

# Risk Management

Managing risk is an integral part of our business strategy. Our risk management approach focuses on ensuring continued financial soundness and safeguarding the interests of our stakeholders, while remaining nimble to seize value-creating business opportunities in a fast-changing environment. We are committed to upholding high standards of corporate governance, sound risk management principles and business practices to achieve sustainable, long-term growth. We continually strive towards strengthening our risk management practices in support of our strategic objectives.

## 2019 Highlights

In 2019, we:

- incorporated conduct risk management into our risk culture framework and stepped up risk culture communication efforts Group-wide, with an emphasis on the Tone from the Top and Tone from Above;
- implemented a risk culture dashboard to provide regular updates to the Board and senior management;
- introduced measures to assess the results of the various risk culture initiatives, including feedback from senior management committees and an annual self-assessment exercise for key business and support units. We also included more questions on risk culture in the Bank's Employee Engagement Survey. UOB is also a member of the Culture and Conduct Steering Committee, established by the Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore (ABS) to promote sound culture and to raise conduct standards among banks in Singapore;
- benchmarked our Three Lines of Defence (3LOD) framework against industry best practices to strengthen our current approach further. We also established a new 3LOD Working Group to drive and to implement identified key initiatives, which aim to define ownership for new areas of risks, to harmonise risk management and controls across the 3LOD, to integrate the assurance methodology and to create a single robust governance, risk and compliance reporting framework;
- replaced the Value-at-Risk (VaR) measure with Expected Shortfall (ES) limits monitoring. The latter takes into account the spread of the tail losses in the process of historical simulation and can provide a more accurate picture of risk and capture large movements in the event of financial market stress, which the VaR measure was unable to do. We also enhanced our Market Risk Aggregation Limits system to automate fully the market risk limits monitoring for all market risk asset types and limits; and
- tightened our Responsible Financing Policy in relation to the financing of carbon-intensive sectors in recognition of the rising threat posed by climate change. We established a Taskforce on Climate-related Financial Disclosures (TCFD) Working Group to oversee and to drive the adoption of the TCFD recommendations. We endeavour to build our capability on climate risk management and stress-testing through active engagement with regulators, industry associations and climate specialists. We also maintained a strong focus on our capacity-building efforts, of which a key initiative was the successful roll-out of the ABS e-learning module on responsible finance to our colleagues in Singapore.

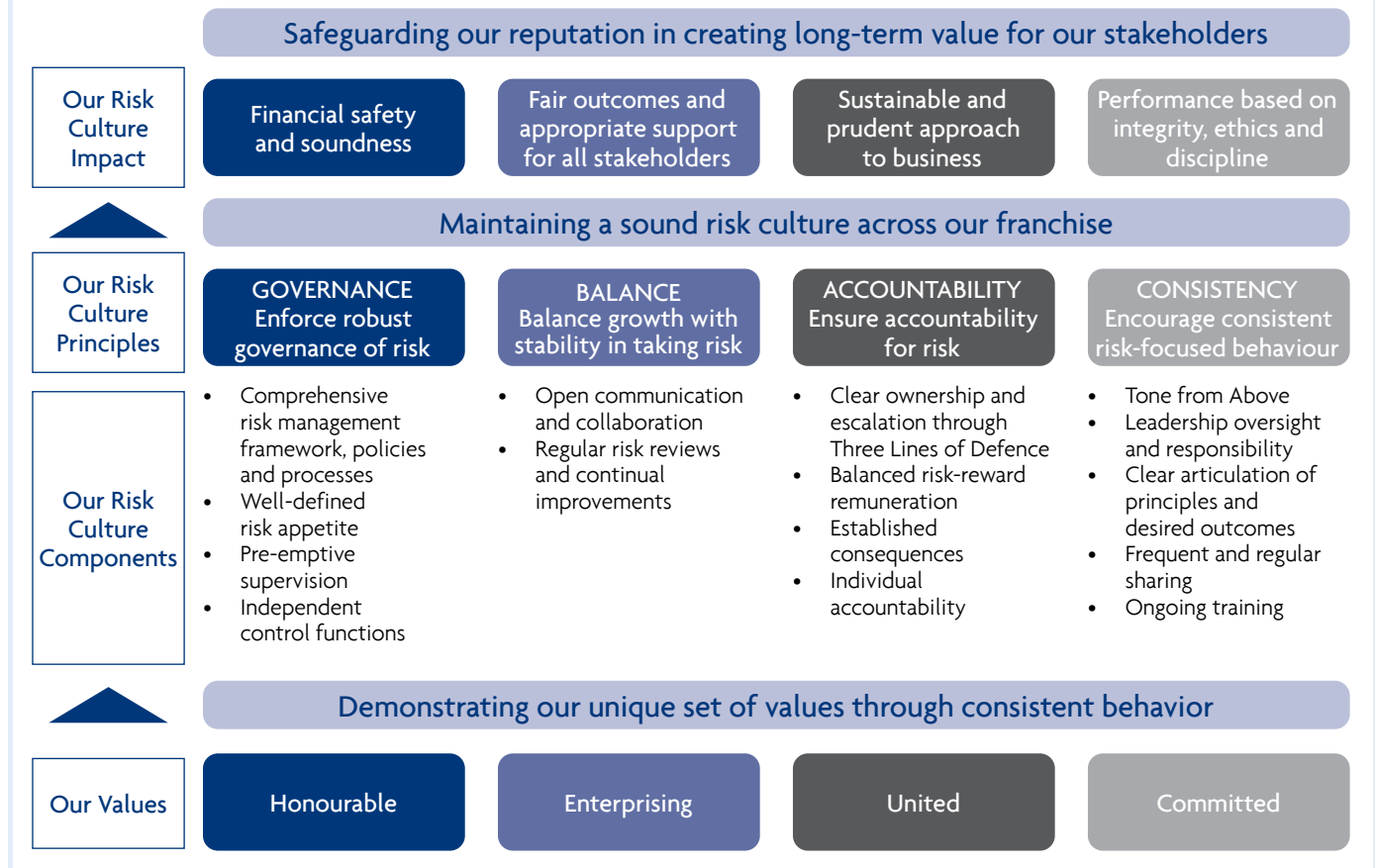
# Risk Management

## Maintaining a Sound Risk Culture

We believe that a strong risk culture is vital to the long-term sustainability of the Bank's business franchise. Specifically, risk culture refers to the norms, attitudes and behaviours related to risk awareness, risk-taking and risk management, and controls that shape decisions on risks\*. At UOB, our risk culture is based on our values. A strong risk culture ensures that our decisions and actions are considered and focused on our customers, and that we are not distracted by short-term gains.

### UOB's Risk Culture Statement

Managing risk is integral to how we create long-term value for our customers and stakeholders. Our risk culture is built on four principles: enforcing robust risk governance; balancing growth with stability; ensuring accountability for all our risk-based decisions and actions; and encouraging awareness, engagement and consistent behaviour in every employee. Each of these principles is based on our distinctive set of values that guides every action we take. In entrenching our risk culture further across our franchise, we uphold our commitment to financial safety and soundness; fair outcomes and appropriate support for our stakeholders; sustainable and prudent business approach and performance based on integrity, ethics and discipline.



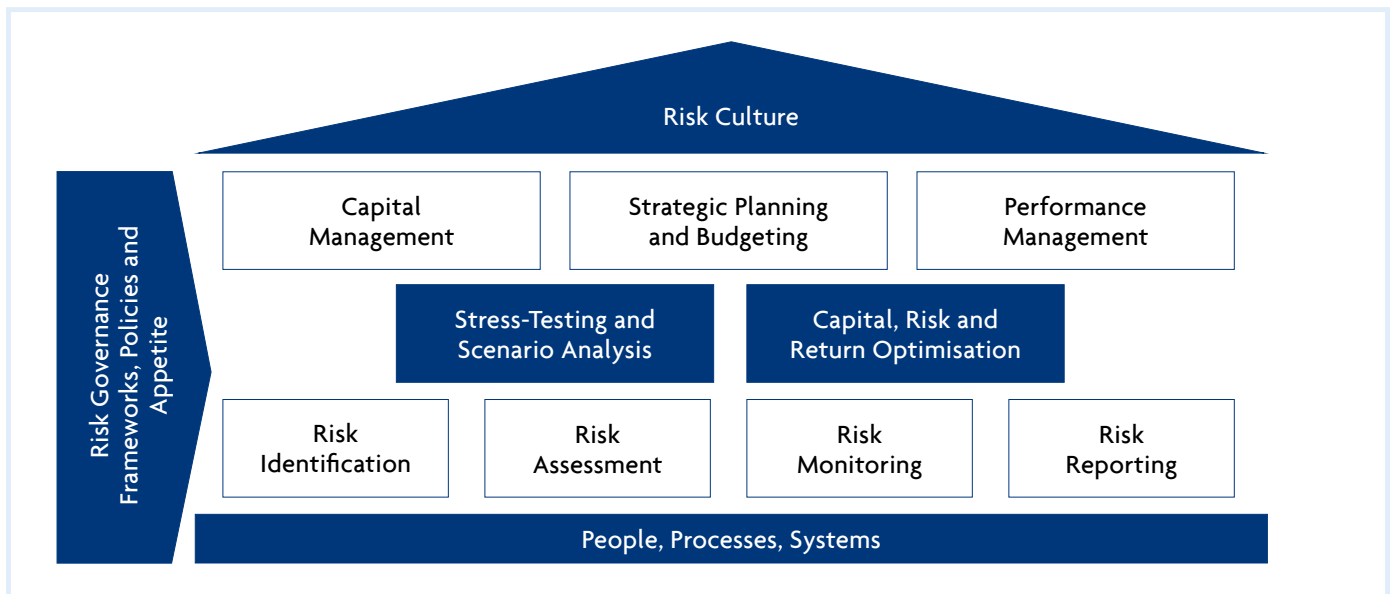
\* Basel Committee on Banking Supervision: Guidelines on Corporate Governance Principles for Banks (July 2015).

To manage conduct risk holistically, we have adopted a multi-faceted approach with the key components set out in the figure below.



### Risk Management Structure

Our risk management structure, as shown in the following diagram, underpins the Group’s risk culture. Under the structure, the various risk and control oversight functions work with the business and support units to identify their risks and to facilitate their risk and control self-assessments.



# Risk Management

Our risk management strategy is to embed our risk culture across the Group to facilitate ongoing effective discovery, management and mitigation of risks arising from external factors and our business activities and to set aside adequate capital to address these risks. Risks are managed within levels established by the senior management committees and approved by the Board and its committees. We have put in place a framework of policies, methodologies, tools and processes that help us to identify, to measure, to monitor and to manage the material risks faced by the Group. These enable us to focus on the fundamentals of banking and to create long-term value for all our stakeholders.

Our risk governance frameworks, policies and appetite provide the principles and guidance for the Group's risk management activities. They guide our key decisions for capital management, strategic planning and budgeting and performance management to ensure that the risk dimension is appropriately and sufficiently considered. Risk reports are submitted regularly to senior management committees and the Board to keep them apprised of the Group's risk profile.

We adopt the Basel Framework and observe the MAS Notice to Banks No. 637 – Notice on Risk Based Capital Adequacy Requirements for Banks incorporated in Singapore. Please refer to the Pillar 3 Disclosure section for further information. We continue to take a prudent and proactive approach in navigating the evolving regulatory landscape, with emphasis on sound risk management principles in delivering sustainable returns. We also adopt the Internal Capital Adequacy Assessment Process (ICAAP) to assess, on an ongoing basis, the amount of capital necessary to support our activities. We review the ICAAP periodically to ensure that the Bank remains well-capitalised after considering all material risks. Stress-testing is conducted to determine capital adequacy under stressed conditions.

## Risk Governance

Responsibility for risk management starts with Board oversight of UOB's governance structure, which ensures that the Group's business activities are:

- conducted in a safe and sound manner and in line with the highest standards of professionalism;
- consistent with the Group's overall business strategy and risk appetite; and
- subject to adequate risk management and internal controls.

Our Board is assisted primarily by the Board Risk Management Committee (BRMC), which reviews the overall risk appetite and level of risk capital to be maintained for the Group.

The CEO has established senior management committees to assist him in making business decisions with due consideration to risks and returns. The main senior management committees involved in this are the Management Executive Committee (MEC), Risk and Capital Committee (RCC), Asset and Liability Committee (ALCO), Credit Committee (CC), and Operational Risk Management Committee (ORMC). These committees also assist the Board Committees in specific risk areas.

Management and the senior management committees are authorised to delegate risk appetite limits by location, business units and/or broad product lines.

Risk management is the responsibility of every employee in the Group. Every one of us must be aware of the risks created by our actions and be accountable for the consequences of those actions. We have an established framework to ensure appropriate oversight, accountability and management of all risk types encountered in the course of our business. Our organisational control structure provides the three Lines of Defence as follows:

### First Line of Defence – The Risk Owner

The business and support units have primary responsibility for implementing and executing effective controls to manage the risks arising from their business activities. This includes establishing adequate managerial and supervisory controls to ensure compliance with risk policies, appetite, limits and controls and to highlight control breakdowns, inadequacy of processes and unexpected risk events.

### Second Line of Defence – Risk Oversight

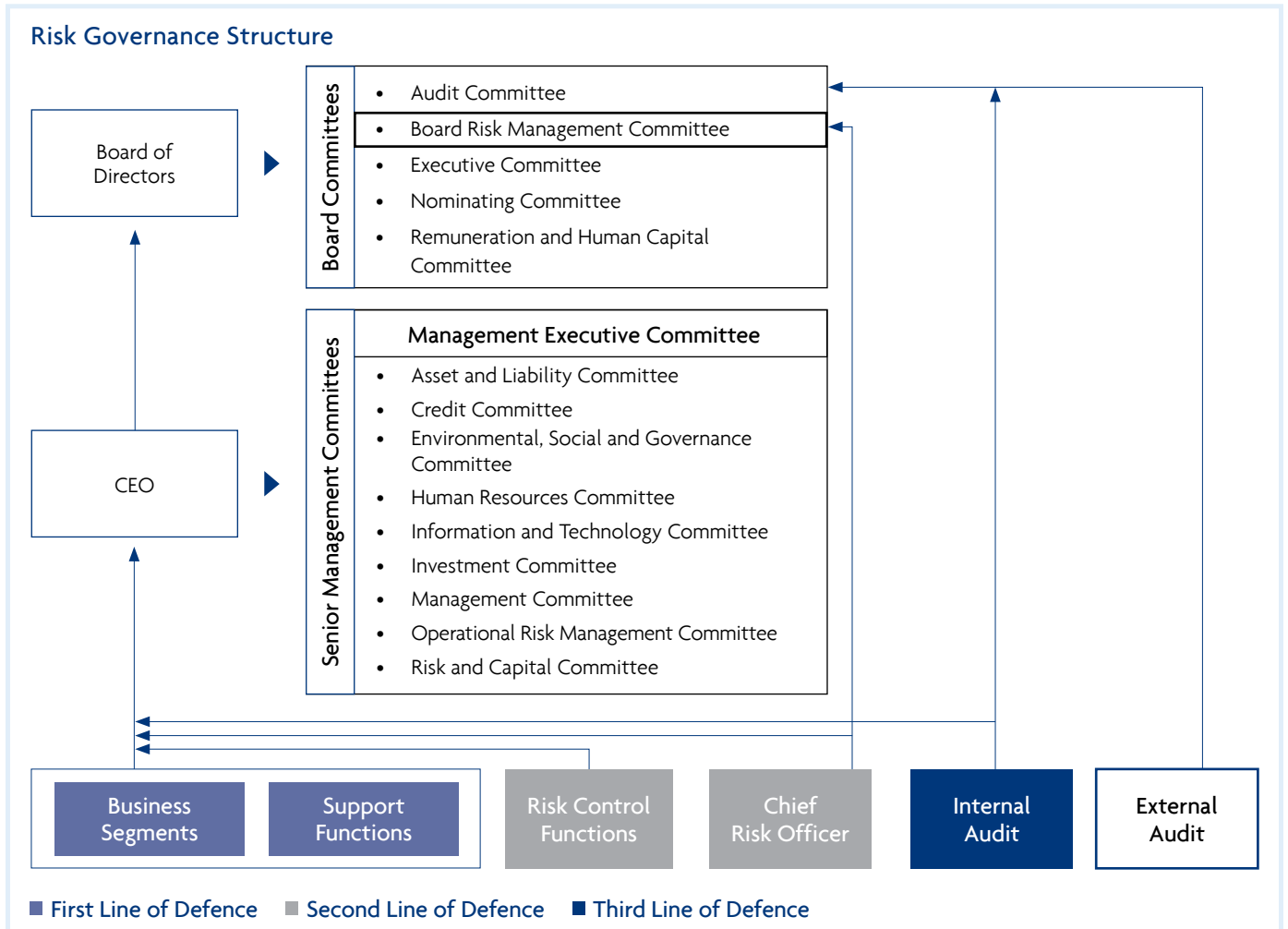
The risk and control oversight functions (Group Risk Management and Group Compliance) and the Chief Risk Officer provide the Second Line of Defence.

The risk and control oversight functions support the Group's strategy of balancing growth with stability by establishing risk frameworks, policies, appetite and limits within which the business functions must operate. They are also responsible for the independent review and monitoring of the Group's risk profile and for highlighting any significant vulnerabilities and risk issues to the respective senior management committees.

The independence of risk and control oversight functions from business functions ensures that the necessary checks and balances are in place.

### Third Line of Defence – Independent Audit

The Group's internal auditors conduct risk-based audits covering all aspects of the First and Second Lines of Defence to provide independent assurance to the CEO, Audit Committee (AC) and the Board, on the effectiveness of the risk management and control structure, policies, frameworks, systems and processes.



The Group's governance framework also provides oversight for our overseas banking subsidiaries through a matrix reporting structure. These subsidiaries, in consultation with Group Risk Management, adapt the risk management governance structure, frameworks and policies to comply with local regulatory requirements. This ensures the approach across the Group is consistent and sufficiently flexible to suit local operating environments.

# Risk Management

## Risk Appetite

We have established a risk appetite framework to define the amount of risk we are able and willing to take in pursuit of our business objectives. The purpose of establishing a risk appetite framework is not to limit risk-taking but to ensure that the Group's risk profile remains within well-defined and tolerable boundaries. The framework was formulated based on the following key criteria:

- alignment to key elements of the Group's business strategy;
- relevance to respective stakeholders, with appropriate levels of granularity;
- practical, consistent and easy-to-understand metrics for communication and implementation; and
- analytically-substantiated and measurable metrics.

The risk appetite defines suitable thresholds and limits across key areas, including but not limited to credit risk, country risk, market risk, liquidity risk, operational risk and reputation risk.

Our risk-taking approach is focused on businesses which we understand and whose risks we are well-equipped to manage. Through this approach, we aim to minimise earnings volatility and concentration risk, and to ensure that our high credit rating, strong capital and stable funding base remain intact. This enables us to remain a steadfast partner of our customers through changing economic conditions and cycles.

Our risk appetite framework and risk appetite are reviewed and approved annually by the Board. Management monitors and reports the risk profiles and compliance with the risk appetite to the Board on a regular basis.

## Material Risks

Our business strategies, products, customer profiles and operating environment expose us to a number of financial and non-financial risks. Identifying and monitoring key risks are integral to the Group's approach to risk management. It enables us to make proper assessments of and to mitigate these risks proactively across the Group. The table below summarises the key risks that could impact the achievement of the Group's strategic objectives. Details of these key risks can be found in the following pages.

| Material Risk    | Definition   | How risk is managed   |
|------------------|--|---|
| Credit Risk      | The risk of loss arising from failure by a borrower or counterparty to meet its financial obligations when such obligations are due.   | Through our credit risk management framework, policies, probability of default/loss given default/exposure at default/portfolio models and limits.  |
| Market Risk      | The risk of loss from movements in the market rates or prices (such as changes in interest rates, foreign exchange rates, equity prices, commodity prices and credit spreads) of the underlying asset. It includes interest rate risk in the banking book which is the potential loss of capital or reduction in earnings due to changes in interest rates environment.  | Through our market risk management framework, policies, Value-at-Risk/Expected Shortfall models and limits. Interest rate risk in the banking book is managed through the Group's balance sheet risk management framework, and interest rate risk in the banking book management policies and limits. |
| Liquidity Risk   | The risk that arises from our inability to meet our obligations or fund increases in assets as they fall due.  | Through our balance sheet risk management framework, liquidity risk management policies, ratios and limits.   |
| Operational Risk | The risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Such loss may be in the form of financial loss or other damage, for example, loss of reputation and public confidence that will impact our creditability and ability to transact, to maintain liquidity and to obtain new business. Operational risk includes banking operations risk, fraud risk, legal risk, outsourcing risk, regulatory risk, reputational risk and technology risk but excludes strategic and business risk. | Through the respective risk management frameworks, policies, and operational risk management programmes including Key Risk and Control Self-Assessments, Key Operational Risk Indicators, Incident Reporting, Management Risk Awareness and Scenario Analysis.  |
| Conduct Risk     | The risk of improper employee behaviour or action that results in unfair stakeholder outcomes, negative impact on market integrity and other issues that damage the reputation of the Group.   | Through a multi-faceted approach leveraging on the key components of operational risk management, internal fraud management, whistle-blowing, employee discipline, individual accountability, code of conduct, remuneration, Fair Dealing, and anti-money laundering.                                 |
| Strategic Risk   | The current or prospective negative impact on earnings, capital or reputation arising from adverse strategic decisions, improper implementation of decisions or a lack of responsiveness to industry, economic or technological changes.   | Through our strategic and business risk management policy.  |

| Material Risk                                    | Definition   | How risk is managed  |
|--|--|--|
| <b>Business Risk</b>                             | The adverse impact on earnings or capital arising from changes in business parameters such as volumes, margins and costs.  | Through our strategic and business risk management policy.   |
| <b>Model Risk</b>                                | The risk arising from: <ul style="list-style-type: none"> <li>the use of a model which cannot accurately evaluate market prices, or which is not a mainstream model in the market (pricing models); or</li> <li>inaccurately estimating the probability or magnitude of future losses (risk measurement models).</li> </ul>              | Through the model risk governance framework and managed under the respective material risk types for which there is a quantitative model.                    |
| <b>Environmental, Social and Governance Risk</b> | The risk of credit loss or non-financial risks, such as reputational damage, arising from environmental, social and governance (ESG) issues, including climate change. While a key component of ESG risk arises indirectly from the financial services we provide to our customers, it can also result directly from our own operations. | The different aspects of ESG risk are managed through the relevant frameworks, policies and guidelines in place, including our Responsible Financing Policy. |

## Credit Risk

Credit risk is the risk of loss arising from any failure by a borrower or counterparty to meet its financial obligations when such obligations are due. It is the single largest risk that we face in our core business as a commercial bank, arising primarily from loans and other lending-related commitments to retail, corporate and institutional borrowers. Treasury and capital market operations and investments also expose the Group to counterparty and issuer credit risks.

We adopt an holistic approach towards assessing credit risk and ensure that managing credit risk is part of an integrated approach to enterprise risk management. Integral to the management of credit risk is a framework that clearly defines policies and processes relating to the identification, measurement and management of credit risk. We review and stress-test the Group's portfolio regularly and continually monitor the operating environment to identify emerging risks and to formulate mitigating actions.

### Credit Risk Governance and Organisation

The CC is the key oversight committee for credit risk. It supports the CEO and BRMC in managing the Group's overall credit risk exposures and serves as an executive forum for discussions on all credit-related matters. The CC also reviews and assesses the Group's credit portfolios and credit risk profiles.

The Country and Credit Risk Management Division develops Group-wide credit policies and guidelines and facilitates business development within a framework that results in prudent, consistent and efficient credit risk management. It is responsible for the reporting, analysis and management of all elements of credit risk to the CC and the BRMC. The comprehensive credit risk reports cover business segments at the overall portfolio level by various dimensions including industry, product, country and banking subsidiaries.

### Credit Risk Policies and Processes

We have established credit policies and processes to manage credit risk in the following key areas:

#### Credit Approval Process

Credit origination and approval functions are clearly segregated to maintain the independence and integrity of the credit approval process. Credit approval authority is delegated to officers based on their experience, seniority and track record. All credit approval officers are guided by credit policies and credit acceptance guidelines which are periodically reviewed to ensure their continued relevance to our business strategy and the business environment.

#### Counterparty Credit Risk

Unlike normal lending risk where the notional amount at risk can be determined with a high degree of certainty during the contractual period, counterparty credit risk exposure fluctuates with market variables. Counterparty credit risk is measured as the sum of current mark-to-market value and an appropriate add-on factor for potential future exposure (PFE). The PFE factor is an estimate of the maximum credit exposure over the remaining life of the foreign exchange (FX)/derivative transaction and is used for limit-setting and internal risk management.

We have also established policies and processes to manage wrong-way risk, i.e. where the counterparty credit exposure is positively correlated with its default risk. Transactions that exhibit such characteristics are identified and reported to the CC on a regular basis. In general, transactions with specific wrong-way risk are rejected at the underwriting stage.

Exposures arising from FX, derivatives and securities financing transactions are typically mitigated through agreements such as the International Swaps and Derivatives Association Master Agreements, the Credit Support Annex and the Global Master Repurchase Agreements. Such agreements help to minimise credit exposure by allowing us to offset what we owe to a counterparty against what is due from that counterparty in the event of a default.

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In addition, derivative transactions are cleared through Central Counterparties, where possible, to reduce counterparty credit exposure further through multilateral netting and the daily margining process.

Our foreign exchange-related settlement risk is significantly reduced through our participation in the Continuous Linked Settlement system. This system allows transactions to be settled irrevocably on a payment-versus-payment basis.

As at 31 December 2019, UOB would have been required to post additional collateral of US\$5 million if our credit rating were downgraded by two notches.

## Credit Concentration Risk

Credit concentration risk may arise from a single large exposure or from multiple exposures that are closely correlated. We manage such risks by setting exposure limits on obligor groups, portfolios, borrowers, industries and countries, generally expressed as a percentage of the Group's eligible capital base.

We manage our credit risk exposures through a robust credit underwriting, structuring and monitoring process. While we proactively minimise undue concentration of exposure in our portfolio, our credit portfolio remains concentrated in Singapore and Malaysia. The Group's cross-border exposure to China has increased over the years, in line with rising trade flows between China and Southeast Asia. We manage our country risk exposures within an established framework that involves setting limits for each country. Such limits are based on the country's risk rating, economic potential measured by its gross domestic product and the Group's business strategy.

Our credit exposures are well-diversified across industries, with the exception of the Singapore real estate sector due mainly to the high home ownership rate here. We remain vigilant about risks in the sector and take active steps to manage our exposure while continuing to maintain a prudent stance in approving real estate-related loans.

We perform regular assessments of emerging risks and in-depth reviews on industry trends to provide a forward-looking view on developments that could impact the Group's portfolio. We also conduct frequent stress-testing to assess the resilience of our portfolio in the event of a marked deterioration in operating conditions.

## Credit Stress Tests

Credit stress-testing is a core component of our credit portfolio management process. The three objectives of stress-testing are:

- to assess the profit and loss and balance sheet impact of business strategies;
- to quantify the sensitivity of performance drivers under various macroeconomic and business planning scenarios; and
- to evaluate the impact of Management's decisions on capital, funding and leverage.

We conduct stress tests to assess if our capital can withstand losses from the credit portfolio resulting from stress scenarios, and their impact on our profitability and balance sheet quality. Stress tests also help us to identify the vulnerability of various business units and enable us to adopt appropriate mitigating actions.

Our stress test scenarios consider potential and plausible macroeconomic and geopolitical events in varying degrees of likelihood and severity. We also consider varying strategic planning scenarios and assess the impact of different business scenarios and proposed managerial actions. These are developed in consultation with relevant business units and approved by Management.

## Credit Risk Mitigation

Our potential credit losses are mitigated through a variety of instruments such as collateral, derivatives, guarantees and netting arrangements. We would generally not grant credit facilities solely on the basis of the collateral provided. All requests for credit facilities are assessed based on the credit standing, source of repayment and debt servicing ability of the borrower.

We take collateral whenever possible to mitigate the credit risk assumed. The value of the collateral is monitored periodically and the frequency of valuation would depend on the type, liquidity and volatility of the collateral value. The collaterals are mostly in the form of properties. Cash, marketable securities, equipment, inventories and receivables may also be accepted. The collateral has to fulfill certain criteria (such as legal certainty across relevant jurisdictions) in order to be eligible for the Internal Ratings-Based Approach (IRBA) purposes. We have in place policies and processes to monitor collateral concentration. Appropriate haircuts that reflect the underlying nature of the collaterals, quality, volatility and liquidity would be applied to the market value of collaterals, as appropriate.

When extending credit facilities to small- and medium-sized enterprises (SMEs), we also often take personal guarantees to secure the moral commitment from the principal shareholders and directors. For IRBA purposes, we do not recognise personal guarantees as eligible credit risk protection. Corporate guarantees are often obtained when the borrower's creditworthiness is not sufficient to justify an extension of credit. To recognise the effects of guarantees under the Foundation Internal Ratings-Based (FIRB) Approach, we adopt the Probability of Default (PD) substitution approach whereby the PD of an eligible guarantor of an exposure is used for calculating the capital requirement.

## Credit Monitoring and Remedial Management

We regularly monitor credit exposures, portfolio performance and emerging risks that may impact our credit risk profile. Our Board and senior management committees are updated on credit trends through internal risk reports. The reports also provide alerts on key economic, political and environmental developments across major portfolios and countries, so that the necessary mitigating actions can be taken promptly.



### Delinquency Monitoring

We closely monitor the delinquency of borrowing accounts as it is a key indicator of credit quality. An account is considered delinquent when payment has not been received by the payment due date. All delinquent accounts, including revolving credit facilities (such as an overdraft) with limit excesses, are closely monitored and managed through a disciplined process by business units and the risk management function. Where appropriate, such accounts are also subject to more frequent credit reviews.

### Classification and Loan Loss Impairment

We classify our credit portfolios according to the borrowers' ability to repay the credit facilities from their normal source of income. There is an independent credit review process to ensure that the loan grading and classification are appropriate and in accordance with MAS Notice 612 Credit Files, Grading and Provisioning.

All borrowing accounts are categorised as 'Pass', 'Special Mention' or 'Non-Performing'. 'Non-Performing' or impaired accounts are further sub-divided into 'Substandard', 'Doubtful' or 'Loss' in accordance with MAS Notice 612. Any account which is delinquent or past due (or in excess of the approval limit for a revolving credit facility such as an overdraft) for more than 90 days will automatically be categorised as 'Non-Performing'. In addition, any account that exhibits weaknesses which are likely to adversely affect repayment on existing terms may be categorised as 'Non-Performing'. The accounting definition of impaired and the regulatory definition of default are generally aligned.

Upgrading and de-classification of a 'Non-Performing' account to 'Pass' or 'Special Mention' status must be supported by a credit assessment of the repayment capability, cash flows and financial position of the borrower. We must also be satisfied that once the account is de-classified, the account is unlikely to be classified again in the near future.

A credit facility is restructured when a bank grants concessions (usually non-commercial) to a borrower because of a deterioration in the financial position of the borrower or the inability of the borrower to meet the original repayment schedule.

A restructured account is categorised as 'Non-Performing' and placed on the appropriate classified grade based on our assessment of the financial condition of the borrower and the ability of the borrower to repay under the restructured terms. A restructured account must comply fully with the requirements of MAS Notice 612 before it can be de-classified.

We provide for impairment of our overseas operations based on local regulatory requirements for local reporting purposes. Where necessary, additional impairment is provided to comply with our impairment policy and the MAS' requirements.

### Group Special Asset Management

Group Special Asset Management is an independent division that manages the restructuring, workout and recovery of our Non-Performing Asset (NPA) portfolios. Its primary objectives are:

- to nurse the NPA back to financial health whenever possible for transfer back to the business unit for management; and
- to maximise recovery of the NPA that we intend to exit.

### Write-Off Policy

A non-performing account is written off when the prospect of a recovery is considered poor or when all feasible avenues of recovery have been exhausted.

### Internal Credit Rating System

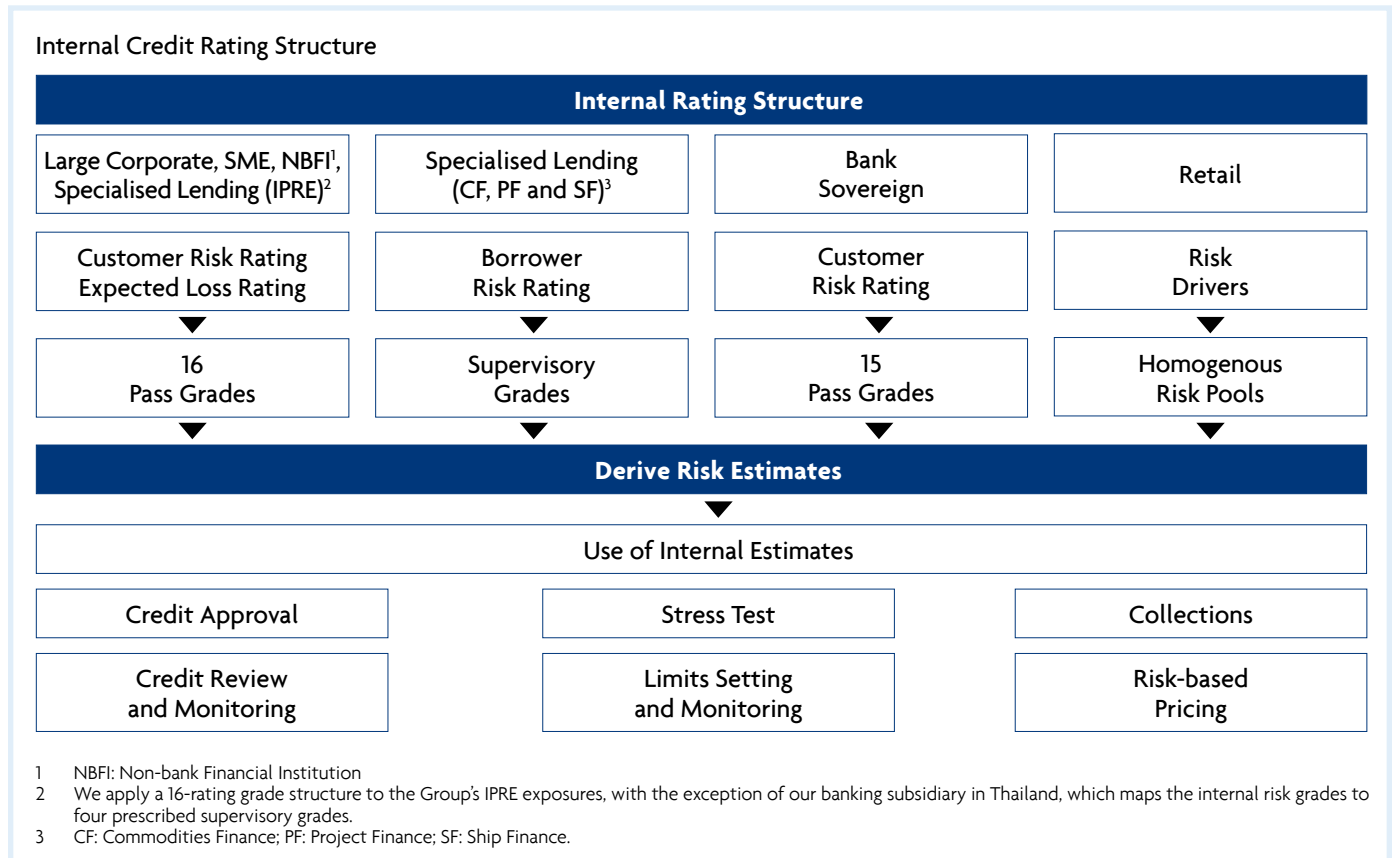
We employ internal rating models to support the assessment of credit risk and the assignment of exposures to rating grades or pools. Internal ratings are used pervasively by the Group in the areas of credit approval, credit review and monitoring, credit stress-testing, limits setting, pricing and collections.

We have established a credit rating governance framework to ensure the reliable and consistent performance of our rating systems. The framework defines the roles and responsibilities of the various parties in the credit rating process, including model changes, model performance monitoring, annual model validation and independent reviews by Group Audit (GA).

Credit risk models are independently validated before they are implemented to ensure that they are fit for purpose. We monitor the robustness of these rating models on an ongoing basis and all models are subject to annual reviews by model owners to ascertain that the chosen risk factors and assumptions continue to remain relevant for the respective portfolios. All new models, model changes and annual reviews are approved by the CC or the BRMC, depending on the materiality of the portfolio.

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The Group's internal rating structure is illustrated as follows:



## Non-Retail Exposures

We have adopted the FIRB Approach for our non-retail exposures. Under this approach, the internal models estimate a PD or supervisory slot for each borrower. These models cover 73.6 per cent of the Total Credit Risk risk-weighted assets (RWA) and employ qualitative and quantitative factors to provide an assessment of the borrower's ability to meet their financial obligations. The models are calibrated to provide an estimate of the likelihood of default over a one-year time horizon. A default is considered to have occurred if:

- the obligor is unlikely to pay its credit obligations in full, without recourse by the Group to actions such as realising the security; or
- the obligor is past due for more than 90 days on any credit obligation to the Group.

Supervisory loss given default (LGD) and exposure at default (EAD) parameters prescribed by the MAS are used together with the internal credit ratings to calculate risk weights and regulatory capital requirements.

While our internal risk rating grades may show some correlation with the rating grades of External Credit Assessment Institutions (ECAIs), they are not directly comparable with or equivalent to the ECAI ratings.

## Corporate Portfolio

We have developed Corporate models to rate Non-Bank Financial Institution (NBF), Large Corporate (LC) and SME portfolios. Credit risk factors used to derive a borrower's risk rating include the borrower's financial strength, quality of management, business risks and the industry in which it operates. The borrower risk-rating process is augmented by facility risk ratings, which take into account the type and structure of the facility, availability and type of collateral and seniority of the exposure.

Our internal rating grade structure for the NBF, LC and SME models consists of 16 pass grades. The models are mapped to the rating scale by calibration that takes into account the respective portfolio's long-term average default rate.

### Specialised Lending Portfolio

We have also developed models for four Specialised Lending portfolios, namely:

- Income Producing Real Estate (IPRE);
- Commodities Finance (CF);
- Project Finance (PF); and
- Ship Finance (SF).

These models produce internal risk grades which are derived based on a comprehensive assessment of financial and non-financial risk factors.

Risk grades derived for the CF, PF and SF portfolios are mapped to four supervisory categories prescribed by MAS Notice 637, which determines the risk weights to be applied to such exposures.

The rating grade structure for the IPRE portfolio, like our Corporate models, has 16 pass grades, with the exception of our banking subsidiary in Thailand, which maps the internal risk grades to the four prescribed supervisory categories.

### Sovereign Portfolio

Exposures in our Sovereign portfolio are rated by our internal Sovereign model, which considers public debt levels, balance of payments, fiscal budgets and other macroeconomic, stability and political risk factors to assess sovereign credit risk. The model has an internal rating grade structure consisting of 15 pass grades.

### Bank Portfolio

Exposures in our Bank portfolio are rated by our internal Bank model, which takes into account asset quality, capital adequacy, liquidity, management, regulatory environment and robustness of the overall banking system. The model has an internal rating grade structure consisting of 15 pass grades.

### Retail Exposures

We have adopted the Advanced Internal Ratings-Based Approach (AIRB) for our retail exposures, which consist of residential mortgages, qualifying revolving retail exposures and other retail exposures. Exposures within each of these asset classes are not managed individually, but as part of a pool of similar exposures that are segmented based on borrower and transaction characteristics. As loss characteristics of retail exposures are geography and product specific, bespoke PD, LGD and EAD segmentation models are developed using empirical loss data for the respective exposures across the Group. Where internal loss data are insufficient to provide robust risk estimates, the segmentation models may incorporate internal and/or external proxies. Where necessary, the model is augmented with appropriate margins of conservatism. These models cover 9.1 per cent of the Total Credit RWA and are regularly validated.

### Retail Probability of Default Models

Retail PD models are based on pools of homogeneous exposures segmented by a combination of application scores, behavioural scores and other risk drivers reflecting borrower, facility and delinquency characteristics. PD pools are calibrated through-the-cycle using at least five years of historical data that cover a full economic cycle. For low default portfolios, internal and/or external proxies that are highly correlated with internal defaults are used to estimate the long-run average PD. A regulatory floor of 0.03 per cent is applied to all PD pools.

In general, the long-run observed default rates are largely lower than the PD estimates due to the model's calibration philosophy and the application of conservative overlays to account for model risk.

### Retail Loss Given Default Models

Retail LGDs are estimated using historical default data and the recovery experience from such defaulted cases. LGD models are segmented using material pre-default risk drivers such as facility and collateral characteristics.

LGD models are calibrated to reflect a portfolio's economic downturn experience. In addition, for residential mortgages, an LGD floor of 10 per cent is applied at the segment level.

### Retail Exposure at Default Models

For revolving products, EAD is computed based on the current outstanding balance and the estimated potential drawdown of undrawn commitments, which is determined based on historical data. For closed-end products, the EAD is the current outstanding balance. EAD models are generally segmented by material pre-default risk drivers such as facility type, limit and utilisation. EAD models are calibrated to reflect the portfolio long-run averages, except for portfolios that exhibit positive correlation between LGD and PD values, in which case, these portfolios' EAD models are calibrated to reflect their economic downturn conditions. EADs must be at least equal to the current outstanding balances.

# Risk Management

## Securitisation Exposures

From time to time, we arrange and invest in securitisation transactions. Any decision to invest in such a transaction is subject to independent risk assessment and approval. Processes are in place to monitor the credit risk of the securitisation exposures and are subject to regular review. The special purpose entities involved in these transactions are established and managed by third parties and are not controlled by the Group. In these transactions, we may also act as a liquidity facility provider, working capital facility provider or swap counterparty. Our securitisation positions are recognised as financial assets or undrawn credit facilities pursuant to our accounting policies and measured accordingly.

Risk weights for securitisation exposures in the banking book are computed using a hierarchy of approaches prescribed by MAS Notice 637. A majority of the exposures are subjected to External Ratings-Based Approach or SA where ECAI ratings from Fitch Ratings, Moody's Investors Service and Standard & Poor's are used, where available.

## Credit Exposures Subject to Standardised Approach

We have obtained the MAS' approval to adopt the IRBA for the majority of our portfolios, with 26 per cent of our exposures treated under AIRB and 66 per cent under FIRB. We apply the SA for the remaining portfolios which are immaterial in terms of size and risk profile and for transitioning portfolios. We will progressively migrate our transitioning portfolios, such as UOB Indonesia's exposures, subject to the approval of the MAS.

For exposures subject to the SA, we use approved ECAI ratings and prescribed risk weights based on asset class in the computation of regulatory capital.

The ECAIs used are Fitch Ratings, Moody's Investors Service and Standard & Poor's. They are mainly in the Bank asset class. ECAI ratings are mapped to a common credit quality grade prescribed by the MAS.

## Market Risk

Market risk refers to the risk of loss to us from movements in the market rates or prices (such as changes in interest rates, foreign exchange rates, equity prices, commodity prices and credit spreads) of the underlying asset.

Market risk is governed by the ALCO, which meets monthly to review and to provide directions on market risk matters. The Market Risk Management and Balance Sheet Risk Management (BSRM) Divisions support the BRMC, RCC and ALCO with independent assessment of the market risk profile of the Group.

The Group's market risk framework comprises market risk policies, practices and the control structure with appropriate delegation of authority and market risk limits. We employ valuation methodologies that are in line with sound market practices and validate valuation and risk models independently. In addition, the Group Product/Service Programme process ensures that different risks, including market risk issues, are identified and adequately addressed prior to launch.

One of our main objectives in undertaking trading activities is to provide customer-centric products and services to support our customers' business and hedging needs. We continually review and enhance our management of derivative risks to ensure that the complexities of the Group's business are appropriately controlled.

Our overall market risk appetite is balanced with targeted revenue at the Group, Bank and business unit levels and takes into account the capital position of the Group and the Bank. This ensures that the Group and the Bank remain well-capitalised, even under stress conditions. The risk appetite is translated into risk limits that are delegated to business units. These risk limits have proportional returns that are commensurate with the risks taken.

Market risk appetite is provided for all trading exposures within the Group and the Group's non-trading FX exposures. The majority of the non-trading FX exposures arises from our investments in overseas subsidiaries in Asia.

## Standardised Approach

We currently adopt the SA for the calculation of regulatory market risk capital but use the Internal Models Approach to measure and to control trading market risks. The financial products which are warehoused, measured and controlled with internal models include:

- FX and FX options;
- plain vanilla interest rate contracts and interest rate options;
- government and corporate bonds;
- equities and equity options; and
- commodities contracts and commodity options.

## Internal Model Approach

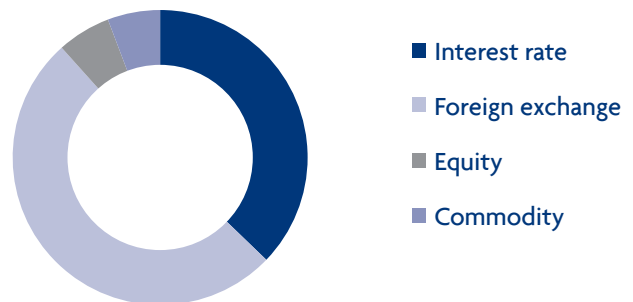
VaR is a statistical measurement which estimates the potential loss over a given period, at a certain confidence level.

We estimate a daily ES within a 97.5 per cent confidence interval over a one-day holding period, using the historical VaR simulation method, as a control for market risk. The method assumes that possible future changes in market rates may be implied by observed historical market movements. ES is the average portfolio loss, assuming that the loss is greater than the specified percentile of the loss distribution.

To complement the ES measure, we perform stress and scenario tests to identify the Group's vulnerability to event risk. These tests serve to provide early warnings of plausible extreme losses for which we have proactive risk management measures.

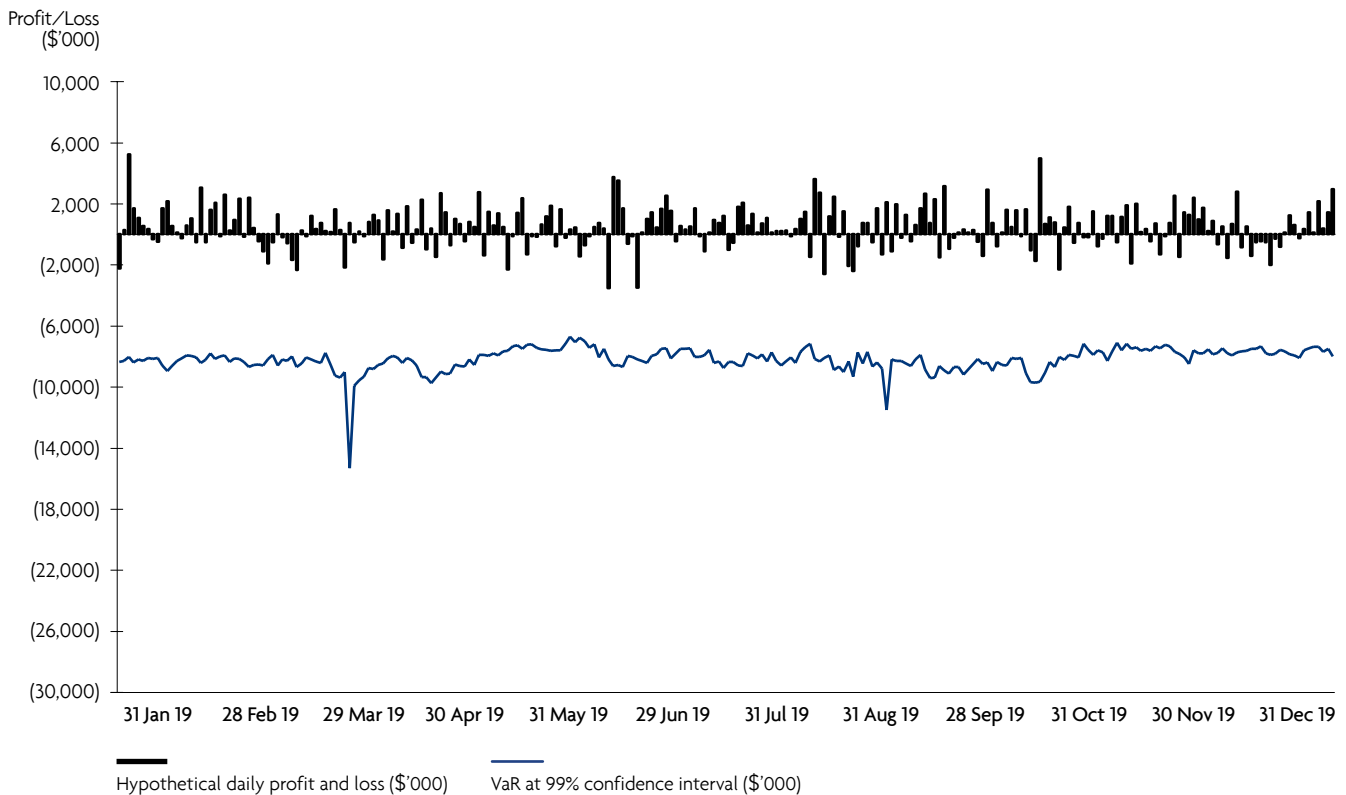
Our daily ES on 31 December 2019 was \$7.95 million.

## Group Trading ES for Market Risk by Risk Class



## Group Trading Backtesting Chart

(Hypothetical daily profit and loss versus VaR at 99% confidence interval)



For backtesting purpose, we use daily VaR within a 99 per cent confidence interval over a one-day holding period, based on the historical simulation method. As VaR is the statistical measure for potential losses, the VaR measures are backtested against profit and loss of the trading book to validate the robustness

of the methodology. The backtesting process analyses whether the exceptions are due to model deficiencies or market volatility. All backtesting exceptions are tabled to the ALCO with recommended actions and resolutions. No backtesting exception was noted for Group Trading in the year under review.

# Risk Management

## Interest Rate Risk in the Banking Book

Interest rate risk in the banking book (IRRBB) is defined as the risk of potential loss of capital or reduction in earnings due to changes in the interest rate environment.

We strive to meet customers' demands and preferences for products with various interest rate structures and maturities. Mismatches in repricing and other characteristics of assets and liabilities would give rise to sensitivity to interest rate movements. As interest rates and yield curves change over time, these mismatches may result in a change in the Group's economic net worth and/or a decline in earnings. Our primary objective of managing IRRBB is to protect and to enhance capital or economic net worth through adequate, stable and reliable growth in net interest earnings under a broad range of possible economic conditions.

The ALCO oversees the effectiveness of the interest rate risk management structure including approval of policies, controls and limits. The BSRM Division supports the ALCO in monitoring the interest rate risk profile of the banking book. Behavioural models used are independently validated and governed by approved policy. The management and mitigation of IRRBB through hedging instruments and activities are governed by the Group's IRRBB policies which are subject to regular review. Monitoring of positions against mandates, limits and triggers approved by the relevant committees and delegated to relevant business units provide alerts for timely actions to control potential risks.

Our banking book interest rate risk exposure is quantified monthly using dynamic simulation techniques. We employ an holistic approach towards balance sheet risk management. We use an in-house enterprise risk management system to integrate liquidity risk and IRRBB into a single platform to facilitate the Group's reporting across entities in a timely manner.

Interest rate risk varies with different repricing periods, currencies, embedded options and interest rate basis. Embedded options may be in the form of loan prepayment and time deposit early withdrawal. In Economic Value of Equity (EVE) sensitivity simulations, we compute the present value for repricing cash flows, with the focus on changes in EVE under different interest rate scenarios. This economic perspective measures interest rate risks across the full maturity profile of the balance sheet, including off-balance sheet items. We estimate the potential effects of interest rate changes on Net Interest Income (NII) by simulating the possible future course of interest rates and expected changes in business activities over time. Mismatches in the longer tenor would result in greater change in EVE than similar positions in the shorter tenor while mismatches in the shorter tenor would have a greater impact on NII. Interest rate scenarios used in simulations include the six standard scenarios prescribed by the Basel Committee on Banking Supervision as well as internal scenarios covering changes in the shape of the yield curve, including positive and negative tilt scenarios.

We also perform stress tests regularly to determine the adequacy of capital in meeting the impact of extreme interest rate movements on the balance sheet. Such tests are also performed to provide early warnings of potential extreme losses, facilitating the proactive management of interest rate risks in an environment of rapid financial market changes.

The risks arising from the trading book, such as interest rates, FX rates and equity prices are managed and controlled by the market risk framework.

## Liquidity Risk

Liquidity risk is the risk that arises from our inability to meet our obligations or fund increases in assets as they fall due. We maintain sufficient liquidity to fund our day-to-day operations, to meet deposit withdrawals and loan disbursements, to participate in new investments and to repay borrowings. Hence, liquidity is managed in a manner that addresses known as well as unanticipated cash funding needs.

Liquidity risk is managed in accordance with a framework of policies, controls and limits approved by the ALCO. These policies, controls and limits enable us to monitor and to manage liquidity risk to ensure that sufficient sources of funds are available over a range of market conditions. This is done by:

- minimising excessive funding concentrations by diversifying the sources and terms of funding, and
- maintaining a portfolio of high quality and marketable debt securities.

We take a conservative stance on the Group's liquidity management by continuing to gather core deposits, ensuring that liquidity limits are strictly adhered to and that there are adequate liquid assets to meet potential cash shortfall.

The distribution of deposits is actively managed to ensure a balance between cost-effectiveness, continued accessibility to funds and diversification of funding sources. Important factors in ensuring liquidity are competitive pricing, proactive management of the Group's core deposits and the maintenance of customer confidence.

Our liquidity risk is aligned with the regulatory liquidity risk management framework and is measured and managed on a projected cash flow basis. The Group is monitored under business-as-usual and stress scenarios. Cash flow mismatch limits are established to limit the Group's liquidity exposure. We also employ liquidity early warning indicators and trigger points to signal possible contingency situations. Our liquidity ratios, Liquidity Coverage Ratio (LCR)\* and Net Stable Funding Ratio (NSFR)\*, are above the regulatory requirement.

We have contingency funding plans in place to identify potential liquidity crises using a series of warning indicators. Crisis management processes and various strategies including funding and communication plans have been developed to minimise the impact of any liquidity crunch.

\* Key monitoring tools defined under Basel III liquidity risk framework on quarterly updates for LCR and semi-annual updates for NSFR are available on our website at [www.UOBgroup.com/investor-relations/financial/index.html](http://www.UOBgroup.com/investor-relations/financial/index.html)

## Operational Risk

Operational risk is the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. Operational risk includes banking operations risk, fraud risk, legal risk, outsourcing risk, regulatory risk, reputational risk and technology risk but excludes strategic and business risk.

Our primary objective is to foster a sound reputation and operating environment.

### Operational Risk Governance, Framework and Programmes

Operational risk is managed through a framework of policies and procedures by which business and support units properly identify, assess, monitor, mitigate and report their risks. The ORMC meets monthly to provide oversight of operational risk matters across the Group.

The Operational Risk Governance structure adopts the 3LOD Model. The business and support units, as the First Line of Defence, are responsible for establishing a robust control environment as part of their day-to-day operations. Each business or support unit is responsible for implementing the operational risk framework and policies, embedding appropriate internal controls into processes and maintaining business resilience for key activities.

The Operational Risk Management Division, as the Second Line of Defence, provides overarching governance of operational risks through relevant frameworks, policies, programmes and systems. It also monitors key risk self-assessment results, outsourcing matters, key operational risk indicator breaches, self-identified operational risks and incidents and reports these to the relevant senior management committees and the Board.

GA acts as the Third Line of Defence by providing, through periodic audit reviews, an independent and objective assessment on the overall effectiveness of the risk governance framework and internal controls.

Two key components of the operational risk management framework are risk identification and control self-assessments. These are achieved through the Group-wide implementation of a set of operational risk programmes. Several risk mitigation policies and programmes are in place to maintain a sound operating environment.

Our business continuity and crisis management programmes ensure prompt recovery of critical business and support units should there be unforeseen events. An annual attestation is provided to the Board on the state of business continuity readiness of the Group.

Our insurance programme covers civil and crime liability, cyber liability, property damage, terrorism, public liability, as well as directors' and officers' liability. The programme reduces operational losses through adequate insurance coverage.

We adopt the SA for the calculation of operational risk capital.

The subject-specific key risks that we focus on include but are not limited to:

### Technology Risk

Technology Risk is defined as any potential adverse outcome, damage, loss, violation, failure or disruption arising from the use of or reliance on information and communication technologies. The governance of technology risk rests with the ORMC, who facilitates an holistic oversight of operational risk matters across the Group. Our technology risk management framework ensures that technology and cyber risks are managed in a systematic and consistent manner. The scope of technology risk management covers many aspects, including technology asset management, technology resiliency and the continuity aspects of business continuity management, cybersecurity management, technology third party risk management and information security management.

Our Technology Risk Management Division, as the Second Line of Defence, has governance and oversight of technology risk management across the Group. The team works with business and support units, including the technology and information security teams, to oversee, to review and to strengthen their current practices in technology risk management. We adopt a risk-based approach in assessing and managing technology and cyber risks. Our Board, senior management and ORMC are briefed regularly on technology risk appetite and technology risk matters.

### Regulatory Risk

Regulatory risk refers to the risk of non-compliance with laws, regulations, rules, standards and codes of conduct. We identify, monitor and manage this risk through a structured governance framework of compliance policies, procedures and guidelines. The framework also manages the risk of regulatory breaches relating to sanctions, anti-money laundering and countering the financing of terrorism.

### Legal Risk

Legal risk arises from unenforceable, unfavourable, defective or unintended contracts, lawsuits or claims, developments in laws and regulations, or non-compliance with applicable laws and regulations. Business and support units work with both internal and external legal counsel to ensure that legal risks are managed.

### Reputational Risk

Reputational risk is the risk of adverse impact on earnings, liquidity or capital arising from negative stakeholder perception or opinion of the Group's business practices, activities and financial condition. We recognise the impact of reputational risk and have developed a policy to identify and to manage the risk across the Group.

### Outsourcing Risk

Outsourcing risk is the risk of adverse financial, operational, reputational, legal and compliance impact arising from the failure of a service provider to provide the outsourced service or to comply with legal and regulatory requirements, or a service provider's breaches of security. We manage this risk through the Group outsourcing risk management framework, policy, procedures and guidelines, and the outsourcing module in the Governance, Risk and Compliance system.

# Risk Management

## Fraud Risk

Fraud is defined as an act with an element to deceive or to conceal facts, and is not restricted to the gain of monetary or material benefits.

We manage fraud risks actively. Our Integrated Fraud Management (IFM) Division, as the Second Line of Defence, drives strategy and governance and oversees the framework of fraud risk management across the Group. The corporate governance oversight of fraud risk is provided by the AC at the Board level and primarily by the ORM at the management level.

All employees are required to comply with the UOB Code of Conduct, which has anti-bribery and anti-corruption provisions. The fraud hotline managed by IFM provides a safe channel to report suspected fraud. IFM conducts independent fraud investigations. The division also works closely with business and support units to strengthen its practices across the five pillars of prevention, detection, response, remediation and reporting.

## Environmental Social and Governance Risk

ESG risk is the risk of credit loss or non-financial risks arising from ESG issues such as climate change. While a key component of ESG risk arises indirectly from the financial services we provide to our customers, it can also result directly from our own operations.

The ESG Committee identifies and reviews ESG factors material to us, and ensures that sustainability factors are considered in all aspects of our operations.

Our material ESG factors provide a framework for our ESG risk considerations and in our day-to-day decision-making processes. The specific risk associated with each factor is monitored and managed in accordance with the respective framework, policy or guidelines.

Specific to our wholesale financing activities, we ensure that ESG considerations are integrated into our credit evaluation and approval processes. To this end, we have made our Responsible Financing Policy, which is approved by the CC, part of our Group Corporate Credit Policy.

Under our Responsible Financing Policy, account officers are required to conduct due diligence on all new and existing borrowers during the client onboarding process and annual credit review. Borrowers who fall into the ESG-sensitive industries defined by the ABS' Responsible Financing Guidelines are subject to enhanced due diligence with sector-specific guidelines. All borrowers are classified based on the level of ESG risk in their business and are monitored on an ongoing basis for any adverse ESG-related news. Those with any known material ESG-related incidents would trigger an immediate review, with ESG risks to be addressed and managed appropriately.

More information on our ESG-related efforts can be found in the Sustainability Report.

## Strategic and Business Risk

Strategic risk refers to the current or prospective negative impact on earnings, capital or reputation arising from adverse strategic decisions, improper implementation of decisions or a lack of responsiveness to industry, economic or technological changes. It is the risk of not achieving our strategic goals.

Business risk refers to the adverse impact on earnings or capital arising from changes in business parameters such as volumes, margins and costs. The sources of business risk include uncompetitive products or pricing, internal inefficiencies, and changes in general business conditions such as market contraction or changes in customers' expectations and demand. It is the risk of not achieving our short-term business objectives.

Our Board of Directors and senior management committees are responsible for managing risks associated with the Group's business. The BRMC and Executive Committee assist the Board in relation to the management of strategic and business risks. The CEO, supported by senior management committees, oversees the day-to-day management of the Group and make business decisions within the Group's risk appetite. The Group's strategy is then translated into annual financial targets, taking into account the macroeconomic environment, and cascaded to specific business for development and implementation.