of additional own funds needed to cover risks or elements of risk not covered by Regulation (EU) No 575/2013[2], cf. Regulation No 233/2017[3], or to further support the determination of risk-by-risk additional own funds requirements where ICAAP calculations for those material risks, or elements of such risk, are considered insufficient or are unavailable. Given the variety of different business models, the outcome of the supervisory benchmarks may not be appropriate in every instance for every institution. The benchmarks calculations have been constructed adequately to avoid double counting.

2. Market risk not covered by Pillar 1

The EBA's Guidelines on common procedure and methodologies for SREP[4] require supervisory authorities to evaluate market risk in the trading book, as well as interest rate risk and equity risk in the banking book. Under Pillar 1, capital charges are set for equity and interest rate risk in the trading book and for exchange rate risk, commodity risk and CVA risk in the overall portfolio, see table 1 below.

[1] EBA/GL/2014/13: Guidelines on common procedures and methodologies for SREP*:* https://www.eba.europa.eu/documents/10180/935249/EBA-GL-2014-13+(Guidelines+on+SREP+methodologies+and+processes).pdf.

[2] Regulation (EU) 575/2013: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0575&from=en.

[3] Reglugerð um varfærniskröfur vegna starfsemi fjármálafyrirtækja, nr. 233/2017: https://www.reglugerd.is/reglugerdir/eftir-raduneytum/fjarmala--og-efnahagsraduneyti/nr/0233-2017.

[4] EBA/GL/2014/13: https://www.eba.europa.eu/documents/10180/935249/EBA-GL-2014-13+(Guidelines+on+SREP+methodologies+and+processes).pdf.

Table 1: Risk factors under Pillar 1 and Pillar 2

Books	Pillar 1	Pillar 2
Trading	• General interest rate risk • Specific interest rate risk • General equity risk • Specific equity risk	• General interest rate risk • General equity risk
Banking		• General equity risk • General interest rate risk (IRRBB)
Overall	• Exchange rate risk • Commodity risk • CVA risk	• Exchange rate risk • Indexation risk • Risk management and control

In the case of equities and bonds in the banking book, no capital charges are set under Pillar 1 for market risk, but these portfolios are included in the Pillar 1 calculation of capital for credit risk. Under Pillar 1, equities are included in calculation with a risk weight of a minimum of 100%, whereas bonds are included in the calculation with a risk weight of 0 to 100%, depending on the issuer's rating score.

The FME assesses the suitability of the Pillar 1 capital requirements for general equity risk in the banking book and if required, calculates additional charges under Pillar 2. As no capital requirements are set for interest rate risk in the banking book (IRRBB) under Pillar 1, the FME assesses the capital requirements under Pillar 2. Table 1 shows which risks are covered under Pillar 1 and which risks the FME includes in its Pillar 2 assessment.

Where Pillar 1 fails to adequately capture risk in the trading book (e.g. due to complex products, illiquid positions etc.), the FME seeks to address this issue in Pillar 2. This also entails making a qualitative assessment of concentration and market liquidity in both the trading book and the banking book, and the bank's management and control of market risk.

For most risk categories there is more than one viable method for assessing the own funds requirement. Each method has different sensitivities to the various underlying risk factors and will therefore result in different estimates of risk and own funds required to mitigate the risk under consideration. The FME will therefore in most cases use more than one method to evaluate the appropriate own fund requirement. In addition, qualitative assessments are made of risk management and control.

The SREP is primarily based on data already reported under the EBA reporting framework (COREP and FINREP), Icelandic FME reporting framework (IRRBB report) and the institution's own reports (ICAAP, Internal-Risk, Pillar 3 and financial statements). Further information is acquired during the SREP, on a need to have basis. Additionally, the commercial banks are required to report specific information on risk limits, daily profit and loss (P&L) and the various portfolios' positions and exposures over the past year, at year-end.

For discussions on risk management and control and intra-risk diversification refer to chapters 2.4.2 and 3.2.1, respectively, in *Common criteria and methodologies for SREP*.

3. Basis for calculation: actual exposure vs. limits and historical P&L

Pillar 1 requirements are set with a basis in actual positions. As the positions, particularly those in the trading book are likely to be subject to frequent fluctuation, the FME also considers the daily positions over the last 12 months to determine whether the reporting date positions reflect the risk inherent in each institution's business activities. In order to increase the risk sensitivity of the Pillar 2 assessment, some methods ignore the actual positions and focus solely on the volatility of each portfolio's historical P&L.

Additionally, institutions are required to have established risk limits for the majority of risk factors. The limits reflect the level of risk acceptable to the Board of directors, and for those institutions that adjust their limits infrequently, give insight into how the positions and the risk levels might change in the short term. However, the FME does not use risk limits directly as a basis for calculation of Pillar 2 requirement.

In the banking book, institutions make less use of risk limits, except as regards interest rate risk in the banking book (IRRBB). Moreover, adjusting exposures in the banking book will normally take longer than in the trading book, where substantial changes are likely to happen on an intraday basis. As a result, there is less reason for the FME to monitor the risk limits of the banking book for risk evaluation purposes, except in the case of interest rate risk.

4. VaR and Stressed VaR

Many of the methods used by the FME utilize VaR and Stressed VaR calculations. The methods are based on the VaR standards presented in Regulation (EU) No 575/2013, cf. Regulation No 233/2017, as well as the EBA Guidelines on Stressed Value At Risk.[5] These methods are intended as a minimum standard for institutions using the Internal Model Approach (IMA) for calculating capital requirement for market risk in the trading book. However, the FME uses them as a supervisory benchmark for risk assessment. The VaR calculations are based either on historical daily P&L figures or on historical changes to the underlying risk factors.

The former approach assumes that the volatility of the historical daily profit and loss is a good indicator of potential future losses for the institution. This approach is often used when good historical information or even decent risk proxies are unavailable. The second approach assumes that the volatility of the underlying risk factors is a good indication of their future behavior and therefore the risk of holding the current positions. In some cases, it is prudent to put more weight on the more recent data, especially if volatility is on the rise.

The observation period for the VaR calculation is the previous 250 business days. For the Stressed VaR, even though the observation period is 250 days, the period used must include a significant stress event relevant to the portfolio under assessment. There are number of ways to identify a suitable period, for example, the period with the highest risk factor volatility or the 12-month period with the highest VaR result. For many portfolios, a 12-month period relating to significant losses in the 2007/2008 period would adequately reflect a period of such stress. In addition, other

[5] EBA/GL/2012/2: https://www.eba.europa.eu/documents/10180/104547/EBA-BS-2012-78--GL-on-Stressed-VaR-.pdf.

periods relevant to the current portfolio should also be considered by institutions to determine a historical period that would provide a conservative capital outcome.

5. Assessment of the trading book

The supervisory benchmarks for the setting of Pillar 2 capital for market risk are based on a calculation of the estimated potential for loss due to negative changes in the most important market risk factors. The interest rate and equity risk in the trading book is estimated by using VaR models. Commodity risk has thus far not been considered a part of the institutions' overall market risk.

5.1 General interest rate risk

To assess the suitability of Pillar 1 capital requirement for general interest rate risk in accordance with Articles 339-340 of Regulation (EU) No 575/2013, cf. Articles 56 and 92 of Regulation No 233/2017, the FME uses historical VaR and Stressed VaR models in accordance with Articles 362-369 of Regulation (EU) No 575/2013, cf. Articles 56 and 92 of Regulation No 233/2017 and EBA Guidelines on Stressed Value-At-Risk, which applies to institutions using Internal Model Approach (IMA) when calculating regulatory capital requirements. Due to lack of proxies and frequent changes in the trading book portfolio, the supervisory assessment is based on historical P&L values for the portfolio. Compared to bond markets in larger countries, the Icelandic bond market is small, illiquid and relatively volatile. It is therefore the view of the FME that a reliance on nominal amounts in the bond portfolio is neither prudent nor risk-sensitive and does not reward those institutions that manage their portfolios in risk-sensitive manner. This also means that during times of extreme volatility, the resulting capital requirement for general interest rate risk could become greater than the nominal value of the bond exposure at reporting date. This is appropriate, as the capital requirement is intended to meet potential losses from day to day business activities of the trading portfolio, not just the position at the reporting date. The supervisory benchmark for general interest rate risk in the trading book is calculated as the sum of:

- 99% VaR on clean P&L scaled to ten-day holding period, using the last 250 days as a historical observation period. The higher of a) the most recent VaR result and b) an average of the VaR results calculated over the last 60 business days multiplied by a back testing multiplication factor of 3.
- 99% Stressed VaR on clean P&L scaled to ten-day holding period using the most adverse 250 day period observed during the last five years. The higher of a) the most recent SVaR result and b) an average of the SVaR results calculated over the last 60 business days multiplied by a back testing multiplication factor of 3.

The general interest rate risk capital requirement under Pillar 1 is deducted from the result.

5.2 General equity risk

The Pillar 1 capital requirement for equity risk in the trading book is a 100% risk weight for general risk and 100% risk weight for specific risk in accordance with Articles 342-343 of

Regulation (EU) No 575/2013, cf. Articles 56 and 92 of Regulation No 233/2017. To assess the suitability of Pillar 1 capital requirement for equity risk, the FME uses two different methods.

First, the *Risk Weight Method*, which is in accordance with Article 155 of Regulation (EU) No 575/2013 (simple risk weight approach), cf. Article 92 of Regulation No 233/2017. This is an IRB method for calculating capital requirements for equity exposures in the banking book. In general, the exposures in the trading book should be more liquid and therefore not as risky as the exposures in the banking book. However, because of the permeability of the boundary between trading and banking books and the illiquidity of the Icelandic equity market, the FME considers the "Simple risk weight approach" appropriate. This supervisory benchmark for equity risk in the trading book is calculated as the sum of the following:

- 370% risk weight for unlisted equities in the trading book.
- 290% risk weight for listed equities in the trading book.
- 190% risk weight for private equity exposures in sufficiently diversified portfolios.
- Look through approach for fund exposures in the trading book (290% or 370% risk weights) and 370% risk weight if such an approach is not possible.

The general and specific equity risk capital requirement under Pillar 1 is deducted.

The second method uses historical VaR and Stressed VaR models in accordance with Articles 362-369 of Regulation (EU) No 575/2013, cf. Articles 56 and 92 of Regulation No 233/2017 and EBA Guidelines on Stressed Value-At-Risk, which applies to institutions using Internal Model Approach (IMA) when calculating regulatory capital requirements. Due to lack of proxies and frequent changes and in the trading book portfolio, the supervisory assessment is based on historical P&L values for the portfolio. Compared to equity markets in larger countries, the Icelandic equity market is small, illiquid and relatively volatile. It is therefore the view of the FME that a reliance on nominal amounts in the equity portfolio is neither prudent nor risk-sensitive and does not reward those institutions that manage their portfolios in risk-sensitive manner. This also means that during times of extreme volatility, the resulting capital requirement for general equity risk could become greater than the nominal value of the equity exposure at reporting date. This is appropriate, as the capital requirement is intended to meet potential losses from day to day business activities of the trading portfolio, not just the position at the reporting date. This supervisory benchmark for general equity risk in the trading book is calculated as the sum of:

- 99% VaR on clean P&L scaled to ten-day holding period, using the last 250 days as a historical observation period. The higher of a) the most recent VaR result and b) an average of the VaR results calculated over the last 60 business days multiplied by a back testing multiplication factor of 3.
- 99% Stressed VaR on clean P&L scaled to ten-day holding period using the most adverse 250 day period observed during the last five years. The higher of a) the most recent SVaR result and b) an average of the SVaR results calculated over the last 60 business days multiplied by a back testing multiplication factor of 3.

The general equity risk capital requirement under Pillar 1 is deducted from the result.

6. Assessment of the Banking book

The supervisory benchmarks for the setting of Pillar 2 capital for market risk are based on a calculation of the estimated potential for loss due to negative changes in the most important market risk factors. In the SREP, the loss potential related to equity, interest rate and property risk in the banking book is measured by stressing the institutions' portfolio holdings.

6.1 General interest rate risk (IRRBB)

General interest rate risk in the banking book is not assessed under Pillar 1.

EBA's Guidelines on interest rate risk in the banking book[6] require interest rate risk to be measured against a sudden parallel +/- 200 basis point shift of the yield curve (applying a 0% floor). This is a minimum requirement. If the +/- 200 basis point shift is lower than the actual level of change in interest rates, calculated using the 1st and 99th percentile of observed one-day interest rate changes over a five year period scaled up to a 240-day year, the higher level of shock arising from the latter calculation should be applied.

Conforming to the Guidelines' prescription, the FME has calculated the appropriate shifts for the ISK assets and liabilities to be +/-400 basis points for non-indexed ISK and +/- 240 basis points for indexed ISK. For assets and liabilities in other currencies, +/- 200 basis point shift is deemed adequate. For all shifts, a 0% interest rate floor is applied. The shifts for the ISK assets and liabilities, will in the near future, be revised in order to align with the methodology prescribed in the recent BCBS standard on IRRBB.[7] Ekki í gildi

The yield curve used is the risk-free yield curve rather than one comprising credit spread.

The EBA Guidelines further state that the exposure level used for assessment should take account of the allocated limit or limits, rather than just the point in time risk position, since IRRBB positions can change (or be changed) significantly in a very short period and risk measurement will normally be undertaken less frequently than in a trading book. Given that risk limits are essentially an expression of an institution's risk appetite, and that any capital allocations for IRRBB under Pillar 2 may be adjusted infrequently (e.g. at an annual review of the institution's ICAAP), such capital allocations may need to be based on limits rather than actual positions. However, the method currently used by the FME to assess IRRBB only takes account of the position in the banking book at the reporting date, since the banks set their limits based on their own distinct methodologies, which in some cases also take into consideration benefits derived from having a positive indexation balance.

Interest rate risk has two forms, economic value volatility and earnings volatility, and the measurement of both of these forms is required for full understanding of the IRRBB. The higher the duration of a loan, the stronger the stabilizing effect on earnings, but the greater the impact on economic value under stress:

[6] See item 24(a) in Chapter 3 of EBA/GL/2015/08: Guidelines on the management of interest rate risk arising from non-trading activities: https://www.eba.europa.eu/documents/10180/1084098/EBA-GL-2015-08+GL+on+the+management+of+interest+rate+risk+.pdf.

[7] Basel Committee on Banking Supervision. Standards: Interest rate risk in the banking book: http://www.bis.org/bcbs/publ/d368.pdf.

Economic value perspective focuses on the long-term effect of interest changes. The economic value of equity (EVE) is the present value of the bank's expected net cash flows (including assets, liabilities, and off-balance sheet) discounted using current risk-free yield curve.

The FME method for assessment is based on sudden, unexpected and permanent parallel yield curve shifts using +/- 400 basis points for non-indexed ISK, +/- 240 basis points for indexed ISK and +/- 200 basis points for other currencies. The assets and liabilities are discounted using risk-free yield curves and a modified duration approach. Static [8]model assumptions, no convexity, no optionality and 0% interest rate floor[9]. Non-performing loans and interest rate insensitive impaired loans can be excluded. No fair-value vs. book value mitigation is allowed.

6.2 Equity risk

The Pillar 1 capital requirement for equity risk in the banking book is calculated at 100-1250% risk weight in accordance with Article 133 of Regulation (EU) No 575/2013, cf. Articles 32 and 92 of Regulation No 233/2017. To assess the suitability of the Pillar 1 capital requirement for equity risk, the FME uses the "Simple risk weight approach", in accordance with Article 155 of Regulation (EU) No 575/2013, cf. Article 92 of Regulation No 233/2017. This is an IRB method for calculating capital requirements for equity exposures in the banking book. The supervisory benchmark for equity risk in the banking book is calculated as the sum of the following:

- 370% risk weight for unlisted equities in the banking book.
- 290% risk weight for listed equities in the banking book.
- Look-through approach for fund exposures in the banking book (290% or 370% risk weights) and 370% risk weight if such an approach is not possible.

The capital requirement for equity risk in the banking book, under Pillar 1 is deducted from the result.

7. Assessment of risks originating in both books

The assessment of the Pillar 2 requirement for market risk is based on a calculation of the estimated potential for loss due to negative changes in the most important market risk factors. In the SREP, the loss potential related to exchange rate risk in both books is measured using a VaR model.

7.1 Exchange rate risk

Exchange rate risk in Pillar 1 is based on the higher of, respectively, the sum of short and the sum of long positions across all currencies in accordance with Articles 351-354 of Regulation (EU) No 575/2013, cf. Articles 56 and 92 of Regulation No 233/2017

To assess the suitability of Pillar 1 capital requirement for an institution's exchange rate risk, the FME uses a "Covariance Matrix VaR" benchmark method, unlike the simple historical VaR used for positions in the trading book. The benchmark uses each institutions' net position in each currency (other than ISK) at the reporting date. The confidence level is 99%. The holding period is the most

[8] Guidelines on the management of interest rate risk arising from non-trading activities, item c) on pg 15.
[9] For the curve shifts, not individual financial instruments.

adverse 250 days observed over a specific five-year period, taking into account each institutions FX positions. The choice of a five-year period can prove problematic as for last nine years the Icelandic krona has been subject to currency-controls, reducing the volatility of the currency. Furthermore, the period from 2007 to the end of 2008 are not suitable due to extreme circumstances. Accordingly, the five-year period used in the benchmark is from the start of 2002 to the end of 2006.

In order to validate whether or not the FX positions at the reporting date are "normal", the VaR result for the reporting date is compared with the average result using the FX positions from the last 60 business days before the reporting date.

The exchange rate risk capital requirement under Pillar 1 is deducted from the result.

7.2 Indexation risk

Indexation risk is the risk of loss due to unexpected changes in inflation, which derive from imbalance in indexed assets and liabilities.

Indexation risk is not addressed under Pillar 1 but it is similar to FX risk. Inflation is subject to seasonality and its historical distribution is both skewed and has excess kurtosis. In order to take account of those characteristics, the historical data[10] set is adjusted for seasonality and MVaR[11] is used to calculate a 1 year, 99% VaR for negative indexation balance:

$$MVaR = \left[z + \frac{S}{6}(z^2 - 1) + \frac{K}{24}(z^3 - 3z) - \frac{S^2}{36}(2z^3 - 5z)\right]\sigma$$

z: 2,33
K: Excess kurtosis
S: Skewness

For MVaR calculation of positive, negative data set (multiplied by -1) is used.

Capital requirement, as a ratio of indexation balance amount:

Positive balance: 3.53%
Negative balance: 6.46%

Due to historical correlation, institutions are permitted to model indexation risk and IRRBB risk jointly. However, since the correlation fluctuates and in some circumstances breaks down, a floor of 75% has been set to limit the diversification benefits enjoyed by the institutions.

[10] Monthly inflation from January 2001 till October 2017.
[11] L. Cavenaile & T. Lejeune (2012). A Note on the Use of Modified Value-at-Risk, *Journal of Alternative Investments*.