ANNEX 1

GUIDELINES ON MARKET RISK MANAGEMENT

FOR BANKS

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1. DEFINITION AND SOURCES OF MARKET RISK

1.1. Market risk is the risk of losses to earnings or capital resulting from adverse movements in market prices, particularly, **changes in interest rates, foreign exchange rates, equity and commodity prices**. Generally, the four types of market risks for banks are as follows:

1.1.1. Interest Rate Risk is the risk of losses to earnings or capital arising from movements in interest rates.

1.1.2. Foreign Exchange Risk refers to the risk of losses to earnings or capital arising from adverse movements in foreign exchange rates.

1.1.3. Equity Risk is the risk of losses to earnings or capital arising from movements in the value of an FI's equity-related holdings.

1.1.4. Commodity Risk is the risk of losses to earnings or capital due to adverse changes in the value of a bank's commodity-related holdings.

2. RISK MANAGEMENT STRATEGY, POLICIES AND PROCEDURES

2.1. Risk Management Strategy

2.1.1. **Banks should develop a sound and well-informed strategy to manage market risk.** The strategy should be approved by the bank's Board of Directors or by the group/regional or its equivalent oversight function for the operations in Brunei Darussalam ("Board"). The Board, based on the recommendation of senior management, should first determine the level of market risk the bank is prepared to assume and the possible losses it is willing to bear. This level should be set with consideration given to, among other factors, the amount of market risk capital set aside by the bank against unexpected losses.

2.1.2. Once its market risk tolerance is determined, the bank should develop a strategy that balances its business goals with its market risk appetite.

2.1.3. In setting its market risk strategy, a bank should consider the following factors:

a. economic, market and liquidity conditions and their impact on market risk;

b. whether it has the expertise to take positions in specific markets and is able to identify, measure, evaluate, monitor, report and control or mitigate the market risk on a timely basis in those markets; and

c. the portfolio mix and how it would be affected if more market risk was assumed.

2.1.4. A bank should be aware that in executing its hedging strategies, offsetting or hedged instruments can still be exposed to market risks when the hedge is not perfect. Hedging strategies generally incorporate and relies on certain assumptions about the correlation between two instruments/assets. The effectiveness of these strategies would be affected if these assumptions are proved to be inaccurate or no longer hold. Institutions should evaluate the impact of a breakdown in these assumptions and critically assess the effectiveness of the strategies.

2.1.5. **A bank should put in place a process by which significant changes in the size or scope of its activities would trigger an analysis of the adequacy of capital supporting the activities.** The bank should have an internal capital allocation system that meaningfully links identification, monitoring and evaluation of market risks to economic capital.

2.1.6. **A bank's market risk strategy should be periodically reviewed by the Board and senior management taking into consideration its financial performance, market risk capital and updated market developments.** The market risk strategy should be effectively communicated to the relevant staff. There should also be a process to detect and report to the approving authority deviations from the approved market risk strategy, operating bands and target markets.

2.2. Risk Management Policies

2.2.1. **A bank should formulate market risk policies which should be approved by the Board.** These policies, which should be reviewed periodically, should reflect the strategy and processes of the bank, including its approach to controlling and managing market risk. The Board should oversee the bank's management to ensure that these strategies, policies and processes are implemented effectively and fully integrated into the bank's overall risk management process. In addition, exceptions to established policies should receive prompt authorisation by the appropriate level of management and the bank's Board where necessary.

2.2.2. Policies should be applied on a consolidated basis and, where appropriate, to specific subsidiaries[1], affiliates[2] or units within a bank. **The policies should clearly:**

(a) prescribe how market risk is measured and communicated, including communication to the Board;

(b) spell out the process by which the Board decides on the maximum market risk the bank is able to take, as well as the frequency of review of risk limits;

(c) set out the scope of activities of the business units assuming market risk;

[1] As defined in the Notice on Banks' Recovery Plan (Notice NO BU/N-3/2019/63).
[2] As above.

(d) delineate the lines of authority and the responsibilities of the Board, senior management and other personnel responsible for managing market risk;

(e) establish the processes which the bank determines the appropriate levels of capital against unexpected losses; and

(f) identify and set guidelines on the market risk control limit structure, delegation of approving authority for market risk control limit setting and limit excesses, capital requirements, and investigation and resolution of irregular or disputed transactions.

2.3. Risk Management Procedures

2.3.1. **Banks should establish appropriate procedures to implement the market risk policy, strategy and processes.**

(a) These should be documented in a manual and the staff responsible for carrying out the procedures should be familiar with the content of the manual.

(b) The manual should set out the operational steps and processes for executing the relevant market risk controls.

(c) The manual should also be periodically reviewed and updated to take into account new activities, changes in systems and structural changes in the market.

(d) The procedures should cover all activities that are exposed to market risk.

3. RISK MEASUREMENT, MONITORING AND CONTROL

3.1. Framework, Processes and Systems

3.1.1. **A bank should establish a sound and comprehensive risk management framework and processes. This framework should include:**

(a) a methodology to identify market risks;

(b) an appropriately detailed structure of market risk limits that are consistent with the bank's risk appetite, product lines, risk profile and capital strength, and which are understood by, and regularly communicated to, relevant staff;

(c) guidelines and other parameters used to govern market risk-taking;

(d) processes for allocation of positions to the trading book;

(e) appropriate management information system (MIS) for accurate and timely identification, aggregation, monitoring, controlling, and reporting of market risk, including transactions between the bank and its affiliates, to the bank's Board and senior management;

(f) exception tracking and reporting processes that ensure prompt action at the Board or appropriate level of the bank's senior management, where necessary;

(g) effective controls around the use of models to identify and measure market risk; and

(h) valuation policies, including policies and processes for considering and making appropriate valuation adjustments for uncertainties in determining the fair value of assets and liabilities, such as positions that otherwise cannot be prudently valued, including concentrated and less liquid positions.

3.1.2. A bank should incorporate, to the fullest extent, its market risk management process into its overall risk management system. The bank can therefore understand and manage its consolidated risk exposure more effectively. Where the bank is part of a financial services group, the risk management process should also be integrated with that of the group's, where practicable.

3.1.3. The risk management system should commensurate with the scope, size and complexity of a bank's trading, other financial activities and the market risks assumed. The system should be able to measure current exposures, through marked-to-market or marked-to-model pricing, as well as potential market risks. It should be able to accommodate volume increases, new valuation methodologies and new products. All significant risks should be measured and aggregated on a bank-wide basis. **Limits for market risks that are consistent with the maximum exposures authorised by the Board and senior management should be set.**

3.1.4. **A bank's risk management system should be able to quantify risk exposures and monitor changes in market risk factors** (e.g. changes in interest rates, foreign exchange rates, equity prices and commodity prices) **and other market conditions on a daily basis.** A bank whose risk levels fluctuate significantly within a trading day should monitor its risk profile on an intra-day basis. The system should also enable a bank to identify risks promptly and take quick remedial action in response to adverse and sudden changes in market factors.

3.1.5. **An independent risk management function should be established. Risk management staff should be separate from and independent of risk-taking staff. The risk management function must:**

(a) define risk management policies;

(b) set procedures for market risk identification, measurement and assessment, and monitor the bank's compliance with established policies and market risk limits;

(c) capture and report transactions and resulting market risk exposures in a timely manner to the Board and senior management;

(d) ensure marked-to market positions are revalued frequently;

(e) ensure that treasury and financial derivative valuation processes are robust and independent of the risk-taking functions;

(f) ensure that the valuation process use consistent and prudent practices and reliable market data are verified independently or in the absence of market prices, internal or industry-accepted models;

(g) ensure that models and supporting statistical analyses used in valuations are appropriate, consistently applied, and have reasonable assumptions. These should be validated before deployment;

(h) ensure that staff involved in the validation process should be adequately qualified and independent of the trading and model development functions;

(i) review models periodically. More frequent reviews may be necessary if there are changes in models or in the assumptions resulting from developments in market conditions.

3.1.6. The Board and senior management should establish effective processes to manage market liquidity risk arising from treasury and financial derivative trading activities.

(a) The Board and senior management should take note of the size and depth of the markets the bank is active in and establish the appropriate risk-taking guidelines. These guidelines should take into account the bank's ability to access alternative markets or credit lines to continue functioning under a broad range of scenarios. They should also consider the risks associated with early termination of treasury and financial derivative contracts.

3.1.7. **Risk management systems of banks with significant assets under management should clearly document the investment decision-making framework, and the risk identification, assessment, measurement, monitoring, control and reporting processes** (e.g. asset allocation, liability portfolio matching criteria, limit structures

and dealing authority, and performance analysis). Such documentation is necessary even if the asset management function is outsourced to third party fund managers.

3.2. Risk Measurement

3.2.1. **Banks should implement suitable measures for all market risks assumed. The monitoring of these measures should be integrated into daily risk management process.** The broad risk types to be measured are outlined below.

3.2.2. **Interest Rate Risk**

(a) A bank should incorporate re-pricing risk (arising from differences between the timing of rate changes and the timing of cash flows), yield curve risk (arising from changing rate relationships across the spectrum of maturities), basis risk (arising from changing rate relationships among yield curves that affect the bank's activities) and optionality risks (arising from interest rate related options embedded in the bank's products). The bank should also consider fee income that is sensitive to changes in interest rates.

(b) Interest rate risk in each currency should be calculated separately. Yield curves should be divided into various maturity segments to capture variation in the volatility of rates along the yield curves. For each currency, the number of yield curves should reflect the risk factors that the bank is exposed to. There should be additional risk measures to capture credit spread and swap spread risks. For bonds and similar instruments, specific risk must also be measured.

3.2.3. **Structural Interest Rate Risk**

(a) A bank's interest rate risk also arises from its structural positions (e.g. non-trading/banking book positions) in financial flows, assets and liabilities. A bank with such positions should note the points raised in paragraph 3.2.2 above, as well as the points considered below.

(b) A bank can alter its structural interest rate risk exposure by changing investment, lending, funding, and pricing strategies and by managing the maturities and repricing of these portfolios to achieve a desired risk profile. The bank should establish an appropriate interest rate risk strategy for management of its structural interest rate risk and establishment of its desired risk profile. The strategy should be reviewed on a regular basis, including a further review by the bank's Board. Where derivatives instruments, such as interest rate swaps, are used to adjust a bank's interest rate risk profile, the bank should fully understand the cash flow characteristics of the instruments.

(c) A bank should establish appropriate interest rate risk measurement systems and adequate MIS to identify, measure, monitor and report on a comprehensive basis its exposure to structural interest rate risks. In particular, the relevance of optionality risk to structural interest rate risk, whereby behavioral maturity differs from contractual maturity. This could occur where

an option is granted to a bank's customers to withdraw deposits or prepay loans at a time of their choosing and where changes in interest rates may influence their choice. Measurement techniques for such options can range from simple maturity and re-pricing schedule analysis or static simulation to more sophisticated dynamic simulations, which can better capture interest rate risk in complex instruments and those with options attached. The bank should ensure that the assumptions and models used for measuring and reporting of structural interest rate risks are independently validated and reviewed regularly.

(d) Interest rate changes have an impact on a bank's income, financial obligations (such as policy liabilities in the case of insurers) and capital positions. The effect of interest rate risk on net income and net interest income should be considered. In particular, a bank with a significant fee income should assess the extent to which that fee income is sensitive to rate changes. From a capital perspective, a bank should consider how intermediate (two years to five years) and long-term (more than five years) positions might affect the bank's future financial performance. Since the value of instruments with intermediate and long maturities can be especially sensitive to interest rate changes, it is important for a bank to monitor and control the level of these exposures. The bank should determine the potential decline in the net present value of its future cash flows as if its balance sheet is subjected to a stressful and uncommon interest rate shock. (This includes the standardised interest rate shocks outlined in the BCBS guidance paper issued in July 2004.)

(e) A bank should consider the fit of its interest rate risk profile with its strategic business plans. A bank that has significant long-term interest rate exposures (e.g. long-term fixed rate assets funded by short-term liabilities) may have difficulty responding to new business opportunities because of depreciation in its asset base.

(f) A bank should set aside capital that is commensurate with the level of structural interest rate risk it is taking.

3.2.4. **Equity Risk**

There should be separate risk factors corresponding to each of the equity markets in which a bank has positions. The measurement of equity risk should capture both general risk (the risk exposure to price movements in the overall equity market (e.g. a market index)), specific sectors of the equity market (e.g. industry sectors or cyclical and non-cyclical sectors), and specific risk (i.e. individual equity issues).

3.2.5. **Foreign Exchange Risk**

Foreign exchange (FX) risk in each currency must be calculated separately. FX risk should include asset-liability mismatch of foreign currencies to the domestic currency. A bank trading in non-deliverable foreign currencies should set limits

reflecting the unique risk characteristics of these currencies. These characteristics include market liquidity, event and settlement date mismatch risks.

3.2.6. **Commodity Risk**

In addition to directional risk arising from changes in their spot prices, commodities also pose other risks such as basis risk (the risk that the relationship between prices of similar commodities alters through time), interest rate risk (the risk of a change in the cost of carry for forward positions and options) and forward gap risk (the risk that the forward price may change for reasons other than a change in interest rates). A bank that is active in commodities trading should also account for variations in the "convenience yield" between derivatives positions, such as forwards and swaps, and cash positions in the commodity. All significant levels of commodity exposures should be properly managed.

3.2.7. **Credit Trading Risk**

A bank that takes positions in credit instruments, such as bonds and credit derivatives, is exposed to the risks of changes in the credit spreads of the underlying issuers. Credit spread is premium above government or risk-free risk, required by the market for taking on credit exposures. Credit instruments are susceptible to default risk as well as credit migration risk. Default risk is the risk of direct losses from an obligor's default and of indirect losses that could arise from a default event. Credit migration risk is the risk of direct losses from rating downgrades or upgrades and of indirect losses that could arise from a credit migration event. Banks should identify, measure, monitor, control and report such risks.

3.2.8. **Market Liquidity Risk**

Market liquidity risk is the risk that a bank is unable to easily liquidate or offset a particular position at or near the last traded market price due to inadequate market depth or market disruptions. Market liquidity conditions can change rapidly. Disruptions in financial markets, as well as entry and exit of major market makers or large institutional investors can affect market liquidity. Available liquidity at any point is also a function of the size of trades that a bank transacts at relative to the market. The bank should continually evaluate trading liquidity risk and its ability to hedge its positions. The risk of tighter liquidity in certain less developed and emerging markets also calls for additional safeguards. Therefore, the banks should have a good understanding of these markets and be able to measure and manage risk exposures to them. All significant market risks, as determined by the bank's definition of material risk, should be measured and aggregated on a bank-wide basis to the fullest extent possible. Where it is not possible to quantify the risk, the bank should seek to understand and report the risk qualitatively.

3.2.9. **Risk Monitoring and Management System**

3.2.9.1. In measuring and monitoring its market risk, a bank should use a risk management system that is commensurate with the scale and complexity of its risk-taking.

3.2.9.2. The system should be able to measure current exposures, through marked-to-market or marked-to-model pricing, as well as potential market risks. It should be able to accommodate volume increases, new valuation methodologies and new products.

3.2.9.3. **The risk management system should provide information on the outstanding positions and unrealised profit or loss as well as, to the extent practicable, the accrued profit or loss on a daily basis.**

i) This information should be retained for audit and investigation purposes.

ii) The system should also cover information on the positions of customers.

iii) The system should be able to monitor trading positions, market movements and credit exposures daily and preferably on a real-time basis.

iv) The risk management system must consider correlations between markets and between categories of risk when evaluating risk positions. These correlations could result in the transmission of shocks from stressed conditions in one market to other markets or may significantly increase the aggregate overall risk to the bank, although individual risks, such as market and credit risks, may appear manageable when viewed independently. Due to such correlated risks, a bank's risk tolerance could be exceeded and so a bank should incorporate risk correlations in its risk assessments and stress testing. A bank whose trading and other financial activity are limited in volume, scope and complexity, may use less sophisticated methodologies.

3.2.9.4. Correlation between various market risk types in different countries for distinct product tenures should be recognised in risk aggregation. In such exercises, the correlation computation method should be empirically sound and periodically validated. Where correlation cannot be accurately determined, a bank should not assume zero correlation. Market risk measurement systems should also allow market risk to be broken down by factors such as risk type, customer, instrument or business unit.

3.2.9.5. Risk measurement systems should accurately capture market risks associated with options. Explicit options face non-linearity in prices while embedded options, such as instruments with prepayment rights, create uncertainty in cash flow timing.

3.2.9.6. The risk management framework should regularly evaluate market risk measurement models and assumptions to ensure that they provide reasonable estimates of market risk. In these reviews, the models should be independently validated, back-tested and re-calibrated when necessary.

(a) Validation should include verifying the consistency, timeliness, reliability, independence and completeness of data sources; the accuracy and appropriateness of volatility and correlation assumptions; and the accuracy of valuation and risk factor calculations.

(b) A back-testing programme should also be conducted regularly to verify that the models are reliable in measuring potential losses over time. The verification should be done at both individual and consolidated levels to ensure that exceptional losses are not concealed in the aggregation. Exceptional back-testing may be warranted when there are significant market developments or when there are changes in the model or its major assumptions.

The Board and senior management should be cognizant of the strengths and limitations of the bank's market risk measurement systems, in order to determine the appropriate risk limits. They should also ensure that the material limitations of the models are well understood and provided for.

3.2.9.7. A screening process should be in place to ensure the integrity of data fed into the risk management system.

(a) Data used should be appropriate (e.g. marked-to-market data for trading activities), accurate, complete (e.g. both on- and off-balance sheet positions), timely, frequently updated and sourced independently of the position-taking units.

(b) While the bank may use market data from reputable sources, it may process and integrate the data to better meet its needs. For instance, when calculating correlations and other parameters, a bank could use an observation period that would be relevant for all the financial instruments it trades in. However, the weighting and processing of data should be justified.

(c) As a counter check, a separate data source could also be used to calculate parameters. Missing data should be addressed by appropriate methods, such as bootstrapping or interpolation techniques, and the integrity of "outliers" should be verified.

(d) A bank should automate the data feed to its market risk management system to reduce incidence of manual error. There should be sufficient documentation of data sources used. Management should be alert to common data problems (e.g. incomplete data, lack of information on off-balance sheet positions, optionality embedded in loans and deposits). Data adjustments (e.g. to account for one-off events) should be documented, and the nature and reasons should be understood.

3.3. Risk Limits

3.3.1. **Risk limits for business units should be established, where appropriate, and approved and periodically reviewed by the Board and senior management respectively.** Changes in market conditions or the resources of the bank should prompt a re-assessment of limits.

3.3.2. Limits should preferably be integrated, where applicable, with group-wide limits for each major type of risk assumed. The bank should ensure consistency between the different types of limits.

3.3.3. The bank should also set limits that are sufficiently granular for effective risk control. For instance, limits for trading desks, portfolios, and dealers by markets, products, instruments and tenors, should be set, where appropriate.

3.3.4. Limits should be clearly understood by, and changes clearly communicated to, all relevant parties.

3.3.5. **Compliance with limits should be monitored by a unit independent of the risk-taking activities.** A bank should have procedures prescribing the course of action for limit excesses. These actions should include investigating the reasons for the excesses, reporting the incidents to management and seeking approval from the Board or senior management. These procedures should also prescribe the actions required for the approval of temporary excesses and limit increases.

3.4. Scenario Analysis and Stress Testing

3.4.1. Stress testing should form an integral part of a bank's overall market risk management process. A bank may choose scenarios based on analysing historical data of changes in market risk factors or creating forward-looking scenarios. The objective should allow the bank to assess the effects of changes in market risk factors on its holdings and financial condition. Hence, scenarios chosen could include low probability adverse scenarios that could result in extraordinary losses. Scenario analysis and stress tests should be both quantitative and qualitative.

3.4.2. **Scenario analysis and stress testing should, as far as possible, be conducted on a bank-wide basis, taking into account the effects of unusual changes in market and non-market risk factors.** Such factors include prices, interest rates, volatilities,

market liquidity, historical correlations and assumptions in stressed market conditions, the bank's vulnerability to worst case scenarios or the default of a large counterparty and maximum cash inflow and outflow assumptions.

3.4.3. Scenario analysis and stress testing would enable the Board and senior management to better assess the potential impact of various market related changes on the bank's earnings and capital position and business strategies.

3.4.4. The Board and senior management should regularly review the results of scenario analyses and stress testing, including the major assumptions that underpin them. The results should be considered during the establishment and review of policies and limits. Depending on the potential losses projected by the scenario analysis and stress tests and the likelihood of such losses occurring, the Board and senior management may consider additional measures to manage the risks or introduce contingency plans.

3.5. Use of Investment Managers

3.5.1. Where a bank engages the services of investment managers, they should be monitored to ensure that the bank's strategy is adhered to. There should be a formal written agreement between the bank and the investment manager.

3.5.2. **A bank's investment strategy and accompanying risk identification, assessment, measurement, monitoring, control and reporting processes** (e.g. asset allocation, liability portfolio matching criteria, limit structures and dealing authority, and performance analysis) must be documented and signed off by the Board and senior management.

3.5.3. The reports made by investment managers should be sufficient to enable a bank to assess whether their operations are in line with the bank's strategy and, in particular, meet the bank's risk-reward criteria. The reporting should also allow the bank to ascertain if it is in compliance with relevant regulatory requirements.

3.5.4. There should be a clear investment mandate setting out the parameters within which the investment manager may operate. It should be tailored to take into consideration legislative constraints, investment limits set by the bank and, more generally, the bank's specific circumstances.

3.5.5. Apart from any specific limits, the parameters need to strike an appropriate balance between risk and reward, taking into account the nature of the bank's liabilities and, where appropriate, the interests and reasonable expectations of its stakeholders.

3.5.6. If an investment manager holds funds on behalf of the bank, or is a counterparty to certain investment transactions, the capitalisation and financial standing of the manager should be regularly assessed.

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