Monetary Authority of Singapore

MARKET RISK

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1 INTRODUCTION

These guidelines provide guidance on sound market risk management practices[1]. Institutions should adopt them to a level that is commensurate with their risk appetite, risk profile and capital strength.

2 FUNDAMENTALS

2.1 Market risk refers to the risk to an institution resulting from movements in market prices, in particular, changes in interest rates, foreign exchange rates, credit spreads, and equity and commodity prices.

2.2 Market risk often arises from other forms of financial risk such as credit and market liquidity risks. For example, a downgrading of the credit standing of an issuer could lead to a drop in the market value of securities issued by that issuer. Likewise, a major sale of a relatively illiquid security by another holder of the same security could depress the price of the security.

2.3 The market risk factors cited above are not exhaustive. Depending on the instruments traded by an institution, exposure to other factors may also arise. The institution's consideration of market risk should capture all risk factors that it is exposed to, and it must manage these risks soundly.

2.4 The institution should also take into account the general market and macroeconomic conditions in which it operates in its assessment and management of risks and its loss absorbing capacity. It should ensure that its risk processes and capital levels are adequate for countering the impact of potential stress developments, including significant deterioration of market liquidity conditions, which emanate from its operating environment.

3 RISK MANAGEMENT STRATEGY, POLICIES AND PROCEDURES

3.1 Risk Management Strategy

3.1.1 An institution should develop a sound and well informed strategy to manage market risk. The strategy should be approved by the institution's Board of Directors (Board). The Board, based on the recommendation of senior management, should first determine the level of market risk the

[1] Institutions should also refer to relevant publications such as those issued by the Basel Committee on Banking Supervision ("BCBS") for further guidance, where appropriate, on supervisory expectations relating to market risk management. These include BCBS' "Principles for the Management and Supervision of Interest Rate Risk" (July 2004) and "Principles for Sound Stress Testing Practices and Supervision" (May 2009), and subsequent or other relevant publications that may be issued from time to time.

institution 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 institution against unexpected losses.

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

3.1.3 In setting its market risk strategy, an institution should consider the following factors:

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

(b) whether the institution 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 institution's portfolio mix and how it would be affected if more market risk was assumed.

3.1.4 An institution 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 rely on certain assumptions about the correlation between two instruments/assets. The effectiveness of these strategies will be affected if these assumptions are proved to be inaccurate or no longer hold. The institution should evaluate the impact of a breakdown in these assumptions and critically assess the effectiveness of the strategies.

3.1.5 An institution 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 institution is encouraged to have an internal capital allocation system that meaningfully links identification, monitoring and evaluation of market risks to economic capital.

3.1.6 An institution'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.

3.2 Risk Management Policies

3.2.1 An institution 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 institution, including its approach to controlling and managing market risk. The Board should oversee the institution's management to ensure that these strategies, policies and processes are implemented effectively and fully integrated into the institution's overall risk management process. In addition, exceptions to established policies should receive the prompt attention of, and authorisation by, the appropriate level of management and the institution's Board where necessary.

3.2.2 Policies should be applied on a consolidated basis and, where appropriate, to specific subsidiaries, affiliates or units within an institution. 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 institution 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;

(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 institution 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.

3.3 Risk Management Procedures

3.3.1 An institution should establish appropriate procedures to implement the market risk policy, strategy and processes. 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. The manual should spell out the operational steps and processes for executing the relevant market risk controls. It should also be periodically reviewed and updated to take into account new activities, changes in systems and structural changes in the market. The procedures should cover all activities that are exposed to market risk.

3.3.2 In the case of insurers, risk management policies and procedures should make reference to the principles on the oversight of the asset management process as set out in MAS Notice 317.

4 RISK MEASUREMENT, MONITORING AND CONTROL

4.1 Framework, Processes and Systems

4.1.1 An institution should establish a sound and comprehensive risk management framework and processes. This should, among other things, comprise:

(a) a framework to identify risks;

(b) an appropriately detailed structure of market risk limits that are consistent with the institution's risk appetite, 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 institution and its affiliates, to the institution's Board and senior management;

(f) exception tracking and reporting processes that ensure prompt action at the Board or appropriate level of the institution'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.

4.1.2 An institution should incorporate, to the fullest extent, its market risk management process into its overall risk management system. This would enable the institution to understand and manage its consolidated risk exposure more effectively. Where the institution is part of a financial services group, the risk management process should also be integrated with that of the group's, where practicable.

4.1.3 The risk management system should be commensurate with the scope, size and complexity of an institution's trading and other financial activities and the market risks assumed. It should also enable the various market risk exposures to be accurately and adequately identified, measured, monitored and controlled. All significant risks should be measured and aggregated on an institution-wide basis. Limits for market risks that are consistent with the maximum exposures authorised by the Board and senior management should be set.

4.1.4 An institution'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. An institution whose risk levels fluctuate significantly within a trading day should monitor its risk profile on an intra-day basis. The system should also enable an institution to identify risks promptly and take quick remedial action in response to adverse and sudden changes in market factors.

4.1.5 An independent risk management function should be established, with the responsibility for defining risk management policies, setting procedures for market risk identification, measurement and assessment, and monitoring the institution's compliance with established policies and market risk limits. It should also ensure that market risk exposures are reported in a timely manner to the Board and senior management. Risk management staff should be separate from and independent of risk-taking staff.

4.1.6 An institution should ensure that transactions are captured on a timely basis and that marked-to-market positions are revalued frequently. Treasury and financial derivative valuation processes should be robust and independent of the risk-taking function. The valuation process should use consistent and prudent practices and reliable market data verified independently or in the absence of market prices, internal or industry-accepted models. Models and supporting statistical analyses used in valuations should be appropriate, consistently applied, and have reasonable assumptions. These should be validated before deployment. Staff involved in the validation process should be adequately qualified and independent of the trading and model development functions. Models should be periodically reviewed. More frequent reviews may be necessary if there are changes in models or in the assumptions resulting from developments in market conditions.

4.1.7 The Board and senior management should establish effective processes to manage market liquidity risk arising from treasury and financial derivative trading activities. The management of market liquidity risk should be an integral part of the institution’s daily operations. The Board and senior management should take note of the size and depth of the markets the institution is active in and establish the appropriate risk-taking guidelines. These guidelines should take into account the institution'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.

4.1.8 Risk management systems of institutions with significant assets under management, such as insurers, 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.

4.2 Risk Measurement

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

4.2.2 Interest Rate Risk

4.2.2.1 In measuring its interest rate risk, an institution 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 institution's activities) and optionality risks (arising from interest rate related options embedded in the institution's products). The institution should also consider fee income that is sensitive to changes in interest rates.

4.2.2.2 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 institution is exposed to. There should be additional risk measures to capture credit spread and swap spread risks.

4.2.3 Structural Interest Rate Risk

4.2.3.1 An institution's interest rate risk also arises from its structural positions (e.g. non-trading/banking book positions) in financial flows and assets and liabilities. An institution with such positions should note the points raised in the section on interest rate risk management, in addition to the points considered below.

4.2.3.2 An institution 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 institution should establish an appropriate interest rate risk strategy for management of its structural interest rate risk and establishment of its desired risk profile. Such a strategy should also be reviewed on a regular basis, including by the institution's Board. Where derivatives instruments, such as interest rate swaps, are used to adjust an institution's interest rate risk profile, the institution should fully understand the cash flow characteristics of the instruments.

4.2.3.3 An institution 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. Of particular relevance to structural interest rate risk is optionality risk, where behavioural maturity differs from contractual maturity. This could occur where an option is granted to an institution's customers to withdraw deposits or prepay loans at a time of their choice 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 institution should ensure that the assumptions and models used for measuring and reporting of structural interest rate risks are independently validated and reviewed regularly.

4.2.3.4 Interest rate changes have an impact on an institution'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 hence be considered. In particular, an institution with significant fee income should assess the extent to which that fee income is sensitive to rate changes. From a capital perspective, an institution should consider how intermediate (two years to five years) and long-term (more than five years) positions might affect the institution'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 an institution to monitor and control the level of these exposures. The institution 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. For banks, this includes the standardised interest rate shocks outlined in the BCBS guidance paper issued in July 2004.

4.2.3.5 An institution should consider the fit of its interest rate risk profile with its strategic business plans. An institution 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.

4.2.3.6 An institution should set aside capital that is commensurate with the level of structural interest rate risk it is taking.

4.2.4 Equity Risk

There should be separate risk factors corresponding to each of the equity markets in which an institution has positions. The measurement of equity risk should capture 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 individual equity issues where appropriate.

4.2.5 Foreign Exchange Risk

There should be risk factors corresponding to individual foreign currencies. The risk arising from changes in values or asset-liability mismatch of these foreign currencies to the domestic currency should also be captured. An institution 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.

4.2.6 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). An institution 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.

4.2.7 Credit Trading Risk

An institution 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. Institutions should identify, measure, monitor, control and report such risks.

4.2.8 Market Liquidity Risk

Market liquidity risk is the risk that an institution 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 an institution transacts at relative to the market. The institution 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. The institution should therefore 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 institution's definition of material risk, should be measured and aggregated on an institution-wide basis to the fullest extent possible. Where it is not possible to quantify the risk, the institution should seek to understand and report the risk qualitatively.

4.2.9 Risk Monitoring and Management System

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

4.2.9.2 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. This information should be retained for audit and investigation purposes. As far as possible, the system should also cover information on the positions of customers. An institution that is active in treasury and financial derivatives should have a system that is able to monitor trading positions, market movements and credit exposures daily and preferably on a real-time basis.

4.2.9.3 An institution should consider correlations between markets and between categories of risk when evaluating its 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 institution, although individual risks, such as market and credit risks, may appear manageable when viewed

independently. Due to such correlated risks, an institution's risk tolerance could be exceeded. An institution could incorporate risk correlations in their risk assessments through appropriately constructed scenarios in stress testing. An institution whose trading and other financial activities are limited in volume, scope and complexity, may use less sophisticated methodologies.

4.2.9.4 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, an institution 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.

4.2.9.5 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.

4.2.9.6 An institution 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. 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. 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 institution’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.

4.2.9.7 A screening process should be in place to ensure the integrity of data fed into the risk management system. 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. While it may use market data from reputable sources, an institution may process and integrate the data to better meet its needs. For instance, when calculating correlations and other parameters, an institution 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. 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. An institution 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.

4.3 Risk Limits

4.3.1 Risk limits for business units should be established, where appropriate, and approved and periodically reviewed by the Board and senior management. Changes in market conditions or the resources of the institution should prompt a re-assessment of limits. Limits should preferably be integrated, where applicable, with group-wide limits for each major type of risk assumed. The institution should ensure consistency between the different types of limits. It 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. Limits should be clearly understood by, and changes clearly communicated to, all relevant parties.

4.3.2 Compliance with limits should be monitored by a unit independent of the risk-taking activities. An institution 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.

4.4 Scenario Analysis and Stress Testing

4.4.1 Stress testing should form an integral part of an institution's overall market risk management process. An institution may choose scenarios based on analysing historical data of changes in market risk factors or creating forward-looking scenarios. The objective should be to allow the institution 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.

4.4.2 Scenario analysis and stress testing should, as far as possible, be conducted on an institution-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 institution's vulnerability to worst case scenarios or the default of a large counterparty and maximum cash inflow and outflow assumptions.

4.4.3 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 institution's earnings and capital position and business strategies. 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.

4.5 Use of Investment Managers

4.5.1 Where an institution engages the services of investment managers, they should be monitored to ensure that the institution's strategy is adhered to. This applies to both related and unrelated external managers. In either case, there should be a formal written agreement between the institution and the investment manager.

4.5.2 Where investment management is outsourced to a third party (including to an entity within the group that it belongs to), the Board and senior management must be satisfied that there are appropriate and effective controls in place. This applies not only where the entire function is

outsourced, but also where only a specialised activity (e.g. derivatives trading) is outsourced. The Board and senior management should ensure that the effects of in-house activities are considered in conjunction with the outsourced activities when monitoring exposures to investment areas and counterparties.

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

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

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

Appendix

CHECKLIST OF SOUND PRACTICES TO ADOPT

[The checklist summarises the key practices only and is not meant to be exhaustive. For details, institutions should refer to the guidelines.]

Ref	Sound Practice	Yes/No
A	**Risk Management Strategies, Policies and Procedures**	
1	**Strategies** Is there a sound and robust strategy to manage market risk? Is the strategy approved by the Board? Is the institution's risk appetite determined? Is the risk appetite commensurate with the amount of market risk capital set aside by the institution and the possible losses it is willing to bear? Does the institution consider such factors as economic and market conditions, its expertise to manage the risk of specific instruments and markets, and the effect of the strategy on the market risk of the institution's portfolio? Is there a process to regularly review the market risk strategy in light of the institution's financial performance, market risk capital and updated market developments?	
2	**Policies** Is there a set of market risk policies approved by the Board? Does the Board approve changes and exceptions to these policies?	

Ref	Sound Practice	Yes/No
	Does the Board oversee the institution's management to ensure that the strategies, policies and processes are effectively implemented and fully integrated into the overall risk management process? Does the policy delineate the lines of authority and the responsibilities of the Board, senior management and other staff responsible for managing market risk, set out the scope of activities, and identify pertinent market risk management issues? Do the policies set out the scope of the activities of the business units taking market risk, identify and set guidelines on the market risk control limit structure, as well as delegation of approving authority for limits setting and excesses? Are the policies reviewed regularly? During the review, does it take into account the institution's long term business strategies and goals?	
3	**Procedures** Are there appropriate procedures and processes to implement the market risk policy and strategy? Are procedure manuals reviewed and updated regularly?	
B	**<u>Risk Measurement, Monitoring and Controls</u>**	
1	**Framework, Processes and Systems** Is there a sound and comprehensive risk management process and record-keeping system covering: • identification of underlying risks; • structure of limits; • management information system for measuring, controlling, monitoring and reporting risks; and	

Ref	Sound Practice	Yes/No
	• policies on accounting treatment? Does the risk management system accurately and adequately identify, measure, monitor and control risk exposures? Can the risk management system quantify risk exposures and monitor changes in market and price factors on a daily basis? Are market risk measurement models and assumptions used regularly re-evaluated and revised where necessary? Is the risk management function independent? Has an independent risk management unit been set up to define risk management policies, establish procedures for risk identification, measurement and assessment, monitor compliance with established policies and risk limits, and report risk exposures in a timely manner to the Board and senior management? Are the processes and methods used to value treasury and financial derivatives positions independent of the dealing function? Are models and supporting statistical analyses used in valuations and stress tests appropriate, consistently applied, and have reasonable assumptions? Are they independently validated by qualified personnel? Have the Board and senior management established risk management processes for market liquidity risks? Is there adequate documentation on the institution's risk management process and investment decision-making framework, which should include processes for monitoring, controlling and reporting investment exposures?	

Ref	Sound Practice	Yes/No
2	**Risk Measurement** Are there suitable measures for all market risks assumed? Are models used to estimate market risk based on accepted financial concepts and market risk measurement techniques? Is the primary market risk measurement model integrated with the day-to-day risk management process? Are the market risk measurement systems and models appropriate for the purpose at hand? Does the measurement of interest rate risk incorporate re-pricing, yield curve, basis and optionality risks? Does it assess the impact on an institution's earnings and economic value arising from the standardised interest rate shocks? Is interest rate risk in each currency calculated separately? Are appropriate proxies for the interest rates used where actual rates are not readily available? Are the risk management systems and models used appropriate for the institution's structural interest rate risk profile? Do the systems and models cover all activities where position-taking is allowed? Do the systems and models measure the risk of derivatives used to adjust interest rate risk profile? Is the effect of interest rate risk on net income and net interest income considered? Is the fit of the interest rate risk profile with the institution's strategic business plans considered? Are there separate risks factors corresponding to each of the equity markets in which the institution has positions?	

Ref	Sound Practice	Yes/No
	Are there risk factors corresponding to individual foreign currencies? Do the commodities risk factors account for directional risk arising from changes in the spot price, basis risk, cost of carry for forward positions and options and forward gap risk? Are the risks of credit trading adequately identified, measured, controlled and reported? Is market liquidity captured by the market risk measure? Is there a system which can provide all information required for risk management on a timely basis? Are correlations between markets and between categories of risk considered when risk positions are evaluated? Do the risk measurement systems accurately capture market risks associated with options? Are the models used to measure market risk validated and re-calibrated periodically? Have the Board and senior management established risk management processes for both market and funding liquidity risks arising from treasury and financial derivatives activities? Is there a good data screening process in place? Is there a process to monitor significant changes in the size or scope of activities and to trigger an analysis of the adequacy of capital supporting the activities?	

Ref	Sound Practice	Yes/No
3	**Risk Limits** Do the Board and senior management establish, approve and regularly review risk limits? Is compliance with limits monitored by an independent unit? Have limits been communicated to all relevant parties?	
4	**Scenario Analysis and Stress Testing** Are there regular stress tests of market risk? How is stress scenarios selected? When scenarios adopted are based on historical data, do they reflect periods of significant stresses relevant to the institution's portfolios? Apart from scenarios based on historical data, are there scenarios that are forward-looking that identify severe events or changes in market conditions that could adversely impact the institution? Are stress tests both quantitative and qualitative in nature? Are stress test scenarios and assumptions, and the results of stress tests reviewed by the Board and senior management? Are stress tests and scenario analysis conducted on an institution-wide basis, taking into account the effects of unusual changes in market and non-market risk factors?	
5	**Use of Investment Managers** Is there a process to monitor the activities of investment managers to ensure that the institution's strategy is adhered to and that the systems employed are effective? Are the Board and senior management satisfied that the	

Ref	Sound Practice	Yes/No
	controls of the investment managers are appropriate and effective? Is the reporting by investment managers adequate to assess whether their operations are in line with the institution's strategy, and its risk-reward criteria? Does the reporting provide sufficient information to determine if regulatory requirements are complied with? Is there a clear mandate setting out the parameters within which investment managers may operate? Does the investment manager hold funds on behalf of the institution, or is it to be counterparty to certain investment transactions? If so, is there a process to assess on a regular basis the financial standing and capitalisation of the manager?	