Unofficial Translation

This translation is for convenience of those unfamiliar with Thai language.

Please refer to the Thai text for the official version.

Notification of the Bank of Thailand

No. FPG. 16 / 2555

Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Internal Ratings-Based Approach (IRB)

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1. Rationale

The Bank of Thailand has revised the Notification of the Bank of Thailand Re: Regulations on Supervision of Capital for Commercial Banks to be in accordance with the Basel III framework : A global regulatory framework for more resilient banks and banking systems (Revised version : June 2011) of the Basel Committee on Banking Supervision. The objective is to ensure that commercial banks maintain adequate quantity of high quality capital to absorb loss under normal circumstances and during a period of stress as well as to maintain the stability of financial system. This revision also improves the calculation of credit risk-weighted asset to better reflect credit risk of the commercial banks.

Under this Notification, the Bank of Thailand has revised regulation on the calculation of credit risk-weighted assets under Internal Ratings-Based Approach (IRB) to be consistent with the revised regulations on Components of Capital whereas the existing principles of the IRB remain unchanged. Over the past crisis, it was evidenced that the quality of borrowers in financial sector is more highly correlated to the systemic risk than other groups of borrower. Therefore, the functions for calculating credit risk-weighted asset have been improved in order to reflect inherent risk of this group of borrower.

For other items, the commercial banks shall comply with the existing regulations prescribed by the Bank of Thailand.

2. Statutory Power

By virtue of Section 29, Section 30 and Section 32 of the Financial Institution Business Act B.E. 2551 (2008) which contains certain provisions relating to the restriction of rights and liberties of persons which Section 29, in conjunction with Section 31, Section 33, Section 36, Section 39, Section 41 and Section 43 of the Constitution of the Kingdom of Thailand so

permit by virtue of law, the Bank of Thailand hereby issues the Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Internal Ratings-Based Approach (IRB) and all commercial banks shall comply accordingly.

3. Scope of Application

This Notification shall apply to all commercial banks according to the law on financial institution business.

4. Repealed Notifications and Circulars

1. The Notification of the Bank of Thailand No. FPG. 91/2551 Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Internal Ratings-Based Approach (IRB) dated 27 November 2008 and

2. The Notification of the Bank of Thailand No. FPG. 21/2552 Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Internal Ratings-Based Approach (IRB) (No.2) dated 1 December 2009

5. Content

5.1 Definition

Under this Notification

"Unexpected loss (UL)" means the loss that exceeds the expected level

"Expected loss (EL)" means the loss that is expected to occur

"Probability of default (PD)" means the probability that the obligor will default

"Loss given default (LGD)" means the amount of loss if the obligors default (expressed as a percentage of EAD)

"Exposure at default (EAD)" means the outstanding amount of facility or estimated outstanding amount of facility if the obligors default

"Effective maturity (M)" means the remaining maturity of facility used for calculating credit risk-weighted assets

"Correlation" means the correlation between the value of asset (which reflect the PD of an individual obligor) and the systematic risk factor

"Exposures" mean loans, investment in debt securities, deposits and off balance sheet items including obligations and other legal claims of commercial banks. In this regard, loans, investments in debt securities and deposits shall include accrued interests

"Specific provision" means provision set aside against assets and all off-balance sheet items, where commercial bank can identify deterioration of particular assets and/or off-balance sheet items. In this regard, specific provision shall include the provision made for the decrease in market value and devaluation of debt and equity securities held for trading and available for sale, but shall not include provision for assets classified as pass which the commercial bank has recognised in its Tier 2 capital.

"General provision" means the provision for assets classified as pass, not including provisions for assets classified as pass which the commercial bank has included in its specific provision

"Dilution risk" means the risk that the amount of purchased receivables is reduced due to the agreement between the seller of receivables and the receivables' obligor. For example, the seller of receivables offers discount to the receivables' obligor when the obligor makes payment within a specified period of time, or returns of goods sold within a specified period of time due to disputes regarding product quality, or any other obligations between the seller and the obligor.

5.2 Principles

The Bank of Thailand has prescribed the guidelines on the calculation of credit risk-weighted asset under the Standardised Approach (SA) and Internal Ratings-Based Approach (IRB) to provide alternatives for calculating credit risk-weighted assets to commercial banks. Thus, commercial banks can choose the approach that is commensurate with the sophistication of their credit risk management system.

The IRB is the approach for calculating credit risk-weighted assets under which commercial banks shall use their own internal tools in estimating credit losses. Based on the loss absorption approach, credit losses are divided into 2 types as follows:

(1) Unexpected loss (UL) is the portion that commercial banks should maintain capital for absorbing loss. The minimum capital requirement that commercial banks shall maintain to absorb UL will be based on credit risk-weighted assets calculated in accordance with the approach prescribed in this Notification.

(2) Expected loss (EL) is the portion that commercial banks should have provision for absorbing loss. Commercial banks shall compare the EL amount calculated in accordance with the approach prescribed in this Notification, with the total eligible

provisions. Where there is difference between those two amounts, commercial banks shall comply with the regulations prescribed by the Bank of Thailand in this Notification.

There are several approaches for estimating the abovementioned risk components where the main approach for calculation of credit risk-weighted assets under the IRB is the PD/LGD (Risk weight function) formula consisting of 4 risk components which are Probability of default (PD), Loss given default (LGD), Exposure at default (EAD) and Effective maturity (M).

To calculate the credit risk-weighted assets under the IRB, commercial banks may choose the following approaches for applying the PD/LGD function (Risk weight function):

(1) Foundation Internal Ratings-Based Approach (FIRB) is the approach that commercial banks shall provide their own estimates of PD but using supervisory estimates prescribed by the Bank of Thailand for other risk components.

(2) Advanced Internal Ratings-Based Approach (AIRB) is the approach that commercial banks shall estimate all 4 risk components by themselves.

Commercial banks shall sum risk-weighted assets calculated under this Notification with other risk-weighted assets prescribed in the Notification of the Bank of Thailand Re: Regulations on Supervision of Capital for Commercial Banks and use the sum of risk-weighted assets to calculate capital adequacy ratio as prescribed by the Bank of Thailand.

5.3 Regulation on the calculation of credit risk-weighted assets under the IRB

In the calculation of credit risk-weighted assets under the IRB, commercial banks using the IRB shall comply with the rules prescribed by the Bank of Thailand as follows:

5.3.1 Asset class

Asset class[1] under the IRB are divided into 7 main classes and in each class are divided into sub-asset classes[2] as follows:

(1) Sovereign exposures

(2) Bank exposures

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[1] means on-balance sheet assets and off-balance sheet items

[2] Definition of Sovereign exposures, Bank exposures, and Corporate exposures as prescribed in Attachment 1; Definition of retail exposures as prescribed in Attachment 2; Definition of equity exposures as prescribed in Attachment 3; Definition of purchased receivables as prescribed in Attachment 4 ; Definition of other assets prescribed in Attachment 5

(3) Corporate exposures subdivided into 2 sub-asset classes which are

(3.1) General corporate exposures

(3.2) Specialised lending exposures

(4) Retail exposures subdivided into 3 sub-asset classes which are

(4.1) Residential mortgage exposures

(4.2) Revolving retail exposures

(4.3) Other retail exposures

(5) Equity exposures

(6) Purchased receivables

(6.1) Purchased corporate receivables

(6.2) Purchased retail receivables

(7) Other assets

5.3.2 Calculation of credit risk-weighted assets under the IRB

The calculation of credit risk-weighted assets of 7 classes of asset under item 5.3.1 is divided into 5 groups. Details of calculation approach and estimation of risk components are prescribed in Attachment 1 to 5 which can be summarized the calculation method for each class of assets and additional information for calculation of credit risk-weighted assets as follows:

Summary of calculation approaches

Group 1 : Sovereign, Bank, and Corporate Exposures

For Sovereign, Bank, and Corporate exposures, commercial shall calculate credit risk-weighted assets by divided them into 2 cases (Details as prescribed in Attachment 1) as follows:

(1) For Sovereign, Bank, Corporate exposures and Specialised lending exposures the meet the minimum requirements on the estimation of risk components, commercial banks shall use PD/LGD formula for corporate exposures (Corporate risk weight function) which they can choose between FIRB and AIRB.

(2) For Specialised lending exposures that do not meet the minimum requirements on the estimation of risk components, commercial banks shall use supervisory slotting criteria approach by multiplying EAD by risk weight prescribed by the Bank of Thailand. The risk weight is calculated by mapping internal rating of specialised lending exposures of commercial banks to the 5 rating grades prescribed by the Bank of Thailand.

Group 2 : Retail Exposure

Commercial banks shall use PD/LGD formula for retail exposures (Retail risk weight function) and use AIRB only (Details as prescribed in Attachment 2).

Group 3 : Equity Exposure

For equity exposures, commercial banks can choose the following approaches for calculating credit risk-weighted assets that is appropriate to each equity portfolio (Details as prescribed in Attachment 3).

(1) Market-based approach consists of 2 sub-approaches as follows:

(1.1) Simple risk weight method : commercial bank shall multiply EAD by risk weight prescribed by the Bank of Thailand

(1.2) Internal models method : commercial banks shall calculate credit risk-weighted assets using Value-at-risk model (VaR)

(2) PD/LGD approach : commercial banks shall use PD/LGD formula for corporate exposures (Corporate risk weight function)

Group 4 : Purchased Receivables

For purchased receivables, commercial banks shall calculate credit risk-weighted assets for 2 types of risk (Details as prescribed in Attachment 4) which are :

(1) Dilution risk : Risk that the amount of purchased receivables is reduced because of the agreement between the seller of receivables and **the receivables' obligor to reduce the receivables outstanding amount under conditions agreed in advance**. Commercial banks shall use PD/LGD formula for corporate exposures (Corporate risk weight function) for calculating credit risk-weighted assets for dilution risk from both purchased corporate receivables and purchased retail receivables.

(2) Default risk : Risk that the receivables' obligor does not repay debt. The calculation of credit risk-weighted assets for default risk is divided into 2 cases which are

(2.1) Purchased corporate receivables

Commercial banks shall choose Bottom-up approach or Top-down approach in accordance with the conditions prescribed by the Bank of Thailand. Commercial banks shall use PD/LGD formula for corporate exposure (Corporate risk weight function)

(2.2) Purchased retail receivables

Commercial banks shall use PD/LGD formula for retail exposures (Retail risk weight function) according to type of purchased retail receivables[3].

Group 5 : Other Assets

Commercial banks shall multiply the outstanding amount net of specific provision by risk weight prescribed by the Bank of Thailand (Details prescribed in Attachment 5)

Additional information for calculation of credit risk-weighted assets of asset group 1 – group 5

To calculate credit risk-weighted assets of asset group 1 – 5 for exposures from derivatives, unsettled transactions, exposures using PD/LGD function for calculating credit risk-weighted assets, or exposures denominated in foreign currency, as the case may be, commercial banks shall apply the following approaches:

Exposures from Derivatives

Commercial banks shall calculate credit risk-weighted assets for counterparty credit risk for all derivatives transaction in banking book and trading book in accordance with the regulation prescribed in the Notification of the Bank of Thailand Re: the Regulation on the Calculation of Counterparty Credit Risk-Weighted Assets for Derivative Transactions. In addition, commercial banks undertaking derivatives transaction in the trading book shall maintain capital to absorb market risk from those transactions as prescribed in the Notification of the Bank of Thailand Re: the Regulation on Supervision of Market Risk and Capital Requirements for Market Risk of Financial Institutions.

In case of credit derivatives[4] in the banking book where commercial banks are protection seller or protection buyer, commercial banks shall comply with the following regulations

[3] The calculation of credit risk-weighted assets is considered the Top-down approach since the estimated risk components and risk-weighted assets of corporate purchased receivables are calculated on a pool basis.

(1) In the case where commercial banks are credit protection sellers[5], commercial banks shall refer to the calculation of credit risk-weighted assets for credit derivatives prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under SA regarding the **Regulation on Risk Weights and Credit Conversion Factors Credit Derivatives in the Banking Book**

(2) In the case where commercial banks are credit protection buyers[5], commercial bank shall refer to the calculation of credit risk-weighted assets prescribed in the estimation of LGD in case of having guarantees and credit derivatives according to type of hedged assets as prescribed in Attachment of this Notification.

Exposures from Unsettled Transactions

Commercial banks shall refer to the calculation of credit risk-weighted assets prescribed in the Notification of the Bank of Thailand Re: the Regulation on the Calculation of Credit Risk-Weighted Assets for Non-Delivery Versus Payment (Non-DvP) for Commercial Banks.

Exposures Using PD/LGD Function for Calculating Credit Risk-Weighted Assets

In the case where commercial banks use PD/LGD function for calculating credit risk-weighted assets, **except PD/LGD function for defaulted exposure**, commercial banks shall **multiply the scaling factor of 1.06 in the calculation of** the percentage of capital requirement as prescribed in Attachment 1 and Attachment 2.

Exposures Denominated in Foreign-Currency

In case of assets and off-balance sheet exposures dominated in foreign currency, commercial banks shall convert the exposures into Thai Baht by using current exchange rate on the reporting date as prescribed in the Notification of the Bank of Thailand Re: Requirements on Accounting for Financial Institutions.

5.4 Regulation on expected loss and total eligible provisions

In addition to calculating the UL amount for the calculation of credit risk-weighted assets, commercial banks shall calculate the sum of EL amount for all classes of asset using the IRB for calculating credit risk-weighted assets in accordance with the approach prescribed by the Bank of Thailand. The total EL amount shall be compared with

[4] Definition of credit derivatives transaction shall be in accordance with the Notification of the Bank of Thailand Re: Permission for a Commercial Bank to Undertake Credit Derivatives Transaction

the total eligible provisions. In case there is difference between EL amount and total eligible provisions, commercial banks shall comply with the regulation prescribed by the Bank of Thailand (Details prescribed in Attachment 6).

5.5 Minimum requirements for the IRB

Commercial banks using the IRB shall comply with the minimum requirements (Details prescribed in Attachment 7) in the following areas:

(1) Internal rating systems design and development

(2) Risk rating system operations

(3) Corporate governance and oversight

(4) Use of internal rating

(5) Risk quantification

(6) Validation of internal estimate

(7) Minimum requirements in applying LGD and EAD prescribed by the Bank of Thailand

(8) Requirements for recognition of leasing

(9) Calculation of credit risk-weighted asset for equity exposures

(10) Disclosure requirements

5.6 Adoption of the IRB

Commercial banks using the IRB shall obtain an approval from the Bank of Thailand and meet all minimum requirements for the IRB (Details prescribed in Attachment 7). Furthermore, commercial banks shall comply with the IRB implementation framework as prescribed by the Bank of Thailand (Details prescribed in Attachment 8)

6. Transitional provision

Under the transition provision of the Notification of the Bank of Thailand Re: Components of Capital for Locally Incorporated Commercial Banks and the Notification of the Bank of Thailand Re: Components of Capital for Foreign Bank Branches, commercial banks shall deduct the amount of intangible assets and investments in financial entities and supporting business companies (except for the investments in the companies in full consolidation group subject to prepare

consolidated financial statements, investments in companies which are beneficial to financial institution system, and investments in debt restructuring companies) from regulatory capital, beginning on 1 January 2014 until 1 January 2018 at the rate of 20 percent, 40 percent, 60 percent, 80 percent, and 100 percent per year. During the transition period, commercial banks shall calculate credit risk-weighted assets for the remainder not deducted from capital, as prescribed in this Notification or other relevant Notification, as the case may be (Details prescribed in Attachment 9).

7. Effective date

This notification is effective from 1 January 2013 onwards.

Announce on 8th November 2012

(Mr. Prasarn Trairatvorakul)
Governor
Bank of Thailand

Attachment 1

The Calculation of Credit Risk-Weighted Assets under the IRB for

Group 1 – Sovereign, Bank, and Corporate Exposure

I. Definition

1. Sovereign exposure means obligors in accordance with the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA), as follows:

1.1 Claims on Sovereigns and central banks

1.2 Claims on local government organisations, state agencies, and state enterprises (Non-central government public sector entities: PSEs) risk weighted in the same manner as sovereign exposure

1.3 Claims on Multilateral Development Banks (MDBs) risk weighted at 0%

2. Bank exposure means obligors in accordance with Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA), as follows:

2.1 Financial institutions and securities companies.

2.2 **PSEs** risk weighted in the same manner as bank exposure.

2.3 **MDBs** risk weighted according to ratings obtained from external credit assessment institutions.

3. Corporate exposures are categorised into 2 sub-classes as follow:

3.1 General corporate exposures mean corporate exposure that is not under specialised lending as specified in Clause I.3.2, comprising claims on:

3.1.1 Juristic persons established by the Civil and Commercial Code or the law on Public Limited Companies or foreign laws, excluding sovereign exposure under Clause I.1, bank exposure under Clause I.2 or retail exposure as specified in Attachment 2.

3.1.2 **PSEs** risk weighted in the same manner as corporate exposure as specified under the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under the SA.

3.1.3 Loans to an individual person or persons for business purposes which fail to meet the criteria on retail exposures as specified in Attachment 2.

3.2 Specialised lending (SL) means claims on corporate that have special characteristics that differ from general corporate exposures. The special characteristic is that both the repayment ability of the obligor and the recovery value in case of default depends on the same factor i.e. revenue streams or the cash flows generated from the assets funded by commercial banks. Thereby, **correlation between PD and LGD** of specialised lending tends to be high **and positively correlated**.

3.2.1 Characteristics of specialised lending

Specialised lending must possess all of the following characteristics:

(1) The obligor is a juristic person which is established for a specific purpose[1] to obtain funding in order to acquire entity's assets or to operate such assets.

(2) The obligor does not have income from other sources or other assets to repay the debt other than the income generated from the assets funded by the loan from commercial banks, or has very little income from other sources or other assets which is not sufficient to repay the debt.

(3) Terms and conditions of the loan give commercial banks a control over the assets or the income generated from the entity's assets.

(4) As a result of the preceding 3 characteristics, the primary source of debt repayment of the obligor is from income generated from the assets funded by commercial banks rather than the obligor's overall repayment capability.

3.2.2 Type of specialised lending

Specialised lending can be categorised into 4 sub-classes[2], as follows

(1) Project finance means loans that are used for financing large and complex investment projects with expensive construction investment where commercial banks consider revenues of such investment project as the source of debt repayment and collateral of the loans. For example, power plant construction project, petrochemical plants, mines, transportation infrastructure, environment project, and etc. However, the obligor **shall**

[1] Often a Special Purpose Entity (SPE).

[2] The Bank of Thailand shall not specify high-volatility commercial real estate (HVCRE), lending that funds real estate with more volatile loss rate than other specialised lending types as a type of specialised lending until adequate statistical data are obtained.

be a juristic person established for a specific purpose, such as for development, acquisition, possession and operation in such business only, and shall not undertake other businesses or functions.

(2) Object finance means loans that are used for financing purchasing or acquisition of large physical assets that are both a source of debt repayment and collateral of the loans. Income from those physical assets is usually in form of rental fees or lease contracts. For example, ships or fleets, aircrafts, satellites, railcars, etc.

(3) Commodities finance means short-term loans that the obligor, mostly a commodity trader, uses for financing acquisition and storage of such commodity inventories for the purpose of production or resale. For example, commodity that is crude oil, metals, and agricultural crops, and etc. The obligor does not have other sources of income for debt repayment other than the income generated from the sale of such commodity. Usually, this type of an obligor does not have other activities or assets on its balance sheet; therefore, the credit rating assessment of the obligor depends significantly on its ability to sell such commodity (self-liquidating) and conditions or agreement of such loans.

(4) Income-producing real estate (IPRE) means loans that are used for financing a real estate development project. The cash flows from the real estate project are both the main sources of income for debt repayment and the collateral. The income of the project is usually in form of rental fees, lease contracts, or sale of such real estate. For example, office buildings to lease, retail spaces for rent, condominiums, warehouses, and hotels, and etc.

II. Risk-Weighted Assets Calculation Method

Categorised by types of assets into 2 cases, as follows:

1. Risk-weighted assets calculation for sovereign, bank, and general corporate exposure

Commercial banks that adopt the FIRB or the AIRB shall apply the corporate risk weight function specified in Clause II. 1.1 (1): in case of obligors not in default that commercial banks do not apply Double Default Method for credit risk mitigation, Clause II. 1.1 (2) in case of obligors not in default that commercial banks apply Double Default Method for credit risk mitigation, and Clause II. 1.2: in case of defaulted obligors. PD and LGD shall be measured in decimal or percentage unit, EAD shall be measured in currency value unit (Baht) and **M shall be measured in number of years**. The calculated risk-weighted

asset shall be used for the calculation of minimum capital requirement for unexpected loss (UL).

Companies operating financial businesses are limited companies, public limited companies, limited partnership, registered ordinary partnerships or other juristic persons that operate commercial banking business, finance business, credit foncier business under the law on Financial Institution Business, specialised financial institutions' business, securities business under the law on Securities and Exchange, futures contract business under the law on Futures contract, life insurance business under the law on Life Insurance, casualty insurance business under the law on Insurance, asset management business under the laws on the asset management companies , holding business that invests in its own financial business group, hire purchase business, leasing business, factoring business, credit card business, personal loan business, securitisation business[3], lending business, venture capital business, trustee business under the law on Trust for Transactions in Capital Market, custodian business, clearing house[4], and central counter party (CCP)[5] business, proprietary trading business and other businesses to be prescribed by the Bank of Thailand.

Commercial banks shall add a multiplier of 1.25 to the correlation formula (R_{FI}) of the above exposure[6], if the exposure meets one of the following conditions:

- is a company operating financial business under supervision and in a business group[7] with asset value[8] of USD 100,000 million[9] or more

[3] Securitisation business includes business that provides credit enhancement to investors and business that provides temporary liquidity facility to special purpose entities or companies to which the asset are transferred or other businesses as prescribed in the Notification of the Bank of Thailand Re: Permission for Commercial Banks to Undertake Securitisation Business.

[4] Means clearing houses that acts as intermediaries for settlement by taking the place of counterparties and guarantee settlement and deliveries of securities in trades. That is, if a particular counterparty defaults on an agreement, the clearing house shall be responsible for the settlement or delivery of securities to another counterparty.

[5] The definition shall be referred from the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-weighted Assets of Counterparty for Derivatives

[6] The Bank of Thailand prescribes the adjustment to the correlation formula since the asset values of these exposure correlates with systemic risk factors, more than sovereign, bank and other corporate exposure. However, the adjustment to the correlation formula does not include the case where companies operating financial business have certain factors that may mitigate their risks, for example, such companies are under supervision and in financial business groups having assets not exceeding the prescribed level.

[7] A group of a company operating financial business includes head quarter and other branches, parent company, associated company and subsidiary located both domestically and internationally.

[8] Commercial banks shall refer to the asset value as appeared in the latest consolidated financial statement of the business group. Such financial statement must be prepared in accordance with relevant accounting standards and audited by certified public accountant.

[9] Commercial banks shall covert this into Thai Baht using current exchange rate on the reporting date in accordance with the Notification of the Bank of Thailand Re: Accounting of financial institutions.

In this regard, a company operating financial business under supervision means the company operating financial business under supervision of an agency[10] having risk supervision standard equivalent to international standards, or a company operating financial business that is significant in the business group and under supervision of an agency having risk supervision standard equivalent to international standards.

- is a company operating financial business that is not under supervision, that is, a company operating financial business that is not a company operating financial business under supervision as mentioned above.

[10] **Agencies in Thailand means the Ministry of Finance, the Bank of Thailand, the Securities and Exchange Commission (SEC) and the Office of Insurance Commission (OIC). Agencies in other countries means agencies with the same authority and duty as the agencies in Thailand mentioned above, or as deemed appropriate by the Bank of Thailand or proved by commercial banks.**

For claims on small and medium enterprise[11] with business group sales[12] below 1,000 million Baht per annum, commercial banks can use sales of the obligor[13] to mitigate credit risk-weighted assets in correlation formula (R_{SME}).

1.1 Risk-weighted assets calculation formula for exposure not in default

(1) In case where commercial banks do not apply Double Default Method for credit risk mitigation

Correlation (R):

$$R = 0.12 \times \left(\frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) + 0.24 \times \left[1 - \left(\frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) \right]$$

Correlation of claims on financial businesses (R_{FI}):

$$R_{FI} = 1.25 \times R$$

$$= 1.25 \times \left[0.12 \times \left(\frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) + 0.24 \times \left[1 - \left(\frac{1 - e^{-50 \times PD}}{1 - e^{-50}} \right) \right] \right]$$

Correlation of claims on small and medium enterprises (R_{SME}):

[11] **Commercial banks shall prescribe their internal guidelines in considering small and medium enterprise. The prescribed guidelines must be consistent to guidelines on lending and risk management of commercial banks.**

[12] Sale volume means income from sales of products and/or services as appeared in latest consolidated financial statements that are prepared in accordance with accounting standards and audited by an auditor. In case where an obligor does not prepare consolidated financial statements which are in accordance with the accounting standards, commercial banks shall use their best effort to find information on sale volume of business group. Commercial banks shall apply guideline on the aggregation of sale volume of business group according to Accounting Standing No. **27** or any amendments.

[13] The Bank of Thailand allows firm-size adjustment in correlation formula of claims on small and medium enterprise (mentioned above) since the probability of such default depends more on its own specific factors, unlike corporate exposure. Therefore, correlation for this exposure shall less than that of general corporate exposure at the maximum of 4% in case where sale volume of business group of such obligor is equal to or less than 100 million Baht.

$$R_{SME} = R - 0.04 \times \left(1 - \frac{S-100}{900}\right)$$
$$= 0.12 \times \left(\frac{1-e^{-50\times PD}}{1-e^{-50}}\right) + 0.24 \times \left[1 - \left(\frac{1-e^{-50\times PD}}{1-e^{-50}}\right)\right] - 0.04 \times \left(1 - \frac{S-100}{900}\right)$$

Maturity adjustment (b):

$$b = \left[0.11852 - 0.05478 \times \ln(PD)\right]^2$$

Capital requirement (K)[14]:

$$K = \left[LGD \times N\left(\frac{1}{\sqrt{1-R}} \times G(PD) + \sqrt{\frac{R}{1-R}} \times G(0.999)\right) - PD \times LGD\right] \times \left(\frac{1+(M-2.5)\times b}{1-1.5\times b}\right) \times 1.06$$

Risk weight (RW):

$$RW = K \times 12.5$$

Risk-weighted assets (RWA):

$$RWA = RW \times EAD$$

Where e^x = Exponential function

$ln(x)$ = Natural logarithm

$N(x)$ = Cumulative distribution function for a standard normal random variable (that is the probability that value of normally distributed random variable is less than or equal to x, where such random variable has mean = 0 and variance = 1)

$G(z)$ = Inverse cumulative distribution function for a standard normal random variable (that is the value of x that makes N(x) = z)

[14] If the value of K calculated has negative value, commercial banks shall set the K value equal to 0 instead.

S (million Baht) = Sales of business group that is greater than or equal to 100 million Baht but less than 1,000 million Baht (if sales volume of business group is less than 100 million Baht, commercial banks shall use 100 million Baht instead)

Steps to apply calculation formula of credit risk-weighted assets for normal exposure in case where commercial banks do not apply Double Default Method for credit risk mitigation are as follow:

Step 1 Calculate correlation (R) by substituting PD calculated according to risk component estimation method specified by the Bank of Thailand in the correlation formula

Step 2 Calculate maturity adjustment (b) by substituting PD calculated according to risk component estimation method specified by the Bank of Thailand in maturity adjustment formula

Step 3 Calculate capital requirement (K) by substituting PD, LGD and M calculated according to risk component estimation method specified by the Bank of Thailand, R calculated from Step 1, and b calculated from Step 2 in the capital requirement formula

Step 4 Calculate risk weight (RW) by multiplying K obtained from Step 3 by 12.5

Step 5 Calculate credit risk-weighted assets (RWA) by multiplying RW obtained from Step 4 by EAD calculated according to risk component estimation method specified by the Bank of Thailand

(2) In case where commercial banks apply Double Default Method[15] for credit risk mitigation

Capital requirement for exposure with credit risk mitigation in case of applying Double Default Method (K_{DD}):

$$K_{DD} = K_o \times \left(0.15 + 160 \times PD_g\right)$$

[15] Credit risk mitigation method that takes into account the case where the debtor and the guarantor (or the protection seller) defaults simultaneously, or double default method, means credit risk mitigation method from guarantee and credit derivatives that takes into account the possibility that the guarantor or the protection seller and the debtor will default at the same time (Double default effect) which is lower than the possibility that either the guarantor or the protection seller or the debtor will default.

Where:

$$K_o = LGD_g \times \left[N\left(\frac{1}{\sqrt{1-R_{os}}} \times G\left(PD_o\right) + \sqrt{\frac{R_{os}}{1-R_{os}}} \times G\left(0.999\right) \right) - PD_o \right]$$

$$\times \left(\frac{1+\left(M-2.5\right) \times b\left(\min\left\{PD_o, PD_g\right\}\right)}{1-1.5 \times b\left(\min\left\{PD_o, PD_g\right\}\right)} \right) \times 1.06$$

Risk-weighted assets (RWA):

$$RWA = K_{DD} \times 12.5 \times EAD_g$$

Where R_{os} = Correlation of the obligors calculated by using the same formula as R, $\mathbf{R_{FI}}$ or R_{SME} in Clause II. 1.1. (1) stated above

PD_o = PD of the obligor

PD_g = PD of the guarantor or the protection seller[16]

LGD_g = LGD comparable to the case where commercial banks have direct exposure to the guarantor or the protection seller; that is LGD for a credit line with no credit risk protection that is given to the guarantor or the protection seller or to the obligor. Which LGD shall be used depends on whether the evidence and the structure of the guarantee or credit derivatives contract indicates that when the obligor and the guarantor or the protection seller default at the same time, the repayment amount recovered depends on financial status of the guarantor or the protection seller or the obligor. Besides, commercial banks are able to use additional collaterals received from the obligor or the guarantor or the protection seller in the estimation of LGD. However, commercial banks shall not consider the result of double recovery[17] in the estimation of LGD.

[16] The definition shall be referred from Notification of the Bank of Thailand Re: Permission of Commercial Banks to Undertake Credit Derivatives Transactions.

[17] Means the case that commercial banks are able to request for compensation or sue for loss payment from both the obligor and the guarantor or the protection seller when both an obligor and a guarantor or a protection seller default.

M = Effective maturity of the guarantee or the credit derivatives (effective maturity of the credit protection), using the same concept and calculation formula as M determined for the case of exposure not in default for commercial banks that do not apply Double Default Method for credit risk mitigation. However, the value of M for calculation of credit risk-weighted assets under Double Default Method shall not be less than 1 year.

$b(min\{PD_o, PD_g\})$ = Maturity adjustment coefficient calculated by using the same formula as b in the aforementioned Clause II. 1.1. (1), but PD shall be substituted with PD of the obligor (PD_o) or PD of the guarantor or the protection seller (PD_g), whichever is lower.

EAD_g = EAD for the part that has credit risk protection

Steps to apply the credit risk-weighted assets calculation formula for exposure not in default in case where commercial banks apply the Double Default Method for credit risk mitigation, only for the part that has credit risk protection, are as follow:

Step 1 Calculate correlation of the obligors (R_{os}) by substituting PD of the obligor (PD_o) calculated according to risk component estimation method specified by the Bank of Thailand in the correlation formula

Step 2 Calculate maturity adjustments (b) by substituting PD with PD of the lower between PD of the obligor (PD_o) and PD of the guarantor or the protection seller (PD_g) calculated according to risk component estimation method specified by the Bank of Thailand, in maturity adjustment formula

Step 3 Calculate capital requirement for the part of exposure that has credit risk protection in case of applying the Double Default Method (K_{DD}) by substituting PD_o, LGD_g, M calculated according to risk component estimation method specified by the Bank of Thailand, R_{os} calculated from Step 1, b calculated from Step 2 in capital requirement formula K_o, then substitute such K_o and PD_g in capital requirement formula K_{DD}

Step 4 Calculate risk weight (RW) by multiplying K_{DD} obtained from Step 3 by 12.5

Step 5 Calculate credit risk-weighted assets (RWA) by multiplying RW obtained from Step 4 by EAD calculated according to risk component estimation methods specified by the Bank of Thailand

Furthermore, in case where there is the difference between maturities (maturity mismatch) between the exposure and the guarantee or credit derivatives (the remaining maturity of a guarantee contract or a credit derivatives is less than remaining maturity of a loan), commercial banks shall refer to the requirements specified in Attachment 8 of the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets of Commercial Banks under Standardised Approach (SA).

1.2 Formula for exposure in default

Capital requirement (K):

$$K = \max[0, LGD - Best\ estimate\ of\ EL]$$

Risk weight (RW):

$$RW = K \times 12.5$$

Risk-weighted assets (RWA):

$$RWA = RW \times EAD$$

Where best estimate of EL = EL **(%)** estimated based on current economic conditions and debt status.

For the calculation of credit risk-weighted assets for exposure in default, commercial banks that adopt the AIRB shall estimate EL based on current economic conditions and debt status and apply their own estimate LGD calculated under minimum requirements specified in Attachment 7 on LGD estimation.

Commercial banks that adopt the FIRB shall set credit risk-weighted assets equal to zero since K is equal to zero[18].

2. Risk-weighted assets calculation for specialised lending

2.1 Commercial banks adopting the FIRB and the AIRB that comply with the relevant minimum requirements can apply the corporate risk weight function under Clause II. 1.1 for

[18] As for commercial banks that adopt the FIRB, the best estimate of EL is equal to LGD.

exposures not in default and under Clause II. 1.2 for exposures in default for each of sub-group of specialised lending.

2.2 Commercial banks adopting the FIRB that do not comply with minimum requirements for PD estimation, or commercial banks adopting the AIRB that do not qualify minimum requirements for PD, LGD, and EAD estimations specified in Attachment 7 on determination of risk components shall apply Supervisory Slotting Criteria Method, as follows:

2.2.1 Map internal rating of commercial bank's specialised lending to 5 rating categories specified by the Bank of Thailand by referring to the requirements in Attachment 1.1. Afterward, multiplying risk weight for UL that is appropriate for each rating (in the table below) by EAD to derive credit risk-weighted assets for specialised lending.

Risk weights for UL for 4 types of specialised lending are as follow

Strong	Good	Satisfactory	Weak	Default
70% (50%)	90% (70%)	115%	250%	0%

2.2.2 If specialised lending is categorised as "Strong" or "Good" and complies with one of the following conditions:

(1) The loan has remaining maturity of less than 2.5 years.

(2) Commercial banks are able to prove that their credit underwriting standards and practices and other risk characteristics of specialised lending are better than those specified by the Bank of Thailand in Attachment 1.1.

Commercial banks can apply lower risk weight for UL, that is, 50% for "Strong" rating and 70% for "Good" rating as specified in parentheses of the above table.

2.2.3 When mapping internal ratings of specialised lending to rating specified by the Bank of Thailand, commercial banks may refer to the following table, for which the Bank of Thailand maps 5 rating categories of the Bank of Thailand with ratings of **external credit assessment institutions (ECAIs)**[19] as follow:

[19] Ratings illustrated in this table is property of Standard & Poor's, which is used as an example only. Commercial banks may use ratings of any other ECAIs recognised and approved by the Bank of Thailand including rating mapping to those of ECAIs as specified in Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

Strong	Good	Satisfactory	Weak	Default
BBB- or above	BB+ or BB	BB- or B+	B to C-	-

III. Estimation of Risk Components

When calculating credit risk-weighted assets for sovereign, bank, and corporate exposure, commercial banks that adopt the FIRB shall estimate only PD. For LGD, EAD, and M, commercial banks shall use the value specified by the Bank of Thailand. Whereas, commercial banks that adopt the AIRB shall estimate their own PD, LGD, EAD, and M in order to substitute in the formula for calculating credit risk-weighted assets. However, the values of risk components that commercial banks use to substitute in the formula shall be in accordance with the following requirements specified by the Bank of Thailand.

1. Probability of default (PD)

For both cases of adopting the FIRB and the AIRB:

Commercial banks are able to use various methods to estimate PD, for example, internal default experience of commercial banks, mapping internal ratings to ratings of ECAIs, etc. In this regard, commercial banks shall comply with the following requirements.

1.1 Commercial banks shall estimate PD for one-year period ahead for each rating of obligors. This PD estimation shall comply with minimum requirements specified by the Bank of Thailand in Attachment 7 on PD estimation.

1.2 One-year PD of corporate and bank exposures derived from internal rating shall not be lower than 0.03 percent, while PD of sovereign exposure may be lower than 0.03 percent.

1.3 Bank exposure categorised in default rating shall have characteristics that is in accordance with default definition specified by the Bank of Thailand in Attachment 7 on minimum requirements regarding default definition. PD of exposures in default shall be equal to 1.

1.4 For the case of having a guarantee and credit derivatives and commercial banks choose to consider effects of having guarantees or using credit derivatives for PD adjustment, commercial banks shall refer to requirements under Clause III. 2.2 Guarantee and credit derivatives.

2. Loss given default (LGD)

Derivation of LGD is based on key factors that help mitigate losses from commercial bank's lending in case where the obligor defaults including collateral, and guarantee and credit derivatives as follow:

2.1 Collateral

In case of adopting the FIRB

Commercial banks shall comply with the following requirement.

2.1.1 In case where commercial banks are creditors with subordinated claim

LGD of 75 percent shall be assigned to both secured and unsecured exposure.

2.1.2 In case where commercial banks are creditors with senior claim

(1) For unsecured claim

LGD of 45 percent shall be assigned.

(2) For secured claim

(2.1) Types of collateral recognised by the Bank of Thailand as credit risk mitigation for commercial banks that adopt the FIRB are as follows:

(2.1.1) Eligible financial collateral as specified in Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA). However, commercial banks shall calculate collateral haircut by using the Comprehensive Approach, including the case of repo-style transaction[20] where the counterparty is a core market participant that is exempted from collateral haircut as specified in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

(2.1.2) Receivables[21]

[20] Repo-style transactions comprise the following transactions: repurchase transaction, reverse repurchase transaction, and securities borrowing and securities lending.

[21] Commercial banks shall refer to the definition of receivables eligible as collateral in Attachment 7.

(2.1.3) Commercial real estate (CRE) and residential real estate (RRE) that meets the 2 following criteria:

a. Repayment capability of the obligor does not significantly depend on the performance of the real estate or project used as collateral but depends on cash flows from other sources, that is, the debt repayment ability does not depend on cash flows received from the CRE or RRE used as collateral.

b. The value of collateral pledged shall not depend on the performance of the obligor.

Therefore, income producing real estate (IPRE) categorised as specialised lending, which does not meet the aforementioned conditions is not recognised as collateral for credit risk mitigation.

(2.1.4) Other types of collateral that meet 2 conditions are as follow:

a. There exists liquid market that allows efficient trading of such collateral.

b. There exists market price to ensure that the collateral value used by commercial banks is not significantly different from the market value.

Currently, collateral recognised by the Bank of Thailand as other types of collaterals are automobiles, motorcycles, ships / fleets, aircrafts, and agricultural commodities traded in the Agricultural Commodity Future Exchange of Thailand (AFET).

(2.2) LGD for secured portion of senior exposure

Commercial banks that adopt the FIRB shall apply LGD for secured portion of senior exposures as summarised in table below.

Table: LGD for secured portion of senior exposure

Type of collateral	Minimum LGD	C*	C**
Eligible financial collateral	0%	0%	n.a.
Receivables	35%	0%	125%
CRE / RRE	35%	30%	140%
Other collaterals	40%	30%	140%

Notes: C* means the minimum ratio of current value of collateral (C) to current value of exposure (E), for the exposure to be recognised as collateralised

C** means the minimum ratio of current value of collateral (C) to current value of exposure (E), for the exposure to be recognised as fully collateralised and is allowed to use LGD in the table

(2.3) Requirements on applying collateral for credit risk mitigation[22]

(2.3.1) In case of having 1 type of collateral

a. If the a ratio of current value of collateral (C) to current value of exposure (E) is below C* or C/E < C*

The exposure is treated as uncollateralised, that is, commercial banks shall apply LGD equal to 45 percent.

b. If the ratio of current value of collateral (C) to current value of exposure (E) is above C** or C/E $\geq$ C**

The exposure is treated as fully collateralised, that is, commercial banks shall apply minimum LGD for each type of collateral as specified under Clause III. 2.1.2.

c. If the ratio of current value of collateral (C) to current value of exposure (E) is greater than or equal to C* but less than C** or C* $\leq$ C/E $\leq$ C**

The exposure is treated as partially collateralised. Commercial banks shall divide such exposure into two portions which are collateralised portion and uncollateralised portion. The collateralised portion is equal to C/C** and commercial banks shall apply minimum LGD for each type of collateral as specified under Clause III. 2.1.2 (2.2) stated above. For uncollateralised portion, commercial banks shall apply LGD equal to 45 percent.

(2.3.2) In case of having many types of collaterals

In case where commercial banks have many types of collateral, commercial banks shall subdivide the exposure of each obligor by collateral type, each shall have different LGD, by using the following methods:

[22] Commercial banks shall refer to the guideline on collateral valuation as specified in Notification of the Bank of Thailand Re: Regulation on Valuation of Collaterals and Foreclosed Immovable Properties Obtained as Debt Repayment of Commercial Banks.

a. Calculate the collateralised portion of the exposure by subtracting current value of exposure (E) by exposure not collateralised by eligible financial collateral after haircut under the comprehensive approach (E*) as specified in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA)[23]. This part of exposure shall apply LGD of 0 percent.

b. Calculate the exposure collateralised by receivables by dividing the current value of collateral by 125 percent. This part of exposure shall apply LGD of 35 percent.

c. If the ratio of the sum of value of CRE or RRE and other collaterals to the remaining exposure after deducting eligible financial collateral after haircut and receivables (if any) is less than C* (30 percent), LGD for such remaining exposure shall equal to 45 percent since such exposure is considered as the uncollateralised portion.

d. If the aforementioned ratio is greater than C* (30 percent) but less than C** (140 percent), the exposure collateralised by **CRE or RRE** and other collaterals shall be calculated by dividing value of each type of collaterals by 140 percent. The portion of exposure collateralised by **CRE or RRE** shall have LGD equal to 35 percent, while the portion of exposure collateralised by other types of collaterals shall have LGD equal to 40 percent. The remaining exposure shall have LGD equal to 45 percent.

(2.3.3) In case of repo-style transactions

For the calculation of credit risk-weighted assets for repo-style transactions, commercial banks using the FIRB may choose to recognise or not recognise effect of netting under master netting agreement[24]. In case where commercial banks choose to recognise effect of netting under master netting agreement, commercial banks shall also be able to comply with the conditions or requirements prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) for repo-style transactions under master netting agreement. Commercial banks shall calculate E* (value of exposure after risk mitigation) as prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised

[23] In order to calculate E* under the comprehensive approach, commercial banks shall define E equals to EAD.

[24] In this Notification, master netting agreement for repo-style transactions means netting agreement that meet conditions prescribed in Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA)

Approach (SA) in order use such value as EAD and shall use LGD equal to the case that an obligor does not have collateral for such EAD.

In case of adopting the AIRB

2.1.1 Commercial banks shall use their own estimate of LGD. Such LGD shall comply with the minimum requirements prescribed in Attachment 7. The loss value used in LGD estimation must be economic loss that already takes into account the following factors:

(1) The difference between EAD and net present value of expected cash flows discounted by an appropriate discount rate

(2) Direct and indirect costs associated with debt collection, including period of debt collection

For appropriate recovery rate, commercial banks shall also take into account factors on collaterals and terms and conditions of credit agreement.

2.1.2 For the calculation of credit risk-weighted assets for repo-style transaction, commercial banks using the AIRB may choose to recognise or not recognise effects of netting under master netting agreement. In case where commercial banks choose to recognise effect of master netting agreement, commercial banks shall also be able to comply with the requirements prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA). Commercial banks shall calculate E* (value of exposure after risk mitigation) as prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) in order use such value as EAD and shall use LGD equal to the case that an obligor does not have collateral for such EAD.

2.2 Guarantees and credit derivatives[25]

2.2.1 In case where commercial banks do not apply the Double Default Method for credit risk mitigation

In case of adopting the FIRB

[25] Currently, the Bank of Thailand does not allow commercial banks to recognise effects of imperfect default correlation between the debtor and the guarantor or the protection seller, in the design and development of internal rating system or in the designation of rating grades. Thus, PD or LGD adjustment due to guarantee or the use of credit derivatives shall also not recognise effect of double default. However, commercial banks are allowed to recognise effect of double default in the calculation of credit risk-weighted assets according to regulation and methodology prescribed by the Bank of Thailand.

(1) Guarantors and protection sellers that the Bank of Thailand permit commercial banks to use in credit risk mitigation under the FIRB shall be guarantors and protection sellers that are recognised by the Bank of Thailand under Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) or corporate with internal rating that has PD **below the debtor's PD**. In this regard, commercial banks shall comply with the requirements on credit risk mitigation by guarantees and credit derivatives prescribed in Attachment 7 of the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) under the sections on minimum operational requirements, types of credit derivatives eligible for credit risk mitigation, credit risk netting of credit risk of the underlying assets under the credit derivatives contracts, partially risk transfer, currency mismatch, maturity mismatch, and government guarantee and counter-guarantees.

(2) For exposure with guarantees or credit derivatives

(2.1) Commercial banks shall use the risk weight function appropriate to the type of guarantor or protection seller and substitute the PD of the obligor by the PD of the guarantor or the protection seller derived from internal rating, a PD between those of the obligor and the guarantor or the protection seller, if commercial banks deem that full substitution of PD of the obligor by PD of the guarantor or the protection seller is inappropriate. LGD shall be set at 45 percent in case where commercial banks are senior creditors and LGD shall be set at 75 percent in case where commercial banks are subordinate creditors.

(2.2) For credit derivatives recognised in credit risk mitigation, commercial banks shall comply with the following guideline.

(2.2.1) Credit default swaps (CDS): commercial banks are CDS buyers

Commercial banks shall calculate credit risk-weighted asset of the protected assets, by substituting the PD of the protected asset by the PD of the CDS sellers or using a PD that has value between those of the protected assets and the CDS sellers.

(2.2.2) Credit linked note (CLN): commercial banks are CLN sellers

Commercial banks shall calculate credit risk-weighted asset of the protected asset by treating such protected asset as a cash-collateralised transaction.

The cash-collateralised portion equals to cash received from borrowing or from notes issued for CLN.

(2.3) For first to default product: commercial banks are first to default swaps buyers or first to default CLN sellers

(2.3.1) In case where commercial banks are first to default swaps buyers

Commercial banks shall calculate credit risk-weighted asset of the protected asset by substituting the PD of the asset with lowest risk-weighted asset in the pool of underlying assets by the PD of the first to default swaps seller or a PD between those of the protected asset and the first to default swaps seller.

(2.3.2) In case where commercial banks are first to default CLN sellers

Commercial banks that have received cash as collateral in full since the first date of the borrowing contract or the note issuance, shall calculate risk-weighted asset of the lowest risk-weighted by treating such asset as cash-collateralised.

In the calculation of credit risk-weighted assets for other protected assets included in the pool of underlying assets of first to default products, the risk weights of such assets shall be used as before.

(2.4) Proportionate CLN and proportionate CDS: commercial banks are proportionate CDS buyers or proportionate CLN sellers

(2.4.1) In case where commercial banks are proportionate CDS buyers

Commercial banks shall calculate risk-weighted assets of the protected asset by substituting the PD of each protected asset in pool of underlying assets in proportion to the amount of credit protection specified in the credit protection agreement by the PD of the seller of the proportionate CDS or a PD that has value between those of the protected assets and the proportionate CDS seller.

(2.4.2) In case where commercial banks are proportionate CLN sellers

Commercial banks shall mitigate credit risk of each asset in the pool in proportion to the amount of credit protection specified in the credit protection

agreement by calculating risk weighted assets as cash-collateralised transaction, only when the portion is collateralised by cash from borrowing or issuing notes.

(2.5) Total rate of return swaps (TRORS): commercial banks are TRORS buyers

Commercial banks shall calculate credit risk-weighted assets of the protected asset by substituting the PD of the protected asset by the PD of the TRORS seller or a PD that has value between those of the protected asset and the TRORS seller.

(3) Commercial banks may replace the LGD of the underlying transaction with the LGD applicable to the guarantee taking into account seniority and any collateralisation[26] of a guaranteed commitment.

(4) For the remaining unprotected portion of exposure that has no guarantee and no credit derivatives, commercial banks shall use the risk weight function associated with the obligor and still use the PD of the obligor in such formula.

(5) Where partial coverage exists (partial guarantee), or where there is currency mismatch between exposure of the obligor and the guarantee or credit derivatives, commercial banks shall separate protected exposure from unprotected exposure and calculate credit risk-weighted assets by referring to the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) under relevant sections.

In case of adopting the AIRB

(1) Commercial banks may recognise effect of guarantees or credit derivatives by adjusting PD or LGD estimates. Whichever adjustment is applied, commercial banks shall consistently apply such adjustment in a consistent manner for all transactions in the same type of guarantees or credit derivatives.

(2) In case where commercial banks make the adjustment to PD, commercial banks shall comply with the same guideline on credit risk mitigation in case of guarantees or credit derivatives as prescribed in case of adopting FIRB above.

(3) Whether commercial banks recognise effect of guarantees or credit derivatives to PD or LGD, the Bank of Thailand does not limit range of eligible guarantors or

[26] Such collateral must be an eligible collateral that the Bank of Thailand permits commercial banks to use under the FIRB.

protection sellers. However, such guarantee and credit derivatives must meet minimum requirements prescribed in Attachment 7.

2.2.2 In case where commercial banks apply the Double Default Method for credit risk mitigation

Commercial banks that apply the IRB may choose to apply the Double Default Method for the calculation of credit risk-weighted assets for exposures, both in banking book and trading book, with credit risk protection (hedged exposure), where commercial banks shall apply the same method in a consistent manner for all transactions in the same type of guarantee or credit derivatives. However, commercial banks shall obtain an approval from the Bank of Thailand and shall comply with the regulations specified in Clause III. 2.2.1 as well as the regulations specifically prescribed for commercial banks that apply the Double Default Method which cover the following 4 areas[27].

(1) Guarantors or protection sellers

The guarantor or the protection seller shall be a financial firm[28], namely financial institution[29], securities company, investment banking, or insurance company (such insurance company shall undertake credit risk protection business by providing guarantees or credit derivatives, including insurance company that undertakes mono-line[30], re-insurer[31], and non-sovereign credit export agency[32] businesses) that meet all qualifications stated below:

– It shall be regulated by an agency[33] or shall receive the equivalent of rating grade 3 or above[34] (investment grade) from eligible ECAIs approved by the Bank of Thailand.

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[27] If related to credit derivatives, commercial banks shall also comply with the regulations prescribed in Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

[28] Financial firm that is a protection seller shall meet the qualifications prescribed by the Bank of Thailand in the Notification of the Bank of Thailand Re: Permission for Commercial Banks to Undertake Credit Derivatives.

[29] Refer to definition prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA)

[30] Means insurance companies that receive only one specific license on the undertaking of insurance business. In this Notification, this means financial guarantee insurance.

[31] Means insurance companies that undertakes reinsurance business.

[32] Means institutions or companies that undertakes export insurance which covers credit risk protection by providing guarantees or credit derivatives that does not receive any benefits from indirect guarantee from government in form of counter-guarantee.

[33] **Agencies in Thailand mean the Ministry of Finance, the Bank of Thailand, Securities and Exchange Commission (SEC) and Office of Insurance Commission (OIC). Agencies in other countries means agencies with the same authority and duty as the agencies in Thailand mentioned above, or as deemed appropriate by the Bank of Thailand or proved by commercial banks.**

[34] Commercial banks shall map ratings of ECAIs recognised by the Bank of Thailand under the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

– It shall have an internal rating with PD equivalent to PD of rating grade 2 or above[34] by ECAIs recognised by the Bank of Thailand as at the initial date where credit risk protection agreement is made or shall use to receive internal rating with aforementioned PD value afterwards.

– It shall have an internal rating with PD equivalent to PD of rating grade 3 or above[34] (investment grade) by ECAIs recognised by the Bank of Thailand.

(2) Obligor

Types of obligors that meet the criteria to apply the Double Default Method are as follow:

– Bank exposures in Clause I. 2 only for provincial organizations, local government organisations, state agencies and state enterprises (PSEs) risk weighted in the same manner as bank exposure.

– Corporate exposures in Clause I. 3, excluding specialised lending where credit risk-weighted assets are calculated using the Supervisory Slotting Criteria Approach.

– Credits granted to small size businesses classified as retail exposures under the category of other retail exposure in Clause I. 3.3 of Attachment 2.

The following obligors shall be excluded:

– Financial firms eligible as guarantors or a protection seller under the Double Default Approach.

– Companies within the same group (members of the same group)[35] as guarantors or protection sellers.

(3) Type of guarantees or credit derivatives used for credit risk protection (form of protection)

Forms of protection[36] eligible for recognition of double default effect are as follow:

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[35] Companies in the same group means group of companies that have relationship as “parent company” and “subsidiary company” according to the Financial Institution Business Act B.E. 2551.

[36] However, the forms of credit derivatives shall not contradict to types of credit derivatives that the Bank of Thailand permits commercial banks to undertake as prescribed in Notification of the Bank of Thailand Re: Permission of Commercial Banks to Undertake Credit Derivatives Transactions and

– Unfunded credit derivatives[37] that have only one reference entity[16] (single-name unfunded credit derivatives) such as credit default swaps.

– Guarantees that protect risk for only one asset (single-name guarantee).

– First to default transaction such as first to default swaps, where commercial banks are permitted to apply the Double Default Method to the asset that has lowest risk-weighted assets in the pool of underlying obligation[16].

(4) Other regulations on the use of the Double Default Method

Guarantees and credit derivatives shall meet the minimum requirements and the regulations prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) and the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Internal Rating-Based Approach (IRB), and shall meet other operational minimum requirements, as follows:

– When there is an event that requires the guarantor to pay debt for the obligor or credit event[16], commercial banks shall have rights and expectation to receive compensation from the guarantor or the protection seller under physical settlement and / or cash settlement without taking legal action for such compensation. Besides, commercial banks shall have procedures to ensure that the guarantor or the protection seller agrees to compensate commercial banks immediately after default of the obligor and shall be able to prepare evidence document which illustrates such procedures to financial institution examiners when requested.

– Guarantees or credit derivatives shall absorb all credit losses due to event that requires the guarantor to pay debt for the obligor or credit event outlined in the contract, incurred on the credit risk protected exposure.

– In case where payout structure prescribes that the payment or delivery shall be in form of physical settlement, commercial banks shall ensure that the delivery of deliverable obligation[16] can be legally made. If commercial banks intend to deliver other types of obligation other than the asset under guarantee or the underlying

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to types of credit derivatives that are eligible for credit risk mitigation according to Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

[37] Means credit derivatives that a protection seller does not pledge cash for settlement value according to credit derivatives agreement to a protection buyer on agreement date.

obligation, commercial banks shall ensure that the deliverable obligation is sufficiently liquid so that commercial banks would have the ability to purchase it for delivery in accordance with the contract.

– Terms and conditions of guarantee or credit derivatives shall legally binding and shall be confirmed in writing by the guarantor or the protection seller and commercial banks.

– Correlation coefficient between credit quality or ability to repay debt (creditworthiness) of the guarantor or the protection seller and the obligor (or the protected asset or the underlying obligation) shall not be too high (excessive correlation), where the high correlation between the performance of the obligor and the guarantor or the protection seller results from their dependence on common factors other than the **systematic risk factor**[38]. Commercial banks shall have procedure to detect excessive correlation and be able to prepare evidence document illustrating such procedures to examiners when requested.

3. Exposure at default (EAD)

EAD shall be measured by considering factors that affect outstanding amount of exposure to commercial banks when an obligor defaults. Measurement of EAD is divided into 3 methods based on types of transaction, as follows:

3.1 EAD for on-balance sheet item

Both the cases of adopting the FIRB and the AIRB:

EAD for on-balance sheet items shall equal to gross exposure including accrued interests outstanding on the balance sheet before deducting specific provisions and partial write-offs[39,40]

Commercial banks may recognise on balance sheet netting between assets (loans) and liabilities (deposits) of the same counterparty. As a result, EAD will decrease since effect of credit risk mitigation is already taken into account. But if currency mismatch or maturity mismatch of on-balance sheet netting exists, commercial banks shall also comply

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[38] **means a systematic risk factor that affects debt repayment ability of obligors within the system.**

[39] For example, if commercial banks have an exposure of 100 Baht with 30 Baht already partially partial written-off, commercial banks shall use EAD = 100 + 30 = 130 Baht as commercial banks can use partial write-off to compared with the EL. However, in case where commercial banks have fully written off the exposure, commercial banks no longer have to calculate EAD.

[40] In calculation of EAD for exposures arising from leasing arrangements, commercial banks shall refer to Attachment 7 regarding requirements for leasing business.

with related requirements. On-balance sheet netting shall be in accordance with the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA)

3.2 EAD for off-balance sheet items

3.2.1 In case of off-balance sheet items which are non-OTC derivatives

EAD for off-balance sheet item which are non-OTC derivatives shall equal to credit equivalent amount of exposure before deducting specific provision and partial write-off calculated by multiplying the value of off-balance sheet item (notional amount) by credit conversion factor (CCF). For unused credit line, commercial banks shall multiply such unused amount by a CCF according to the following formula.

EAD = Notional amount of off-balance sheet item x CCF

The calculation of CCF is divided into 2 cases, as follows:

In case of adopting the FIRB

(1) Commercial banks shall apply CCFs to all off-balance sheet items as prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA), with exception of unused credit lines.

(2) For all types of unused committed credit lines[41], commercial banks shall apply a CCF of 75 percent regardless of maturity of such credit lines, different from what prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) that takes into account maturity as well.

Nevertheless, where commercial banks are able to specify that the unused committed credit line is a credit line for an off-balance sheet item of which CCF is lower than 75 percent, commercial banks may apply the CCF that is lower than 75 percent to such unused committed credit line.

[41] Including note issuance facilities (NIFs) and revolving underwriting facilities (RUFs) which are credit lines that commercial banks gives to an issuer (mostly short-term to medium-term securities in Eurocurrency markets) with an agreement that if the issuer is not able to sell such securities at market yield, commercial banks will purchase that securities at a specified yield or grant credits by purchasing other short term securities and the issuer will pay fee as agreed with commercial banks.

(3) For unused credit lines which commercial banks can cancel unconditionally (uncommitted lines or unconditionally cancellable commitment)[42] or can cancel immediately without prior notice to an obligor, commercial banks may apply a CCF of 0 percent. However, commercial banks shall demonstrate that there exists an internal control system capable of monitoring deterioration in creditworthiness of an obligor in a timely manner.

(4) For the calculation of EAD of unused credit line, commercial banks may multiply a CCF by the lower between value of (1) unused committed credit line and (2) remaining credit line available to be drawn by an obligor, which reflects conditions additional specified by commercial banks to limit credit line of an obligor, e.g. commercial banks set a ceiling on possible credit granting amount to be dependent on cash flows of an obligor, and etc. However, commercial banks shall be able to demonstrate that commercial banks have sufficient management and monitoring procedures to support credit line measurement in case (2). If commercial banks are not able to measure unused committed credit lines in case (2), commercial banks shall use the value of unused committed line in case (1) only.

In case of adopting the AIRB

Commercial banks shall use their own estimates of CCF across different off-balance sheet item types, except off-balance sheet items subject to a CCF of 100 percent as prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA), which commercial banks that apply the AIRB shall also apply CCF of 100 percent. In order to use their own estimates of CCF, commercial banks shall meet the minimum requirement prescribed by the Bank of Thailand in Attachment 7 regarding estimation of EAD.

3.2.2 In case of OTC derivatives

Commercial banks adopting the FIRB and the AIRB shall refer to the calculation of **credit risk-weighted assets** for OTC derivatives as prescribed in **the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets of Counterparties for Derivatives.**

4. Effective Maturity (M)

[42] In a credit line agreement, there must be a provision that gives commercial banks the rights to cancel the credit lines immediately and unconditionally, at any time. Where "event of default" or "material adverse change clause" is specified as a condition to cancel the agreement, it shall not limit the rights of the commercial banks to cancel the credit lines only in the case where debtor credit quality deteriorates or in a particular case.

In case of adopting the FIRB:

Commercial banks shall set M or effective maturity of all types of credit lines equal to 2.5 years except for repo-style transactions where effective maturity may be set at 6 months (or 0.5 years).

In case of adopting the AIRB:

4.1 Commercial banks shall calculate M by determining the weighted-average remaining time period where payments due to be received weighted by cash flows received in each period payable contractually according to the contract, as shown in the following formula:

$$M = \frac{\sum_t t \times CF_t}{\sum_t CF_t}$$

Where M = Effective maturity (year)

CF_t = Contractual cash flows (including principal, interest, and fees) contractually payable by the obligor at each period t

t = Time period (year)

Σ = Summation

4.2 In case where commercial banks are not able to calculate M of each contract as set in the above formula, commercial banks may use a more prudent approach for the calculation, that is, using maximum remaining time that commercial banks permit the obligor to fully discharge the contractual obligation (principal, interest, and fees), which is normally equal to remaining nominal maturity of the instrument.

4.3 For derivatives that commercial banks choose to recognise effects of netting under a master netting agreement[43] for calculation of credit risk-weighted assets, commercial banks shall use weighted average M by weighting M of each derivative contract calculated from above the formula by notional amount of each transaction.

[43] Master netting agreements for OTC derivatives under this Notification means eligible netting agreement as prescribed in **the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets of Counterparties for Derivatives.**

4.4 M shall not be less than 1 year and not greater than 5 years, except for short-term transactions that have original maturity of less than 1 year. For short-term transactions, commercial banks may use M of lower than 1 year but shall not be less than 1 day as prescribed by the Bank of Thailand, as follows:

4.4.1 OTC derivatives transactions in which the contract require daily remargining and revaluation including provisions that allow commercial banks to promptly liquidate or setoff collaterals in the event of default or failure to remargin.

4.4.2 Repo-style transactions

4.4.3 Short-term loans and deposits

4.4.4 Short-term self liquidating trade transactions such as import and export letters of credit

4.4.5 Exposures arising from settling securities purchased and sales, including overdrafts for the continuation of transaction arising from failed securities settlements provided that such overdrafts must have fixed number of business days of lending.

4.4.6 Exposures arising from cash settlements via wire transfer system, including overdrafts for the continuation of transaction arising from failed securities settlements provided that such overdrafts must have fixed number of business days of lending and are not on-going lending.

4.4.7 Exposures arising from unsettled foreign exchange transactions.

4.5 For overdrafts which commercial banks are not able to calculate cash flows or t in M measurement formula, the Bank of Thailand permits commercial banks to use M equals to commercial banks' credit line review frequency, provided that M shall not be less than 1 year.

4.6 For OTC derivatives and repo-style transactions in the aforementioned Clause III. 4.4.1 and Clause III. 4.4.2 that commercial banks choose to recognise effects of netting under a master netting agreement in the calculation of credit risk-weighted assets, commercial banks shall calculate weighted average maturity (M) by using notional amount of each of transaction for weighting M of each transaction. Such weighted average maturity shall not be less than minimum holding period prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

4.7 Where there is more than one transaction type contained in a master netting agreement, the floor of average maturity shall be equal to the minimum holding period of the transaction type with the highest minimum holding period[44].

For the case of maturity mismatch

Maturity mismatch occurs when residual maturity of credit risk mitigations recognised by the Bank of Thailand is less than that of net exposure. On this, commercial banks shall apply the regulations prescribed in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

[44] Currently, the Bank of Thailand does not permit commercial banks to recognise cross-product netting in the calculation of risk-weighted assets.

Attachment 1.1

Table of Supervisory slotting criteria for specialised lending

Table 1: Supervisory rating grade project finance exposures

	Strong	Good	Satisfactory	Weak
Financial Strength 1) Market condition	Few competing suppliers or substantial and durable advantage in location, cost, or technology. Demand is strong and growing	Few competing suppliers or better than average location, cost, or technology but this situation may not last. Demand is strong and stable	Project has no advantage in location, cost, or technology. Demand is adequate and stable	Project has worse than average location, cost, or technology. Demand is weak and declining
2) Financial ratios (e.g. debt service coverage ratio (DSCR), loan life coverage ratio[1] (LLCR), and debt to equity ratio (D/E ratio))	Strong financial ratios considering the level of project risk; very robust economic assumptions	Strong to acceptable financial ratios considering the level of project risk; robust project economic assumptions	Standard financial ratios considering the level of project risk	Aggressive financial ratios considering the level of project risk
3) Stress analysis	The project can meet its financial obligations under	The project can meet its financial obligations under	The project is vulnerable to stresses that are not	The project is likely to default even though

[1] LLCR = Present value of project cash flows available for debt repayment over the life of loan / total debt.

	Strong	Good	Satisfactory	Weak
	sustained, severely stressed economic or sectoral conditions	normal stressed economic or sectoral conditions. The project is only likely to default under severe economic conditions	uncommon through an economic cycle, and may default in a normal downturn	economic conditions improve soon
4) Financial structure 4.1 Duration of the credit compared to the duration of the project 4.2 Debt repayment schedule	Useful life of the project significantly exceeds tenor of the loan Amortising debt	Useful life of the project exceeds tenor of the loan Amortising debt	Useful life of the project exceeds tenor of the loan Amortising debt with limited bullet payment	Useful life of the project may not exceed tenor of the loan Bullet repayment or amortising debt repayments with high bullet repayment
Political and legal environment 1) Political risk, including transfer risk, considering project type and mitigants	Very low exposure; strong mitigation instruments, if needed	Low exposure; satisfactory mitigation instruments, if needed	Moderate exposure; fair mitigation instruments	High exposure; no or weak mitigation instruments
2) Force majeure risk (war, civil unrest, etc),	Low exposure	Acceptable exposure	Standard protection	Significant risks, not fully mitigated
3) Government support and project's importance for the country over the	Project of strategic importance for the country (e.g. export-	Project considered important for the country. Good level of support	Project may not be strategic but brings unquestionable benefits	Project not key to the country. No or weak support from Government

	Strong	Good	Satisfactory	Weak
long term	oriented). Strong support from Government	from Government	for the country. Support from Government may not be explicit	
4) Stability of legal and regulatory environment (risk of change in law)	Favourable and stable regulatory environment over the long term	Favourable and stable regulatory environment over the medium term	Regulatory changes can be predicted with a fair level of certainty	Current or future regulatory issues may affect the project
5) Acquisition of all necessary supports and approvals for such relief from local content laws	Strong	Satisfactory	Fair	Weak
6) Enforceability of contracts, collateral and security	Contracts, collateral and security are enforceable	Contracts, collateral and security are enforceable	Contracts, collateral and security are considered enforceable even if certain non-key issues may exist	There are unresolved key issues in respect if actual enforcement of contracts, collateral and security
Transaction characteristics 1) Design and technology risk	Fully proven technology and design	Fully proven technology and design	Proven technology and design — start-up issues are mitigated by a strong completion package	Unproven technology and design; technology issues exist and/or complex design
2) Construction risk 2.1 Permission request	All necessary permits have been approved.	Some permit requests are still unapproved but their	Some permits are still outstanding but the	Key permits still need to be obtained and are not

	Strong	Good	Satisfactory	Weak
		receipts are considered very likely.	permitting process is well defined and they are considered routine.	considered routine. Significant conditions may be attached
2.2 Type of construction contract	Fixed-price date-certain turnkey construction EPC (engineering and procurement contract)	Fixed-price date-certain turnkey construction EPC	Fixed-price date-certain turnkey construction contract with one or several contractors	No or partial fixed-price turnkey contract and/or interfacing issues with multiple contractors
2.3 Completion guarantees	Substantial liquidated damages supported by financial substance and/or strong completion guarantee from sponsors with excellent financial standing	Significant liquidated damages supported by financial substance and/or completion guarantee from sponsors with good financial standing	Adequate liquidated damages supported by financial substance and/or completion guarantee from sponsors with good financial standing	Inadequate liquidated damages or not supported by financial substance or weak completion guarantees
2.4 Track record and financial strength of contractor in constructing similar projects	Strong	Good	Satisfactory	Weak

	Strong	Good	Satisfactory	Weak
3) Operating risk				
3.1 Scope and nature of operation and maintenance (O&M) contract	Strong long-term O&M contract, preferably with contractual performance incentives, and/or O&M reserve accounts	Long-term O&M contract, and/or O&M reserve accounts	Limited O&M contract or O&M reserve account	No O&M contract: risk of high operational cost overruns beyond acceptable level
3.2 Limited/weak, or local operator dependent on local authorities	Very strong, or committed technical assistance of the sponsors	Good	Acceptable	Limited/weak, or local operator dependent on local authorities
4) Off-take risk				
4.1 If there is a take-or-pay or fixed-price off-take contract:	Excellent creditworthiness of off-taker; strong termination clauses; tenor of contract comfortably exceeds the maturity of the debt	Good creditworthiness of off-taker; strong termination clauses; tenor of contract exceeds the maturity of the debt	Acceptable financial standing of off-taker; normal termination clauses; tenor of contract generally matches the maturity of the debt	Weak off-taker; weak termination clauses; tenor of contract does not exceed the maturity of the debt
4.2 If there is no take-or-pay or fixed-price off-take contract:	Project produces essential services or a commodity sold widely on a world market; output can readily be absorbed at projected	Project produces essential services or a commodity sold widely on a regional market that will absorb it at projected prices at	Commodity is sold on a limited market that may absorb it only at lower than projected prices	Project output is demanded by only one or a few buyers or is not generally sold on an organised market

	Strong	Good	Satisfactory	Weak
	prices even at lower than historic market growth rates	historical growth rates		
5) Supply risk 5.1 Price, volume and transportation risk of feed-stocks; supplier's track record and financial strength	Long-term supply contract with supplier of excellent financial standing	Long-term supply contract with supplier of good financial standing	Long-term supply contract with supplier of good financial standing — a degree of price risk may remain	Short-term supply contract or long-term supply contract with financially weak supplier — a degree of price risk definitely remains
5.2 Reserve risks (e.g. natural resource development)	Independently audited, proven and developed reserves well in excess of requirements over lifetime of the project	Independently audited, proven and developed reserves in excess of requirements over lifetime of the project	Proven reserves can supply the project adequately through the maturity of the debt	Project relies to some extent on potential and undeveloped reserves
Strength of sponsor 1) Sponsor's track record, financial strength, and country/sector experience	Sponsor has excellent track record and excellent financial status.	Sponsor has satisfactory track record and good financial status.	Sponsor has adequate track record and good financial status.	Sponsor has no track record or unreliable track record and/or weak financial status.
2) Sponsor support, as evidenced by equity, ownership clause and incentive to inject	Strong. Project is highly strategic for the sponsor (core business — long-term strategy)	Good. Project is strategic for the sponsor (core business — long-term strategy)	Acceptable. Project is considered important for the sponsor (core business)	Limited. Project is not key to sponsor's long-term strategy or core business

	Strong	Good	Satisfactory	Weak
additional cash if necessary				
Collateral 1) Assignment of contracts and accounts	Fully comprehensive	Comprehensive	Acceptable	Weak
2) Pledge of assets, taking into account quality, value and liquidity of assets	First perfected security interest in all project assets, contracts, permits and accounts necessary to run the project	Perfected security interest in all project assets, contracts, permits and accounts necessary to run the project	Acceptable security interest in all project assets, contracts, permits and accounts necessary to run the project	Little security or collateral for lenders; weak negative pledge clause
3) Lender's control over cash flow (e.g. cash sweeps, independent escrow accounts)	Strong	Satisfactory	Fair	Weak
4) Strength of the covenant package (mandatory prepayments, payment deferrals, payment cascade, dividend restrictions and etc.)	Covenant package is strong for this type of project. Project may issue no additional debt.	Covenant package is satisfactory for this type of project Project may issue extremely limited additional debt	Covenant package is fair for this type of project Project may issue limited additional debt	Covenant package is insufficient for this type of project Project may issue unlimited additional debt
5) Reserve funds (debt service, operation and maintenance (O&M),	Longer than average coverage period, all reserve funds fully funded	Average coverage period, all reserve funds fully funded	Average coverage period, all reserve funds fully funded	Shorter than average coverage period, reserve funds funded from

	Strong	Good	Satisfactory	Weak
renewal and replacement, unforeseen events, and etc.)	in cash or letters of credit from highly rated bank			operating cash flows

Table 2: Supervisory rating grades for income-producing real estate exposures

	Strong	Good	Satisfactory	Weak
Financial strength 1) Market conditions	The supply and demand for the project's type and location are currently in equilibrium. The number of competitive properties coming to market is equal or lower than forecasted demand	The supply and demand for the project's type and location are currently in equilibrium. The number of competitive properties coming to market is roughly equal to forecasted demand	Market conditions are roughly in equilibrium. Competitive properties are coming on the market and others are in the planning stages. The project's design and capabilities may not be state of the art compared to new projects	Market conditions are weak. It is uncertain when conditions will improve and return to equilibrium. The project is losing tenants at lease expiration. New lease terms are less favourable compared to those expiring
2) Financial ratios and advance rate	The property's debt service coverage ratio (DSCR) is considered strong (DSCR is not relevant for the construction phase) and its loan to value ratio (LTV) is considered low given its property type. Where a secondary market	The DSCR (not relevant for development real estate) and LTV are satisfactory. Where a secondary market exists, the transaction is underwritten to market standards	The property's DSCR has deteriorated and its value has fallen, increasing its LTV	The property's DSCR has deteriorated significantly and its LTV is well above underwriting standards for new loans

	Strong	Good	Satisfactory	Weak
	exists, the transaction is underwritten to market standards			
3) Stress analysis	The property's resources, contingencies and liability structure allow it to meet its financial obligations during a period of severe financial stress (e.g. interest rates, economic growth)	The property can meet its financial obligations under a sustained period of financial stress (e.g. interest rates, economic growth). The property is likely to default only under severe economic conditions	During an economic downturn, the property would suffer a decline in revenue that would limit its ability to fund capital expenditures and significantly increase the risk of default	The property's financial condition is strained and is likely to default unless conditions improve in the near term
4) Cash flow prediction 4.1 For complete and stabilised property	The property's leases are long-term with creditworthy tenants and their maturity dates are scattered. The property has a track record of tenant retention upon lease expiration. Its vacancy rate is low. Expenses (maintenance, insurance, security, and	Most of the property's leases are long-term, with tenants that range in creditworthiness. The property experiences a normal level of tenant turnover upon lease expiration. Its vacancy rate is low. Expenses are predictable	Most of the property's leases are medium rather than long-term with tenants that range in creditworthiness. The property experiences a moderate level of tenant turnover upon lease expiration. Its vacancy rate is moderate. Expenses are relatively predictable but	The property's leases are of various terms with tenants that range in creditworthiness. The property experiences a very high level of tenant turnover upon lease expiration. Its vacancy rate is high. Significant expenses are incurred preparing space for new

	Strong	Good	Satisfactory	Weak
	property taxes) are predictable		vary in relation to revenue	tenants
4.2 For complete but not stabilised property	Leasing activity meets or exceeds projections. The project should achieve stabilisation in the near future	Leasing activity meets or exceeds projections. The project should achieve stabilisation in the near future	Most leasing activity is within projections; however, stabilisation will not occur for some time	Market rents do not meet expectations. Despite achieving target occupancy rate, cash flow coverage is tight due to disappointing revenue
4.3 For construction phase	The property is entirely preleased through the tenor of the loan or pre-sold to an investment grade tenant or buyer, or the bank has a binding commitment for take-out financing from an investment grade lender	The property is entirely pre-leased or pre-sold to a creditworthy tenant or buyer, or the bank has a binding commitment for permanent financing from a creditworthy lender	Leasing activity is within projections but the building may not be pre-leased and there may not exist a take-out financing. The bank may be the permanent lender	The property is deteriorating due to cost overruns, market deterioration, tenant cancellations or other factors. There may be a dispute with the party providing the permanent financing
Asset characteristics				
1) Location	Property is located in highly desirable location that is convenient to services that tenants desire	Property is located in desirable location that is convenient to services that tenants desire	The property location lacks a competitive advantage	Weaknesses exist in the property's configuration, design or maintenance

	Strong	Good	Satisfactory	Weak
2) Design and condition	Property is favoured due to its design, configuration, and maintenance, and is highly competitive with new properties	Property is appropriate in terms of its design, configuration and maintenance. The property's design and capabilities are competitive with new properties	Property is adequate in terms of its configuration, design and maintenance	Design, appearance, and maintenance of the project are its weakness.
3) Property is under construction	Construction budget is conservative and technical hazards are limited. Contractors are highly qualified	Construction budget is conservative and technical hazards are limited. Contractors are highly qualified	Construction budget is adequate and contractors are ordinarily qualified	Project is over budget or unrealistic given its technical hazards. Contractors may be under qualified
Strength of sponsor / developer				
1) Financial capacity and willingness to support the property	The sponsor/developer made a substantial cash contribution to the construction or purchase of the property. The sponsor/developer has substantial resources and limited direct and contingent liabilities. The	The sponsor/developer made a material cash contribution to the construction or purchase of the property. The sponsor/developer's financial condition allows it to support the property in the event of a cash	The sponsor/developer's contribution may be immaterial or non-cash. The sponsor/developer is average to below average in financial resources	The sponsor/developer lacks capacity or willingness to support the property

	Strong	Good	Satisfactory	Weak
	sponsor/developer's properties are diversified geographically and by property type	flow shortfall. The sponsor/developer's properties are located in several geographic regions		
2) Reputation and track record with similar properties	Experienced management and high sponsors' quality. Strong reputation and lengthy and successful record with similar properties	Appropriate management and sponsors' quality. The sponsor or management has a successful record with similar properties	Moderate management and sponsors' quality. Management or sponsor track record does not raise serious concerns	Ineffective management and substandard sponsors' quality. Management and sponsor difficulties have contributed to difficulties in managing properties in the past
3) Relationships with relevant real estate actors	Strong relationships with other organisations such as leasing agents	Proven relationships with other organisations such as leasing agents	Adequate relationships with leasing agents and other parties providing important real estate services	Poor relationships with leasing agents and/or other parties providing important real estate services
Collateral 1) Nature of lien	First lien and possible collateral enforcement	First lien and possible collateral enforcement	First lien and possible collateral enforcement	The lender's ability to enforce collateral is rather limited
2) Assignment of rents (for projects leased to long-term tenants)	The lender has obtained an assignment from the project. They maintain current tenant information	The lender has obtained an assignment. They maintain current tenant information that would	The lender has obtained an assignment. They maintain current tenant information that would	The lender has not obtained an assignment of the leases or has not maintained the

	Strong	Good	Satisfactory	Weak
	that would facilitate providing notice to remit rents directly to the lender, such as a current rent roll and copies of the project's leases	facilitate providing notice to the tenants to remit rents directly to the lender, such as current rent roll and copies of the project's leases	facilitate providing notice to the tenants to remit rents directly to the lender, such as current rent roll and copies of the project's leases	information necessary to readily provide notice to the building's tenants
3) Quality of the insurance coverage	Appropriate	Appropriate	Appropriate	Substandard

Table 3: Rating grades for object finance exposures

	Strong	Good	Satisfactory	Weak
Financial strength 1) Market condition	Demand is strong and growing, strong entry barriers, low sensitivity to changes in technology and economic outlook	Demand is strong and stable. Some entry barriers, some sensitivity to changes in technology and economic outlook	Demand is adequate and stable, limited entry barriers, significant sensitivity to changes in technology and economic outlook	Demand is weak and declining, vulnerable to changes in technology and economic outlook, highly uncertain environment
2) Financial ratios (debt service coverage ratio and loan-to-value ratio)	Strong financial ratios considering the type of asset. Very robust economic assumptions	Strong / acceptable financial ratios considering the type of asset. Robust project economic assumptions	Standard financial ratios considering the type of asset	Aggressive financial ratios considering the type of asset
3) Stress analysis	Stable long-term revenues, capable of withstanding severely stressed conditions through an economic cycle	Satisfactory short-term revenues. Loan can withstand some financial adversity. Default is only likely under severe economic conditions	Uncertain short-term revenues. Cash flows are vulnerable to stresses that are not uncommon through an economic cycle. The loan may default in a normal downturn	Revenues subject to strong uncertainties; even in normal economic conditions the asset may default, unless conditions improve

	Strong	Good	Satisfactory	Weak
4) Market liquidity	Market is worldwide basis; assets are highly liquid	Market is worldwide or regional; assets are highly liquid	Market is regional with limited prospects in the short term, implying lower liquidity	Local market and/or poor visibility. Low or no liquidity, particularly on niche markets
Political and legal environment 1) Political risk including transfer risk	Very low; strong mitigation instruments, if necessary	Low; satisfactory mitigation instruments, if necessary	Moderate; fair mitigation instruments	High; no or weak mitigation instruments
2) Legal and regulatory risk	Jurisdiction is favourable to repossession and enforcement of contracts	Jurisdiction is favourable to repossession and enforcement of contracts	Jurisdiction is generally favourable to repossession and enforcement of contracts, even if repossession might be long and/or difficult	Poor or unstable legal and regulatory environment. Jurisdiction may make repossession and enforcement of contracts lengthy or impossible
Transaction characteristics 1) Financing term compared to the economic life of the asset	Minimum balloon. No grace period	Balloon more significant, but still at satisfactory levels	Important balloon with potentially grace periods	High balloon

	Strong	Good	Satisfactory	Weak
Operating risk 1) Permit and licensing	All permits have been obtained; asset meets current and foreseeable safety regulations	All permits obtained or in the process of being obtained; asset meets current and foreseeable safety regulations	Most permits obtained or in process of being obtained, outstanding ones considered routine, asset meets current safety regulations	Problems in obtaining all required permits, part of the planned configuration and/or planned operations might need to be revised
2) Scope and nature of O & M contracts	Strong long-term O&M contract, preferably with contractual performance incentives, and/or O&M reserve accounts (if necessary)	Long-term O&M contract, and/or O&M reserve accounts (if necessary)	Limited O&M contract or O&M reserve account (if necessary)	No O&M contract: risk of high operational cost overruns beyond mitigants
3) Operator's financial strength, track record in managing the asset type and capability to re-market asset when it comes off-lease	Excellent track record and strong re-marketing capability	Satisfactory track record and re-marketing capability	Weak or short track record and uncertain re-marketing capability	No or unknown track record and inability to re-market the asset

	Strong	Good	Satisfactory	Weak
Asset characteristics 1) Configuration, size, design and maintenance (i.e. age, size for a plane) compared to other assets on the same market	Strong advantage in design and maintenance. Configuration is standard such that the object meets a liquid market	Above average design and maintenance. Standard configuration, maybe with very limited exceptions — such that the object meets a liquid market	Average design and maintenance. Configuration is somewhat specific, and thus might cause a narrower market for the object	Below average design and maintenance. Asset is near the end of its economic life. Configuration is very specific; the market for the object is very narrow
2) Resale value	Current resale value is well above debt value	Resale value is moderately above debt value	Resale value is slightly above debt value	Resale value is below debt value
3) Sensitivity of the asset value and liquidity to economic cycles	Asset value and liquidity are relatively insensitive to economic cycles	Asset value and liquidity are sensitive to economic cycles	Asset value and liquidity are quite sensitive to economic cycles	Asset value and liquidity are highly sensitive to economic cycles
Strength of sponsor 1) Operator's financial strength, track record in managing the asset type and capability to re-market asset when it comes off-lease	Excellent track record and strong re-marketing capability	Satisfactory track record and re-marketing capability	Weak or short track record and uncertain re-marketing capability	No or unknown track record and inability to remarket the asset
2) Sponsors' track record and financial strength	Sponsors with excellent track record and high financial standing	Sponsors with good track record and good financial standing	Sponsors with adequate track record and good financial standing	Sponsors with no or questionable track record and/or financial weaknesses

	Strong	Good	Satisfactory	Weak
Collateral 1) Asset control	Legal documentation provides the lender effective control (e.g. a first perfected security interest, or a leasing structure including such security) on the asset, or on the company owning it	Legal documentation provides the lender effective control (e.g. a perfected security interest, or a leasing structure including such security) on the asset, or on the company owning it	Legal documentation provides the lender effective control (e.g. a perfected security interest, or a leasing structure including such security) on the asset, or on the company owning it	The contract provides little security to the lender and leaves room to some risk of losing control on the asset
2) Rights and means at the lender's disposal to monitor the location and condition of the asset	The lender is able to monitor the location and condition of the asset, at any time and place (regular reports, possibility to lead inspections)	The lender is able to monitor the location and condition of the asset, almost at any time and place	The lender is able to monitor the location and condition of the asset, almost at any time and place	The lender is able to monitor the location and condition of the asset are limited
3) Insurance against damage	Strong insurance coverage including collateral damages in an unexpected event with top quality insurance companies	Satisfactory insurance coverage (not including collateral damages in an unexpected event) with good quality insurance companies	Fair insurance coverage (not including collateral damages) with acceptable quality insurance companies	Weak insurance coverage (not including collateral damages) or with weak quality insurance companies

Table 4: Rating grades for commodities finance exposures

	Strong	Good	Satisfactory	Weak
Financial strength 1) Degree of over-collateralisation of trade	Strong	Good	Satisfactory	Weak
Political and legal environment 1) Country risk	No country risk	Limited exposure to country risk	Exposure to country risk	Strong exposure to country risk
2) Mitigation of country risk	Very strong mitigation: Strong offshore mechanisms Strategic commodity 1st class buyer	Strong mitigation: Offshore mechanisms Strategic commodity Strong buyer	Acceptable mitigation: Offshore mechanisms Less strategic commodity Acceptable buyer	Only partial mitigation: No offshore mechanisms Non-strategic commodity Weak buyer
Asset characteristics 1) Liquidity and susceptibility to damage	Commodity is quoted and can be hedged through futures or OTC instruments. Commodity is not susceptible to damage	Commodity is quoted and can be hedged through OTC instruments. Commodity is not susceptible to damage	Commodity is not quoted but is liquid. There is uncertainty about the possibility of hedging. Commodity is not susceptible to damage	Commodity is not quoted. Liquidity is limited given the size and depth of the market. No appropriate hedging instruments. Commodity is susceptible to damage

	Strong	Good	Satisfactory	Weak
Strength of sponsor 1) Financial strength of trader	Very strong financial strength	Strong financial strength	Adequate financial strength	No financial strength
2) Track record, including ability to manage the logistic process	Extensive experience with the type of transaction in question. Strong record of operating success and cost efficiency	Sufficient experience with the type of transaction in question. Above average record of operating success and cost efficiency	Limited experience with the type of transaction in question. Average record of operating success and cost efficiency	Limited or uncertain track record in general. Volatile costs and profits
3) Trading controls and hedging policies	Strong standards for counterparty selection, hedging, and monitoring	Adequate standards for counterparty selection, hedging, and monitoring	Past deals have experienced no or minor problems	Trader has experienced significant losses on past deals
4) Quality of financial disclosure	Excellent	Good	Satisfactory	Financial disclosure contains some uncertainties or is insufficient
Collateral 1) Asset control	First perfected security interest provides the lender legal control of the assets at any time if necessary	First perfected security interest provides the lender legal control of the assets at any time if necessary	At some point in the process, there is a rupture in the control of the assets by the lender. The rupture is mitigated by knowledge of the trade process or a third party	Contract leaves room for some risk of losing control over the assets. Recovery could be jeopardised

	Strong	Good	Satisfactory	Weak
			undertaking as the case may be	
2) Insurance against damages	Strong insurance coverage including collateral damages with top quality insurance companies	Satisfactory insurance coverage (not including collateral damages) with good quality insurance companies	Fair insurance coverage (not including collateral damages) with acceptable quality insurance companies	Weak insurance coverage (not including collateral damages) or with weak quality insurance companies

Attachment 2

The Calculation of Credit Risk-Weighted Assets under the IRB for

Group 2 – Retail Exposure

I. Definition

Retail exposures mean small-sized obligors which are managed by commercial banks on a pooled basis[1] which is different from corporate exposures which are managed individually. Retail exposure portfolio consists of many obligors[2] having identical characteristics.

Retail exposures are divided into 3 sub-groups which are

1. Residential mortgage exposures (RME) mean residential mortgage loans given to an individual or a group of individuals in which the main purpose is to use as residence[3,4] and such land and/or building are pledged with commercial banks. In this regard, the Bank of Thailand does not prescribe the maximum amount of credit line per obligor.

2. Qualifying revolving retail exposures (QRRE) mean exposures that satisfy the following criteria:

2.1 The exposures are revolving, uncommitted, and unsecured. Outstanding amount may fluctuate within the credit limit established by the commercial bank and based on the obligor's decisions to borrow and repay loan. For example, credit card, overdraft for individual.

2.2 The exposures are given to an individual or a group of individuals with the maximum credit limit not exceeding 5 million Baht per obligor.

2.3 Commercial banks shall demonstrate to the Bank of Thailand that revolving retail exposures have low volatility of loss rate[5] in comparison with other retail portfolios, especially the group of obligors within the low PD bands because the correlation of

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[1] However, managing exposure individually at some stages of risk management does not consider a condition to preclude the exposure from being classified as retail exposure. For example, loan underwriting process

[2] The Bank of Thailand does not prescribe the minimum number of obligor per pool of retail exposure

[3] Commercial banks are responsible for monitoring their obligor to ensure that the uses of borrowed funds are consistent with the borrowing objective

[4] Including condominium

[5] Portfolio of revolving retail exposures with high volatility of loss rates shall be classified as other retail exposures.

revolving retail exposure is much lower than correlation of other retail portfolios at low PD level.

2.4 Commercial banks shall retain data on loss rates of aggregated revolving retail portfolio and each revolving retail sub-portfolio in order to allow analysis of the volatility of loss rates as well as allow the Bank of Thailand to examine.

3. Other retail exposure (ORE) means loans that satisfy one of the following criteria.

3.1 Loans to an individual or a group of individuals having specific repayment period (personal term loan) or hire purchase contracts. For example, credit lines to retail obligors secured by financial instruments, instalment loans, car loans, and educational loans. Moreover, this shall include residential mortgage loans and revolving retail loans that do not satisfy the requirements prescribed under the aforementioned Clause I.1 and Clause I.2. However, the Bank of Thailand does not prescribed the limit on the maximum amount of loan per obligor.

3.2 Business-related loans to an individual or a group of individuals; for example, hairdressing salon business and dry cleaning business, where the maximum aggregated credit lines and contingent liabilities given to one obligor including related parties[6] does not exceed 50 million Baht.

3.3 Loans to small businesses where the aggregated credit lines and contingent liabilities given to one obligor including related parties does not exceed 50 million Baht. **In this regard, commercial banks shall set appropriate internal criteria for small business which shall be in line with the lending practices and the risk management system of commercial banks.**

II. Calculation of Credit Risk-Weighted Assets

Commercial banks adopting the FIRB and the AIRB shall use the retail risk weight function which is divided into 2 cases which are 1. Non-defaulted exposure and 2. Defaulted exposure. PD and LGD are measured as decimals or percentage and EAD is measured as currency value (Thai Baht)[7]. Credit risk-weighted assets obtained from the function shall be used in calculating the minimum capital requirement that commercial banks have to maintain to absorb unexpected loss (UL).

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[6] Commercial banks shall refer to the definition of related parties as prescribed in Section 4 of the Financial Institution Business Act B.E. 2551 (2008). If commercial banks can prove that they have examined the related persons with care but cannot know and thus do not include all relative parties, it shall be deemed that commercial banks have not committed the offence. In order to calculate the aggregated credit lines for retail obligors, only in case of small businesses, commercial banks shall include credit equivalent amounts of OTC derivatives.

[7] Retail risk weight function does not contain M since the effect of maturity has already reflected in correlation (R).

1. Credit risk-weighted function for non-defaulted exposure is divided into 3 sub-functions using different correlations as follows:

1.1 Residential mortgage exposure (RME)

Correlation (R_{RME}):

$$R = 0.15$$

Capital requirement (K):

$$K = \left[LGD\ x\ N\left(\frac{1}{\sqrt{1-R}}\ x\ G(PD) + \sqrt{\frac{R}{1-R}}\ x\ G(0.999) \right) -\ PD\ x\ LGD \right] x\ 1.06$$

Risk weight (RW):

$$RW = K \times 12.5$$

Risk-weighted Assets (RWA):

$$RWA = RW \times EAD$$

1.2 Qualifying revolving retail exposures (QRRE)

Correlation (R_{QRRE}):

$$R = 0.04$$

Capital requirement (K):

$$K = \left[LGD\ x\ N\left(\frac{1}{\sqrt{1-R}}\ x\ G(PD) + \sqrt{\frac{R}{1-R}}\ x\ G(0.999) \right) -\ PD\ x\ LGD \right] x\ 1.06$$

Risk weight (RW):

$$RW = K \times 12.5$$

Risk-weighted Assets (RWA):

$$RWA = RW \times EAD$$

1.3 Other retail exposures (ORE)

Correlation (R_{ORE}):

$$R = 0.03 \text{ x } \left(\frac{1 - \text{e}^{-35\text{xPD}}}{1 - e^{-35}}\right) + 0.16 \text{ x } \left[1 - \left(\frac{1 - \text{e}^{-35\text{xPD}}}{1 - \text{e}^{-35}}\right)\right]$$

Capital requirement (K):

$$K = \left[LGD \; x \; N\left(\frac{1}{\sqrt{1-R}} \; x \; G(PD) + \sqrt{\frac{R}{1-R}} \; x \; G(0.999)\right) - \; PD \; x \; LGD\right] x \; 1.06$$

Risk weight (RW) :

$$RW = K \text{ x } 12.5$$

Risk-weighted Assets (RWA) :

$$RWA = RW \text{ x } EAD$$

Where e^x = Exponential function

N(x) = Cumulative distribution function for a standard normal random variable (that is the probability that value of normally distributed random variable is less than or equal to x, such random variable has mean = 0 and variance = 1)

G(z) = Inverse cumulative distribution function for a standard normal random variable (that is the value of x that make N(x) = z)

There are 4 steps to apply the function for calculating credit risk-weighted assets for non-defaulted exposure as follows:

Step 1 Calculate correlation (R) for other retail exposures by substituting PD calculated according to risk components estimation approach prescribed by the Bank of Thailand in correlation function of other retail exposure (R_{ORE}). For residential mortgage exposures and qualifying revolving retail exposures, commercial banks shall use R_{RME} and R_{QRRE} as prescribed respectively.

Step 2 Calculate capital requirement (K) by substituting PD and LGD calculated according to risk components estimation approach prescribed by the Bank of Thailand**,** including R from Step 1 in the capital requirement function.

Step 3 Calculate risk weight (RW) by multiplying K obtained from Step 2 by 12.5.

Step 4 Calculate risk-weighted assets (RWA) by multiplying RW obtained from Step 3 with EAD calculated according to risk components estimation approach prescribed by the Bank of Thailand.

In case where commercial banks use the double default approach to mitigate risk where a protected asset or underlying obligation[8] is a non-defaulted small business exposure considered to be the Other Retail Exposure (ORE), commercial banks shall calculate K for such exposure by using corporate risk weight function using the double default approach for credit risk mitigation and shall comply with the regulation on the calculation of credit risk-weighted assets and regulation on using double default approach prescribed in Attachment 1.

2. Credit risk-weighted function for defaulted exposures

3 types of retail exposures mentioned above shall use the same function as follows:

Capital requirement (K):

$$K = max[0, LGD - Best\ estimate\ of\ EL]$$

Risk weight (RW):

$$RW = K \times 12.5$$

Risk-weighted Assets (RWA):

$$RWA = RW \times EAD$$

Where best estimate of EL = EL (%) estimated based on current economic circumstances and the facility's status.

III. Estimation of Risk Components

When calculating capital charges for retail exposures, commercial banks shall use only the AIRB. That is, commercial banks using the IRB shall substitute their own estimates of PD, LGD, and EAD in the credit risk-weighted assets function. Commercial banks may estimate

[8] Referring to the definition in the Bank of Thailand 's Notification Re: the Permission for Commercial Banks to Undertake Credit Derivatives Transaction.

risk components of retail exposures on a pool basis since each exposure in a portfolio has similar risk characteristics, while commercial banks shall estimate risk components of sovereign exposures, bank exposures, and corporate exposures on an individual basis. Risk components to substitute in the function shall be in accordance with the requirements prescribed by the Bank of Thailand as follows:

1. Probability of default (PD)

1.1 Commercial banks shall estimate PD, the probability that the obligor will default within one-year time period, for each pool of exposures. In this regard, PD estimation shall be in accordance with the minimum requirements prescribed by the Bank of Thailand in Attachment 7.

1.2 One-year PD of retail exposure shall not be lower than 0.03 percent.

1.3 Exposures that commercial banks categorised as default exposures shall possess characteristics in line with the definition of default exposure prescribed by the Bank of Thailand in minimum requirements in Attachment 7. For default exposure, commercial banks shall assign PD equal to 1.

2. Loss given default (LGD)

2.1 Collateral

Commercial banks shall use their own estimate of LGD. The LGD estimate shall satisfy minimum requirements as prescribed in Attachment 7.

LGD for residential mortgage loans shall not be lower than 10% except the case of loans with government guarantee.

2.2 Guarantees and credit derivatives[9]

2.2.1 Commercial banks can recognise risk mitigating effects of guarantees or credit derivatives through adjustments of either PD or LGD estimates of an individual obligor or pools of exposures or through credit risk mitigation under the double default approach. Whichever adjustment approach is chosen, they shall be done in a consistent manner for all transactions with the same type of guarantee and credit derivatives.

[9] Currently, the Bank of Thailand does not allow commercial banks to recognise effects of imperfect default correlation between the debtor and the guarantor or the protection seller in the design and development of internal rating system or in the designation of rating grades. Thus, PD or LGD adjustments due to guarantee or use of credit derivatives shall also not recognise effects of double default. However, commercial banks are allowed to recognise effects of double default in the calculation of credit risk-weighted assets according to regulations and methodology prescribed by the Bank of Thailand.

2.2.2 In case where commercial banks recognise risk mitigating effects through an adjustment of PD estimates, commercial banks shall comply with the treatment of credit risk mitigation through guarantees or credit derivatives for commercial banks using the FIRB as prescribed in Attachment 1. Whether commercial banks recognise effects of guarantees or credit derivatives through either PD or LGD, the Bank of Thailand does not limit range of eligible guarantors or protection sellers[8]. However, such guarantees and credit derivatives shall meet the minimum requirement prescribed in Attachment 7.

3. Exposure at default (EAD)

3.1 EAD for on-balance sheet exposures

EAD for on-balance sheet items shall equal to gross exposures including accrued interests outstanding on the balance sheet before deducting specific provisions or partial write-offs[10, 11]

Commercial banks may recognise on-balance sheet netting between assets (loans) and liabilities (deposits) of the same counterparty. As a result, EAD will decrease since effect of credit risk mitigation is already taken into account. But if currency mismatch or maturity mismatch of on-balance sheet netting exists, commercial banks shall also comply with related requirements. On-balance sheet netting shall be in accordance with the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA).

3.2 EAD for off-balance sheet items

3.2.1 In case of off-balance sheet items which are non-OTC derivatives

(1) EAD for off-balance sheet items which are non-OTC derivatives shall equal to credit equivalent amount of exposure before deducting specific provision and partial write-off calculated by multiplying the value of off-balance sheet item (notional amount) by credit conversion factor (CCF). For unused credit lines, commercial banks shall multiply such unused amount by a CCF according to the following formula.

EAD = Notional amount x CCF

[10] For example, if commercial banks have an exposure of 100 Baht with 30 Baht already partially written-off, commercial banks shall use EAD = 100 + 30 = 130 Baht as commercial banks can use partial write-off to compare with the EL. However, in case where commercial banks have fully written off the exposure, commercial banks no longer have to calculate EAD.

[11] In calculation of EAD for exposures arising from leasing arrangements, commercial banks shall refer to Attachment 7 regarding requirements for leasing business.

Commercial banks shall use their own-estimate CCF for each type of off-balance sheet item where commercial banks shall satisfy the minimum requirements as prescribed by the Bank of Thailand in Attachment 7.

(2) For retail exposures with uncertain future drawdown such as credit cards, commercial banks shall take into account the probability of additional drawings prior to default in their EAD estimates, or take into account the probability of additional drawings prior to default in their LGD estimates instead if the probability of additional drawings does not reflect in EAD estimates. Where commercial banks shall take into account the history of drawings and/or additional drawings prior to default in their loss estimates as well.

(3) In case where commercial banks have securitized only the drawn balances of a retail portfolio, but the undrawn balances still remain with commercial banks, the commercial banks shall calculate credit-risk weighted assets for this portion of exposure where the EAD estimates shall reflect the probability of additional drawings. The Bank of Thailand shall issue regulation on securitisation in the future.

3.2.2 In case of OTC derivatives

Commercial banks shall refer to the calculation of credit risk-weighted for OTC derivatives in the Notification of the Bank of Thailand Re: Regulation on the Calculation of Credit Risk-weighted Asset of Counterparty for Derivatives.

Attachment 3

The Calculation of Credit Risk-Weighted Assets under the IRB for

Group 3 – Equity Exposures

I. Definitions

Equity exposures mean exposures related to equity, on the basis of the economic substance, including **both direct and indirect**[1] **ownership interests, whether voting or non-voting, in assets and incomes of a juristic person or of a financial institution** but have not been deducted from capital. In this regard, equity exposures arising from securitisation transaction or equity structured similar to debt securities or having debt obligation[2] shall not be included in equity exposures.

Equity exposures[3] include instruments as follows:

1. Instruments that meet all of the following criteria

1.1 It is irredeemable and the return of invested funds can be achieved only by the sale of the investment, the sale of the rights to the investment or by the liquidation of the issuer

1.2 It does not embody an obligation on the part of the issuer

1.3 It conveys a residual claim on the assets or income of the issuer

2. Instrument with the same structure as **Common equity tier 1 capital and Additional tier 1 capital** of commercial banks

3. Instruments that embody an obligation or conditions that meets any of the following criteria.

3.1 The issuer may defer indefinitely the settlement of the obligation

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[1] Indirect equity **interests** include holdings of derivative instruments linked to equity and investment in corporations, organizations, or juristic persons that engage principally in the business of investing in equity instruments

[2] For example, redeemable preferred shares that are treated as debt securities

[3] **Including investments in equity instruments and warrants issued by companies operating financial business and financial supporting business under the scope of full consolidation that are required to be included in the consolidated financial statements, and companies providing supporting functions for the financial institution system or acquired from debt restructuring.**

3.2 The issuer has discretion on settlement of obligation by issuance of a fixed number of the issuer's equity shares

3.3 The issuer has discretion on settlement of obligation by issuance of a variable number of the issuer's equity shares in proportionate to the value of the obligation, which is attributable to the change in fair value of a fixed number of the equity shares multiplied by a factor set by the issuer

3.4 The holder has the option to require that the obligation be settled in equity shares, unless commercial banks can demonstrate to the Bank of Thailand that the instrument has characteristics similar to those of debt securities or is a debt obligation of the issuer. Commercial banks may decompose the calculations of credit risk-weighted assets based on the proportion of debt securities and equity securities subject to the approval from the Bank of Thailand.

4. Other securities or derivatives structured with the intent of conveying the economic substance of equity ownership[4] including equity securities recorded as a loan but arising from a debt/equity swaps made as part of the restructuring of the debt. However, these instruments may not attract a lower capital charge than would apply if the holdings remained in the debt portfolio. In addition, debt instruments that are convertible into equity at the option of a holder should be deemed equity on conversion.

5. Hybrid debt capital instruments prescribed by the Bank of Thailand on case by case basis.

II. Calculation of Credit Risk-Weighted Assets

Calculation of credit risk-weighted assets under the IRB for equity exposures in the banking book[5] is divided into 2 approaches which are Market-based approach and PD/LGD approach. **However, for investments in equity instruments and warrants of companies operating non-financial businesses and supporting businesses, where commercial banks own more than 10 percent of total issued and paid-up common shares of each company, commercial banks shall calculate credit risk-weighted assets by applying a risk weight of 100 % divided by 8.5 % or 1176.5%**

Commercial banks shall apply the higher risk weight between the risk weight of 250% and the risk weight prescribed under the Market-based approach or the PD/LGD

[4] e.g. options or warrants of equity, debt instruments that are convertible into equity at the option of the issuer

[5] Commercial banks shall refer the classification of trading book positions and banking book positions from the Notification of the Bank of Thailand Re: Regulation on Market Risk Supervision Policy and Maintenance of Capital Requirement for Market Risk of Financial Institutions, as the case maybe.

approach to investments in equity instruments and warrants issued by companies operating financial business and financial supporting business, except companies under the scope of full consolidation that are required to be included in the consolidated financial statements, and companies providing supporting functions for the financial institution system or acquired from debt restructuring, both directly and indirectly, where commercial banks own more than 10% of the total issued and paid-up common shares of each company, only in the part that shall be included in the calculation of credit risk-weighted asset as prescribed in the Notification of the Bank of Thailand Re: the Components of Capital [6].

1. Market-based approach[7]

The market-based approach is divided into 2 sub-approaches as follows:

1.1 Simple risk weight

Commercial banks shall calculate credit risk-weighted assets for Unexpected loss (UL) of equity exposures by multiplying EAD by the risk weight prescribed by the bank of Thailand as follows:

1.1.1 A risk weight of 300% in the case of the equity securities registered on a recognised stock exchange[8]

1.1.2 A risk weight of 400% for other types of equity securities

1.2 Internal model method

1.2.1 Models that commercial banks use for calculating the Value-at-Risk (VaR) shall comply with the minimum requirements prescribed by the BOT in Attachment 7 : Calculation of Credit Risk-Weighted Assets for Equity Exposure.

1.2.2 Commercial banks shall calculate VaR for equity exposures from internal model at the 99th percentile, one-tailed confidence interval. VaR shall be calculated from the difference between quarterly returns of equity exposures and quarterly returns of risk-free financial securities (risk free rate) computed over a long-term sample period.

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[6] **The Notification of the Bank of Thailand Re: Components of Capital for locally incorporated commercial banks or the Bank of Thailand's Notification on the Components of Capital for foreign bank branches, as the case maybe**

[7] Under the Market-Based Approach, the Bank of Thailand allow commercial banks to recognise effects of credit risk mitigation through guarantees, but does not allow them to recognise effects of credit risk mitigation through collateral.

[8] In case of Thailand, means all equity securities registered in the Stock Exchange of Thailand but excluding equity securities in the MAI index.

1.2.3 Commercial banks shall calculate credit risk-weighted assets for Unexpected loss (UL) of equity exposure by multiplying VaR calculated from 1.2.2 with 12.5 to convert VaR into credit risk-weighted assets.

1.2.4 Risk-weighted assets calculated under the internal models method may not less than the risk-weighted assets that would be calculated under the simple risk weight approach[9] using the minimum risk-weighted assets prescribed by the Bank of Thailand as follows:

(1) A risk weight of 200% in the case of the equity securities registered on a recognised stock exchange

(2) A risk weight of 300% in the case of other types of equity securities

2. PD/LGD Approach

2.1 Commercial banks shall comply with the minimum requirements and only use the corporate risk weight function prescribed in Attachment 1 in calculating credit risk-weighted assets. That is commercial banks shall use such function with equity exposures of small business classified as retail exposure.

2.2 The sum of minimum capital requirement (UL) and Expected loss (EL) from the PD/LGD approach divided by 8.5% ,in order to convert them into credit risk-weighted assets, shall not be lower than the risk-weighted assets calculated under the simple risk weight approach using the minimum risk-weighted assets prescribed by the Bank of Thailand as follows:

2.2.1 A risk weight of 200% in the case of the equity securities registered on a recognised stock exchange

2.2.2 A risk weight of 300% in the case of other types of equity securities

2.2.3 A risk weight of 100% for equity exposures having the following characteristics:

(1) The equity securities registered on a recognised stock exchange where the investment is a part of a long-term customer relationship. In almost all cases, commercial banks also grant loan to the company; thus, they have sufficient information for estimating the PD, and commercial banks do not expect to realize any capital gains, both

[9] Commercial banks shall calculate the minimum credit risk-weighted assets for equity exposures on an individual basis.

short-term and long-term, where commercial banks usually hold the equity for at least 5 years.

(2) Other equity securities[10] where the returns on the investment are based on regular cash flows from operation not derived from capital gains and commercial banks intend to hold the equity for at least 5 years.

2.3 In the case where the sum of minimum capital requirement (UL) and Expected loss (EL) from PD/LGD approach is higher than the value of the equity exposure, credit risk-weighted assets of such equity exposure shall be equal to the value of the equity exposure **multiply with a risk weight of 100% and divided by 8.5% or 1176.5%**.

2.4 In the case where commercial banks do not grant loans or contingent liabilities or invest in debt securities of the company that commercial banks have equity exposures, commercial banks may not have sufficient information on the position of that company to be able to use the definition of default as prescribed by the Bank of Thailand in the minimum standard in Attachment 7. However, if it meets the other minimum requirements, The Bank of Thailand allows commercial banks to use their estimated PD but shall apply a 1.5 scaling factor to the risk weights derived from the corporate risk-weight function as follows:

RW = K (Percent of capital charge) x 12.5 x 1.5

2.5 Commercial banks shall use the simple risk-weight approach for calculating credit risk-weighted assets of equity exposure in the case where commercial banks' equity exposure is material as prescribed in Section IV and have already obtained approval from the Bank of Thailand to use a PD/LGD approach for calculating credit risk-weighted assets of other group of assets, but they cannot comply with the minimum requirements for using PD/LGD approach for calculating credit risk-weighted assets of equity exposure.

3. Approaches for calculating credit risk-weighted assets of equity exposures

3.1 Commercial banks may choose one approach or one sub-approach as they deems appropriate to each portfolio[11] of equity exposure depending on the characteristics of equity portfolio and internal risk management system of commercial banks.

3.2 After commercial banks apply a certain approach or sub-approach with their equity portfolio, they shall use the chosen approach on a consistent basis. Commercial

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[10] Means general investment or long-term investment in accordance with the Accounting Standard No. 105 Re: Accounting for Debt and Equity Security or any additional amendments.

[11] Commercial banks shall separate portfolio in accordance with their internal risk management system.

banks shall not choose the approach that will minimise their capital requirement (Capital arbitrage).

3.3 Commercial banks shall indicate the approach and sub-approach that they plan to apply to each equity portfolio in the plan submitted to the Bank of Thailand as well as demonstrate that the chosen approach or sub-approach is appropriate to their equity portfolio.

III. Estimation of Risk Components

1. Exposure at Default (EAD)

1.1 EAD of equity exposures in the banking book for the Market-based approach and the PD/LGD approach shall be equal to net value presented on balance sheet after making adjustment to such investments as if they were using trade date accounting as prescribed in the Notification of the Bank of Thailand Re: Supervisory Guideline on Capital Requirement for Commercial Banks, the Notification of the Bank of Thailand Re: Guidelines on Accounting of Financial Institutions, and the Regulation on the calculation of Credit Risk-Weighted Assets prescribed in the Notification of the Bank of Thailand.

1.2 For derivatives instruments linked to equity that commercial banks hold to hedge the exposure from holding such equity security, the Bank of Thailand allows commercial banks to net off the equity exposure with investment in same equity security provided that the remaining maturity of the derivatives used in hedging shall be no less than 1 year. Where there is a maturity mismatch, commercial banks shall comply with the regulation prescribed in the Notification of the Bank of Thailand Re: the Regulation on the calculation of Risk-Weighted Assets for Commercial Banks under Standardised Approach (SA) : Maturity Mismatch.

1.3 Net short positions in equity exposures shall be treated as if they are long positions by multiplying the absolute value of each position with the relevant risk weight

1.4 In the case where commercial banks hold investment units which invest in both debt securities and equity securities, there are 3 approaches for determining EAD used for calculating credit risk-weighted assets as prescribed below. Once a commercial bank chooses one of these approaches, such approach should be consistently applied.

1.4.1 Treat the entire exposure as investment in either debt or equity securities, considering the majority of the investment fund's holdings on the date when credit risk-weighted assets are calculated, and use EAD applicable to the type of securities.

1.4.2 Consider the fund's actual component holdings (Look-through approach) provided that commercial banks shall be able to calculate net value of such securities on a daily basis to separate investment in equity securities from investment in debt securities.

1.4.3 Consider the investment mandate of the investment fund instead of considering the fund's actual component holdings as prescribed in 1.4.1. and 1.4.2. Commercial banks may treat them as a single investment, either in debt securities or equity securities, under the assumption that the investment fund shall invest in the securities with the highest capital charge at the maximum amount that is allowed under the investment mandate first. Commercial banks may apply the look through approach to separate the investment into equity securities and debt securities based on investment mandate provided that the assets held by the investment fund are rated.

1.4.4 If commercial banks cannot apply the approaches prescribed in 1.4.1 – 1.4.3 mentioned above, they shall treat the whole amount of such investment unit as equity securities.

2. PD, LGD, and M for PD/LGD approach

2.1 Commercial banks shall estimate PD or the probability that obligors will default in the next 1 year. Commercial banks shall satisfy the minimum requirements for PD estimation as if commercial banks grant loans, have contingent liabilities, or invest in debt securities of such company[12]

2.2 LGD of equity exposures in the banking book is 90%. This also includes the equity exposures using the PD/LGD approach for calculating risk-weighted assets with risk protection agreement.

2.3 M of equity exposures in the banking book is 5 years. This also includes the equity exposure using the PD/LGD approach for calculating risk-weighted assets with risk protection agreement.

IV. Equity Exposures Exempted from Calculating Credit Risk-Weighted Assets under the IRB approach

1. Commercial banks can use the SA as prescribed in the Notification of the Bank of Thailand Re: Regulation on the calculation of Credit Risk-Weighted Assets for Commercial Banks under the SA to calculate credit risk-weighted assets of the following equity exposures

[12] For the purpose of credit risk-weighted asset calculation, if commercial banks have exposures on equity securities, loans, commitments, or investment in debt securities of the same obligor, the default of such obligor shall be deemed as default in equity exposure.

1.1 Equity securities of the entities whose debt obligations to commercial banks shall obtain a risk weight of 0% as prescribed in the Notification of the Bank of Thailand Re: Regulation on the calculation of Credit Risk-Weighted Assets for Commercial Banks under the SA.

1.2 Equity securities under legislated programme that the government strongly promotes and provides significant subsidies by offering compensation for the investment of commercial banks or there is other factor indicating that commercial banks' investments are subject to limited risk; that is, at least the principal shall be protected e.g. investment in Vayupak Fund 1. However, the proportion of equity exposures exempted from using the IRB in such business sector shall not exceed 10% of total capital[13] of the commercial banks. If commercial banks hold equity securities in this sector exceeding the prescribed amount, they shall use the IRB with the whole portfolio of such equity exposures.

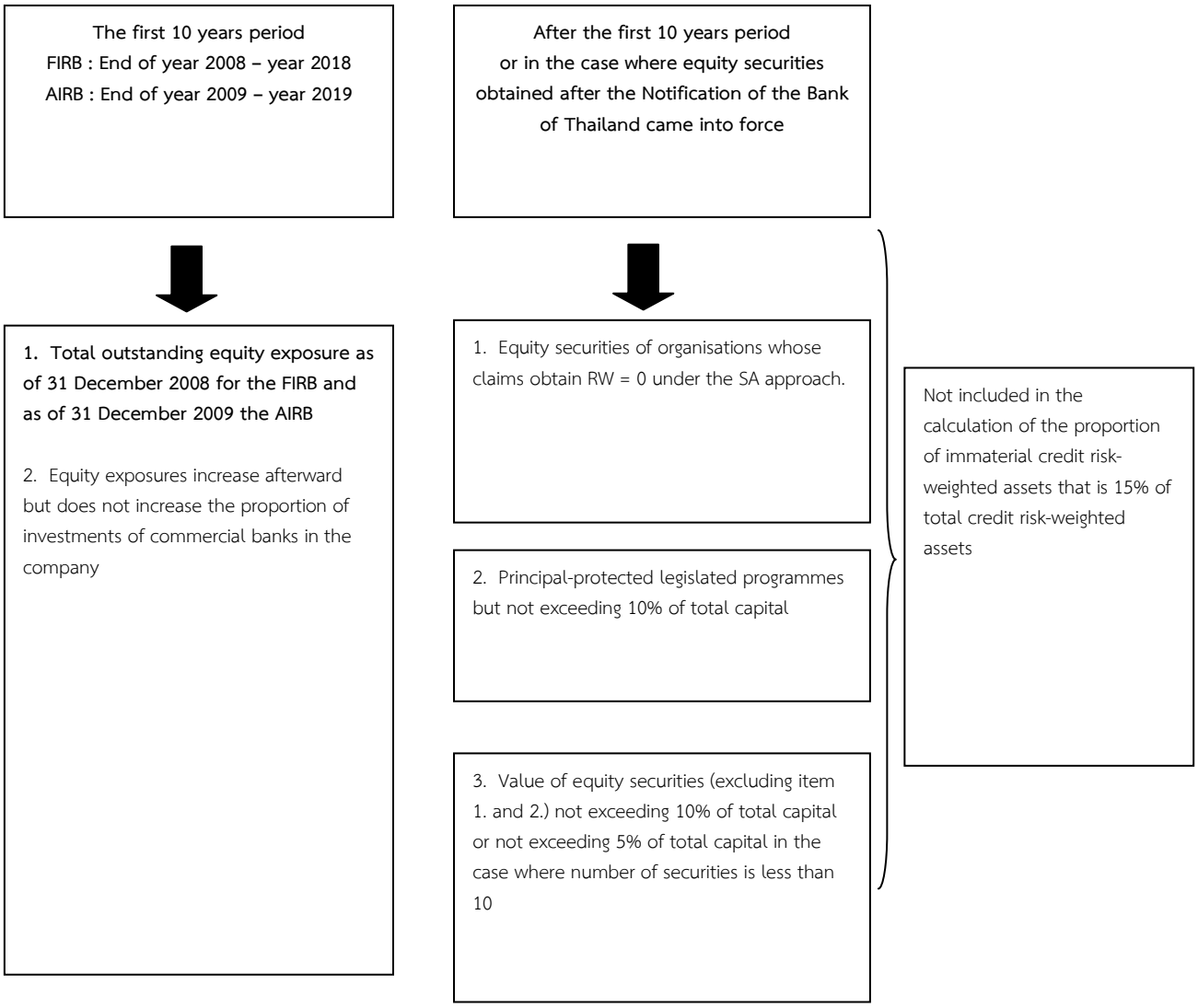
1.3 Total equity exposures of commercial banks, excluding exposures exempted from the IRB in 1.1 and 1.2, are immaterial. That is annual average outstanding exposures (1-year historical average of month-ended equity exposures) does not exceed 10% of total capital[13] of commercial banks, or does not exceed 5% of total capital if the equity portfolio of commercial banks consist of less than 10 individual equity securities.

1.4 During the first 10 year of Basel II implementation (during the end of year 2008 – year 2018 for the FIRB and during the end of year 2009 - year 2019 for the AIRB), the Bank of Thailand allows commercial banks to use the SA with equity exposures, only for the outstanding exposure as of **31 December 2008 for commercial banks using the FIRB and as of 31 December 2009 for commercial banks using the AIRB**. This exemption also applies to the case where the increase in number of equity securities after the date specified above does not increase the proportion of investments[14] of commercial banks in those companies. However, the Bank of Thailand does not allow commercial bank to use the SA with equity exposures, in the case where commercial banks have sold the above equity exposures but purchase back later, except that such exposures satisfy the criteria prescribed in item 1.

[13] Total capital outstanding at the month-end prior to calculation.

[14] e.g. stock dividend, shares increases from stock splits or buying additional shares to maintain proportion of equity holding.

Equity exposures exempted from calculating credit risk-weighted assets under the IRB approach



Attachment 4

The Calculation of Credit Risk-Weighted Assets under the IRB for

Group 4 - Purchased Receivables

I. Definitions

Purchased receivables mean receivables that commercial banks have purchased from another juristic person[1]. Purchased receivable is divided into 2 types which are

1. Purchased corporate receivables

2. Purchased retail receivables

In this regard, commercial banks shall refer to the definition of corporate exposures and retail exposures as prescribed in Attachment 1 and Attachment 2 respectively.

II. Calculation of Credit Risk-Weighted Assets

1. Risks of purchased receivables

Commercial banks that purchase receivables shall calculate risk-weighted assets for 2 types of risk which are

1.1 Dilution risk means the risk that the amount of purchased receivables is reduced due to the agreement between the seller of receivables and the receivables' obligor. For example, the seller of receivables offers discount to the receivables' obligor when the obligor makes payment within a specified period of time, or returns of goods sold within a specified period of time due to disputes regarding product quality, or any other obligations between the seller and the obligor.

1.2 Default risk means the risk that the purchased receivables' obligor does not repay debt.

2. Calculation of credit risk-weighted assets for dilution risk

For the FIRB and the AIRB

[1] The Bank of Thailand permit commercial banks to purchase receivables as prescribed in the Notification of the Bank of Thailand Re: Permission for Commercial Banks to Conduct Factoring Business and the Notification of the Bank of Thailand Re: Permission for Commercial Banks to Conduct Business operation on Purchasing or Accepting Transfer of Debtors

2.1 In the case where commercial banks can demonstrate to the Bank of Thailand that dilution risk for the purchased corporate receivables or purchased retail receivables is immaterial, commercial banks' dilution risk are to be exempted from calculating credit risk-weighted assets. For example, it is specified in a contract that commercial banks will purchase receivables unless there is condition on return of goods sold, or the effective period for the return of goods sold is valid for a short period and is already expired by the time commercial banks purchase the receivables.

2.2 In the case where commercial banks' dilution risk are material, commercial banks shall calculate credit risk-weighted assets for the purchased receivables using corporate risk weight function prescribed in Attachment 1.

3. Calculation of credit risk-weighted assets for default risk

For the FIRB and AIRB

3.1 In the case where commercial banks can separate purchased receivables by type of exposure

Commercial banks shall use the credit risk-weight function in accordance with the type of purchased receivables. Commercial banks shall also comply with the requirements related to such credit risk-weight function.

3.1.1 In the case of purchased corporate receivables

(1) Commercial banks shall use the Bottom-up approach that is the estimates of risk components and risk-weighted assets of purchased corporate receivables are calculated on an individual basis using corporate risk weight function. The calculation method applied is the same as sovereign, financial institution and corporate exposures as prescribed in Attachment 1.

(2) Commercial banks may use the Top-down approach that is the estimates of risk components and risk-weighted assets of purchased corporate receivables are calculated on a pool basis using corporate risk-weight function[2]. In this regard, the Bank of Thailand allows commercial banks to use the top-down approach only in the case where

[2] In the case where commercial banks adjust the correlation formula of claims on small and medium sized enterprise by sales volume according to the regulation prescribed in Attachment 1, commercial banks shall use the average sales volume weighted by individual exposure in a pool of purchased corporate receivables. If commercial banks do not have sufficient data for calculating the weighted average sales volume, the Bank of Thailand shall not allow commercial banks to make adjustment to the correlation function.

the receivables are purchased for undertaking securitisation transaction. The purchase of receivables shall satisfy the following conditions.

(2.1) The receivables are purchased from third party sellers i.e. the purchasing commercial banks has not originated the receivables either directly or indirectly.

(2.2) The purchased receivables shall be generated on an arm's-length basis between the seller and the obligor. In addition, the lending agreement between the seller and the obligor shall have the same standard as those applied to other obligors[3].

(2.3) The purchasing commercial banks shall have a claim on all proceeds from the pool of the purchased receivables or a pro-rata interest in the proceeds of the purchased receivables.

3.1.2 In the case of purchased retail receivables

Commercial banks shall use the retail risk weight function according to type of purchased retail receivables[4] and the same calculation method according to each type of retail exposures as prescribed in Attachment 2.

3.2 In the case where commercial banks cannot separate purchased receivables by type of exposure

For a hybrid pool of receivables containing both corporate receivables and retail receivables, commercial banks shall use credit risk weight function (either corporate risk weight function or retail risk weight function) that produces the highest capital charge.

III. Estimation of Risk Components

1. Estimation of risk components for dilution risk

For both the FIRB and AIRB and for both the bottom-up and top-down approach, commercial shall comply with the following requirements.

1.1 Probability of default (PD) and Loss given default (LGD)

1.1.1 Commercial banks shall estimate the Expected loss (EL) for dilution risk within one-year period[5] where

[3] Receivables generated from inter-company transactions of companies in the same business group in terms of contra-accounts trading (involves a customer buying from and selling to the same firm, such transactions are normally offset instead of cash settlement which may leads to interpretation challenge in the court) are ineligible for an arm's-length basis

[4] The calculation of risk-weighted assets for retail portfolio is the top-down approach, since it is the estimation of risk components on a pool basis.

(1) Commercial banks can use internal or external data to estimate EL of the obligors.

(2) Commercial banks shall estimate the EL under assumptions of no recourse or other guarantees from the seller or other parties.

1.1.2 PD is equal to the estimated EL in Section 1.1.1

1.1.3 LGD is equal to 100 percent

1.2 Exposure at default (EAD)

EAD is the outstanding amount of purchased receivables.

1.3 Effective maturity (M)

Commercial banks shall use M as prescribed in Attachment 1. Commercial banks using the FIRB or the AIRB may set M equal to 1 year, provided that they can demonstrate that their risk management and monitoring system for purchased receivables are properly put in place to ensure that dilution risk of the receivables will be resolved within 1 year.

2. Estimation of risk components for default risk

Commercial banks shall use the risk components according to the requirements prescribed by the Bank of Thailand as follows:

2.1 For purchased corporate receivables

2.1.1 Probability of default (PD) and Loss given default (LGD)

(1) In case of the bottom-up approach, commercial banks shall comply with the requirements on the estimation of PD and LGD for corporate exposures as prescribed in Attachment 1.

(2) In the case of the top-down approach, commercial banks shall comply with the following requirements.

[5] expressed as a percentage of purchased receivables amount

For the FIRB

(2.1) If commercial banks can reliably estimate PD for each pool of purchased receivables, commercial banks shall use their own-estimates of PD and use supervisory LGD prescribed by the Bank of Thailand in Attachment 1.

(2.2) If commercial banks cannot reliably estimate PD and LGD for the pool of purchased receivables, commercial banks shall estimate the expected long-run loss rate for the pool of purchased receivables; then, estimate PD and LGD according to the following approach. In this regard, the expected long-run loss rate shall be the EL for one-year default risk and expressed as a percentage of purchased receivables amount under assumptions of no recourse or other guarantees from the seller or other parties. Commercial banks can use internal or external data to estimate PD and LGD.

(2.2.1) If the commercial banks can demonstrate that they are senior claims, an LGD of 45 % shall be used. PD shall be calculate by dividing the EL by LGD of 45%

(2.2.2) If commercial banks cannot demonstrate that they are senior claims, LGD of 100% shall be used. PD is the expected long-run loss rate.

For the AIRB

(2.1) If commercial banks can reliably estimate PD and LGD for each pool of purchased receivables, commercial banks shall use their own-estimates of PD and LGD.

(2.2) If commercial banks cannot reliably estimate PD and LGD for the pool of purchased receivables, commercial banks shall estimate the expected long-run loss rate for the pool of purchased receivables; then, estimate PD and LGD according to the following approach. In this regard, the expected long-run loss rate shall be the EL for one-year default risk and expressed as a percentage of purchased receivables amount under assumptions of no recourse or other guarantees from the seller or other parties. Commercial banks can use internal or external data to estimate PD and LGD.

(2.2.1) If commercial banks can only estimate the average PD for each pool of purchased receivables in a reliable manner, commercial banks shall estimate the long-run default-weighted average LGD, by dividing expected long-run loss rate by the average PD. In this regard, LGD used for calculating credit risk-weighted assets shall not be less than the long-run default-weighted average LGD and shall be in line with the minimum requirements prescribed in Attachment 7.

(2.2.2) If commercial banks can only estimate the long-run default-weighted average LGD for each group of purchased receivables in a reliable manner as prescribed in the minimum requirements in Attachment 7, commercial banks shall estimate the average PD by dividing expected long run loss rate by the long-run default-weighted average LGD. In this regard, LGD used for calculating credit risk-weighted assets shall not be less than the long-run default-weighted average LGD and shall be in line with the minimum requirements prescribed in Attachment 7.

2.1.2 Exposure at default (EAD)

For both the FIRB and AIRB and for both the bottom-up and top-down approach, commercial shall comply with the following requirements.

(1) In general cases

EAD = Outstanding amount of purchased receivables – Capital charge for dilution risk[6] before taking into account credit risk mitigation effect.

(2) In the case of revolving purchase facility

EAD = [Outstanding amount of receivables already purchased + (Undrawn purchase commitments x Credit conversion factor of 75%)] – Capital charge for dilution risk, before taking into account credit risk mitigation effect.

2.1.3 Effective maturity (M)

For the FIRB

Commercial banks shall comply with the regulation prescribed in Attachment 1 Section III. Estimation of risk components: Measure of M.

For the AIRB

(1) In case of bottom-up approach, commercial banks shall calculate M of an individual obligor in the pool of purchased receivables by using function and regulation on the calculation of M for corporate exposures as prescribed in Attachment 1.

(2) In case of top-down approach

[6] The purpose of deducting Unexpected loss (UL) capital charge for dilution risk before calculating capital charge for default risk is to ensure that such capital charge does not duplicate with the portion that commercial bank shall maintain for dilution risk.

(2.1) For drawn amount

M of the purchased receivables is the pool's exposure-weighted average effective maturity.

(2.2) For undrawn amount of exposures with purchasing commitment

(2.2.1) In the case that the facility agreement contains clause that protect the commercial bank against a significant deterioration in the quality of the receivables after they have agreed to purchase receivables facility; for example, the commercial bank is not bound to purchase additional amount of receivables under the agreement. The protections can be in the form of covenants or early amortization triggers or other features. With such protections, commercial banks shall use M calculated according to item (2.1) with the undrawn amount.

(2.2.2) In the absence of the conditions or agreement prescribed in (2.2.1). M[7] shall be calculated as the sum of 1) The longest-dated potential receivable under the purchase agreement and 2) The remaining maturity of the purchase facility.

2.2 For purchased retail receivables

2.2.1 Probability of default (PD) and Loss given default (LGD)

In estimation of PD and LGD (or EL), commercial banks shall satisfy the minimum requirements related to the estimation of risk components estimation for retail exposures as prescribed in Attachment 2. Commercial banks can use internal or external data to estimate PD and LGD (or EL) of the obligor. Commercial banks shall estimate those risk components under assumptions of no recourse or other guarantees from the seller or other parties.

2.2.2 Exposure at default (EAD)

Commercial banks shall comply with the regulation on the calculation of EAD for corporate purchased receivables under 2.1.2 mentioned above.

[7] For example, Company A sells Company B's receivables to a commercial bank, where the purchase agreement specifies that the commercial bank is subject to purchase Company B's receivables from Company A within 1-year period. Commercial bank anticipates that the longest-dated potential receivable of Company B under the purchase agreement is 6 months. Currently, time period that commercial bank committed to purchase receivables has passed for 3 months; thus, the remaining maturity of the purchase facility is 9 months. Therefore, M = 6 + 9 = 15 months.

3. Credit risk mitigation

3.1 For credit risk mitigation through guarantees and credit derivatives that cover default risk and dilution risk, commercial banks shall refer to type guarantor or protection sellers[8] as well as requirements as prescribed in Attachment 1 under Guarantees and credit derivatives section.

3.2 Principles of credit risk mitigation through guarantees or credit derivatives are as follows:

3.2.1 If the guarantee or credit derivatives covers both default risk and dilution risk of the pool of purchased receivables, commercial banks shall substitute risk weight of the guarantor or the protection seller in place of the pool's total risk weight for default risk and dilution risk

3.2.2 If the guarantee or credit derivatives covers only default risk or dilution risk, commercial banks shall substitute the risk weight of the guarantor or the protection seller in place of the pool's risk weight for default risk or dilution risk.

3.2.3 If the guarantee or credit derivatives covers only a portion of default risk and/or dilution risk, commercial banks shall apply the risk weight of the guarantor or the protection seller in proportion to the coverage of guarantees or credit derivatives. In this regard, commercial banks shall comply with the rules on proportional-cover credit risk protection through guarantees and credit derivatives and tranched-cover credit risk protection through guarantees and credit derivatives prescribed in the Notification of the Bank of Thailand Re: Regulation on the calculation of Credit Risk-Weighted Assets for Commercial Banks under the SA.

3.3 If the credit risk protection against dilution risk meet the requirements on the double default effect as prescribed in Attachment 1, and the seller of receivables are not in the same group as the guarantor or the protection seller, commercial banks may use the double default approach in the calculation of the credit risk-weighted assets for dilution risk. In this regard, commercial banks shall comply with the double default requirements and use the risk weight function for calculating K_{DD} as prescribed in Attachment 1. On this, PD_0 is set equal to EL, LGD_g is set equal to 100%, and M is set in accordance with the calculation of credit risk-weighted assets for dilution risk in general case.

[8] Please refer to definition set out in the Notification of the Bank of Thailand Re: Regulations on Permission for Commercial Banks to Engage in Credit Derivatives

4. Calculation of Risk-Weighted Assets in Case of Purchase Price Discounts

If a commercial bank purchase receivables at the price lower than that specified in the contract or at a discount, commercial banks shall treat a portion of purchase price discount which may be refunded to the seller as first loss facility. Commercial banks may recognise such first loss protection as credit risk mitigation as prescribed in the Notification of the Bank of Thailand Re: The Regulation on the calculation of Credit Risk-Weighted Assets for Securitisation Transactions of Commercial banks under the IRB. In addition, if the first loss position is absorbed by commercial banks, commercial banks shall calculate credit risk-weighted assets for the first loss protection or deduct the first loss protection from regulatory capital as prescribed in the Notification of the Bank of Thailand Re: the Regulation on the calculation of Credit Risk-Weighted Assets for Securitization Transaction.

Attachment 5

The Calculation of Credit Risk-Weighted Assets under the IRB for

Group 5 – Other Assets

I. Definitions

Other assets means on-balance sheet assets and off-balance sheet items not included in the definitions of 6 classes of assets[1] as prescribed in Attachment 1 – 4.

II. Calculation of Credit Risk-Weighted Assets

Commercial banks shall calculate credit risk-weighted assets for Unexpected loss by multiplying the outstanding amount net of specific provision[2] by a risk-weight prescribed by the Bank of Thailand as follows:

1. A risk weight for the following items is 0 %

    1.1 Cash in Thai baht and foreign currencies

    1.2 Inter-office balances of the commercial bank

    1.3 Prepaid expenses

    1.4 Derivatives assets arising from the marking-to-market of derivatives contract

    1.5 Assets stipulated by the Bank of Thailand to be deducted from regulatory capital e.g. goodwill and deferred tax assets

2. A risk weight for the following items is 20 %

Cash in transit which is a sub-item in the cash item on the balance sheet which are instruments payable on demand that are in collection process and instruments according to the regulations on interbank clearing, for those to be collected within the next business day, such as drafts, cheques that have not been cleared but the bank has already credited customers' accounts and returned cheques.

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[1] Including Sovereign, Bank, Corporate, Retail, Equity, and Purchase receivable exposures

[2] Please refer to the regulation on provisioning for other assets prescribed in the Notification of the Bank of Thailand Re: Regulation on Asset Classification and Provisioning for Financial Institutions.

3. A risk weight for the following items is 100 %

3.1 Land, buildings, equipment, other fixed assets, and non-performing assets

3.2 Other assets to which risk weights have not been assigned

4. A risk weight of 100 % divided by 8.5 % (100/8.5%) or 1176.5% shall be assigned to

Amount of loan or investment in debt securities in the portion that is lower than the materiality threshold where commercial banks ,that are the protection buyer, shall absorb first loss position. This is applied to the credit protection agreement with materiality thershold, in accordance with the regulation on credit risk mitigation through guarantees and credit derivatives as prescribed in the Notification of the Bank of Thailand Re: the Regulation on the Calculation of Credit Risk-Weighted Assets under Standardised Approach for Commercial Banks

Attachment 6

The Adequacy of Total Eligible Provisions against Expected Loss

In addition to maintaining capital for absorbing the unexpected loss (UL), commercial banks shall have sufficient provisions for absorbing the expected loss (EL) as well. In this regard, the commercial banks shall comply with the requirements in this attachment for all type of exposures except for the securitisation exposures.

I. Calculation of Expected Loss (EL)

1. EL for Sovereign, Bank , Corporate, Retail exposures including Purchased receivables exposures (excluding specialised lending subject to the supervisory slotting criteria)

1.1 For non-defaulted exposure

(1) In the case where commercial banks do not use the double default approach for credit risk mitigation

$$EL = EAD \times PD \times LGD$$

Commercial banks shall use own-estimates or supervisory estimates of EAD, PD, and LGD for each type of exposures based on the approach that commercial banks use for calculating risk-weighted assets.

(2) In the case where commercial banks use the double default approach for credit risk mitigation

$$EL = 0$$

1.2 For defaulted exposure

$$EL = EAD \times Best\ estimate\ of\ EL$$

For commercial banks using the FIRB, the best estimate of EL is LGD prescribed by the Bank of Thailand. For commercial banks using the AIRB, the best estimate of EL is EL of each defaulted exposure estimated based on current economic circumstances and the facility's status as prescribed in Attachment 7.

2. EL for specialised lending subject to the supervisory slotting criteria

$$EL = EAD \times Risk\ weight\ specified\ in\ the\ table \times 8\%$$

Risk weights for EL specified in the table below shall be applied to all 4 types of specialised lending which are project finance, object finance, commodities finance and income-producing real estate, as follows:

Strong	Good	Satisfactory	Weak	Default
5% (0%)	10% (5%)	35%	100%	625%

When exposures are classified as "Strong" or "Good", commercial banks may assign preferential risk weights, **the numbers shown in parenthesis in the table above**, to special lending exposure in order to obtain the lower EL which are 0% for "Strong" exposure, 5% for "Good" exposure. **In this regard, specialised lending shall satisfy one of the following conditions.**

2.1 The remaining maturity of loan is less than 2.5 years.

2.2 Commercial banks can demonstrate that their lending standards and practices as well as other risk characteristics of such specialised lending are better than the criteria prescribed in Attachment 1.1.

3. EL for equity exposure subject to the PD/LGD approach

$$EL = EAD \times PD \times LGD$$

Commercial banks shall use own-estimates or supervisory estimates of EAD, PD, and LGD for equity exposures subject to the PD/LGD approach.

EL is 0, in the case where the sum of the minimum capital requirement for UL and EL, calculated under the PD/LGD approach dividing by 8.5%, is less than the credit risk-weighted asset calculated under the simple risk weight approach using specified minimum risk weight, or in the case where the sum of the minimum capital requirement for UL and EL, is greater than such equity exposures.

4. EL for equity exposures subject to the Market-based approach

$$EL = 0$$

5. EL for other assets

$$EL = 0$$

II. Calculation of Total Eligible Provisions

1. Total eligible provisions means the sum of all provisions (i.e. general provision and specific provision) that commercial banks set aside for all types of asset class specified in this attachment of which commercial banks use the IRB to calculate risk-weighted assets. This shall include partial write-offs[1] except specific provisions set aside for equity exposures, securitisation exposures, other assets[2],

2. Commercial banks using the SA, prescribed in the Notification of the Bank of Thailand Re: Regulation on the calculation of Risk-Weighted Assets for Commercial Banks under the SA, to calculate credit risk-weighted assets for some portions of asset, either on a temporary basis during the transitional period or on a permanent basis if the exposures subject to the SA are immaterial, shall allocate provisions for non-defaulted assets calculated under the SA and the IRB, as follows :

2.1 In general cases, commercial banks shall allocate all general provisions using one of the following approaches.

2.1.1 In the case where commercial banks can set provisions on an account basis, the general provisions shall be allocated according to credit risk-weighted assets under the SA or the IRB.

2.1.2 In the case where commercial banks cannot assign provisions to individual accounts, that is the provisions are set aside for overall portfolios, commercial banks shall attribute total general provisions on a pro rata basis according to the proportion of credit risk-weighted assets calculated under the SA and the IRB.

2.2 In the case where commercial banks use the SA (or the IRB) exclusively with asset portfolio of a certain branch, commercial banks may attribute the whole amount of general provisions set aside by that branch, to the asset portfolio under the SA (or the IRB).

2.3 For the general provisions attributed to asset portfolio under the SA, locally incorporated banks may include such general provisions in Tier 2 capital subject to a limit of 1.25% of total credit risk weighted assets **calculated under the SA**. For the general

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[1] Means commercial banks write off some portion of loan from account since they do not receive payment in full, for example, debt reduction through debt restructuring. Partial write-offs are included in EAD calculation because commercial banks can compare provisions and partial write-offs to the EL to determine surplus or shortfall of provisions. In addition, partial write-offs include discount from purchasing of defaulted obligors that commercial banks do not recognise such discount through deducting from exposure or recognizing as profit.

[2] Specific provision for equity exposures and other assets are excluded since the EAD used in calculation of credit risk-weighted assets of such exposure is the amount net of provisions. For the securitisation exposures, the Bank of Thailand will issue a regulation on capital requirement specifically for this type of transaction.

provisions allocated to the asset portfolio under the IRB, commercial banks shall comply with the guidelines prescribed in Section III which shall be mentioned later.

2.4 Foreign bank branches are not allowed to include the general provisions assigned to asset portfolio under the SA in capital, since foreign banks branches do not have Tier 2 capital.

III. Rules on Expected Loss and Total Eligible Provisions

1. Commercial banks shall calculate **credit risk-weighted asset** for EL of equity exposures subject to PD/LGD approach by **multiplying EL** calculated under Section **I. by risk-weight of 100% and dividing by 8.5% or 1176.5%**

2. Commercial banks shall calculate the sum of EL for Sovereign, Bank, Corporate, Retail exposures including Purchased receivables[3] and Specialised lending subject to supervisory slotting criteria calculated under Section I. and compare total of EL with the sum of provisions calculated under Section II. If there is difference, commercial banks shall comply with the following rules:

2.1 In the case where provisions are less than the total EL (Shortfall of provision)

2.1.1 For locally-incorporated banks, commercial bank shall deduct **the full amount of** difference between total EL and provisions from **Common equity tier 1 capital**.

2.1.2 For foreign bank branches, commercial bank shall deduct **the full amount of** difference between total EL and provisions from Total capital.

2.2 In the case where the provisions are greater than the total EL (Surplus of provision)

2.2.1 For locally-incorporated banks, commercial banks can include the surplus provisions in Tier 2 capital. In this regard, the surplus of provision include in Tier 2 capital shall not exceed 0.6% of total credit risk-weighted assets calculated under the IRB.

In the case where the EL is less than the total provisions, the Bank of Thailand may consider whether the calculated EL fully reflects the current market conditions before allowing commercial banks to include the surplus provisions in Tier 2 capital or before allowing commercial banks to allocate the surplus provisions of defaulted exposures to set off the shortfall provisions of non-defaulted exposures.

[3] Including EL of dilution risk.

2.2.2 Foreign bank branches are not allowed to include the surplus of provisions in the capital.

Attachment 7

Minimum Requirements for IRB

The main objective of the minimum requirements prescribed by the Bank of Thailand for commercial banks using the IRB is to ensure that the commercial bank's internal rating system is able to rank order and quantify risk of different types of obligor and transactions in an appropriate, accurate, and reliable manner. For example, a commercial bank shall have a risk control unit responsible for reviewing internal rating process, input data obtaining from reliable sources, and appropriateness of risk assessment system, in order to ensure that the risk components estimated by commercial bank are accurate.

In this regard, the Bank of Thailand prescribed 10 areas of minimum requirements which are: 1. Internal rating systems design and development 2. Risk rating system operations 3. Corporate governance and oversight 4. Use of internal rating 5. Risk quantification 6. Validation of internal estimate 7. Minimum requirements in applying LGD and EAD prescribed by the Bank of Thailand 8. Requirements for recognition of leasing 9. Calculation of credit risk-weighted asset for equity exposure and 10. Disclosure requirements.

Commercial bank using the IRB shall apply 10 areas of the minimum requirements, prescribed by the Bank of Thailand, to all classes of commercial banks' assets unless specified otherwise in each area. Commercial banks shall comply with the minimum requirements at the outset and on ongoing basis.

Nevertheless, in case where a commercial bank is not in complete compliance with all the minimum requirements, the commercial bank shall provide a plan specifying approaches and time period needed for full compliance with the minimum requirements and submit the plan to the Bank of Thailand for consideration, or commercial bank shall demonstrate that the effect of such non-compliance is immaterial in terms of the risk posed to the commercial bank.

During the period that the commercial bank cannot fully comply with all the minimum requirements, the Bank of Thailand may consider to impose measures on the commercial banks in accordance with the Notification of the Bank of Thailand Re: the Regulation on Supervisory Review Process (Pillar 2), **capital floor or other measures.**

1. Internal Rating System Design and Development[1]

Internal rating system comprises all of the methods, processes, controls, data collection and IT systems that support the assessment of credit risk, the assignment of internal risk rating, and the quantification of probability of default and loss given default.

A Commercial bank may adopt multiple internal rating systems for assessing the risk of obligors according to characteristics of each loan portfolio. For example, a commercial bank may categorize rating system by industrial sector or by size of obligor (e.g. large size or medium size). In this case, the commercial bank shall have documents to demonstrate to the Bank of Thailand that each internal rating system can reflect the risk of obligors in each portfolio appropriately. A commercial bank shall not use multiple internal rating systems to minimize their capital requirement. Furthermore, all internal rating systems shall be in compliance with the minimum requirements as prescribed by the Bank of Thailand.

Under the area of internal rating system design and development, a commercial bank shall comply with 6 requirements as follows:

1.1 Rating dimensions

1.1.1 Minimum requirements for sovereign, financial institution and corporate exposures

The internal rating system adopted by commercial bank shall have 2 separate and distinct dimensions which are:

(1) Obligor rating that reflects the probability to default of obligor.

(1.1) In case where the same obligor has multiple types of facility or transaction with commercial bank, such obligor must be assigned to the same rating grade regardless of any differences in characteristics of each facility or transaction excepted in the following in 2 cases:

(1.1.1) Commercial bank may assign different ratings to an obligor based on the currency of facility denominated in Thai Baht currency or foreign currencies in order to reflect country transfer risk.

[1] Please refer to the Guidelines on Risk Management for Internal Rating System prescribed in the Circular Regarding The Best Practices on Risk Management

(1.1.2) When taking into account the effect of guarantee or credit derivatives on a facility, commercial bank may adjust rating of the obligor to differentiate it from the facility without guarantee or credit derivatives.

(1.2) Commercial bank shall articulate in their credit risk management policy or credit policy the level of credit risk of obligor in relation to each internal rating in terms of probability of default (PD) and factors or criteria used to classify obligors into different rating grades. In this regard, obligor with lower credit quality should be classified in the higher risk level.

(2) Facility rating that reflects the level of risk of each transaction or facility by focusing on the assessment of loss incurred after obligors defaulted **in percentage of exposure (LGD)** depending on transaction-specific factors of each transaction or facility e.g. collateral, seniority of claim, and type of loan.

(2.1) Commercial bank using the FIRB shall have facility rating that reflects the level risk of transaction or facility in one of the following cases.

(2.1.1) Facility rating system that reflects expected loss (EL) by incorporating both probability of default and loss given default considerations. In this case, the internal rating system of commercial banks does not separately quantify LGD

(2.1.2) Facility rating system that quantify LGD separately from PD

(2.2) Commercial bank using the AIRB shall have facility rating system that quantifies LGD separately from PD. For this purpose, all factors significantly influencing LGD shall be taken into account e.g. type of collateral, facility, industry of obligor. Commercial bank may include obligor's characteristics as one of the criteria in the facility rating system used for quantifying LGD if such factors are predictive of LGD. Commercial bank may alter the factors that influence facility rating across segments of portfolio, if they are able to demonstrate to the Bank of Thailand that such factors can improve the precision of their LGD estimates.

1.1.2 Minimum requirements for specialised lending

A Commercial bank using corporate risk weight function in calculating credit risk-weighted asset for specialised lending shall have internal rating system that have 2 separate and distinct dimensions as prescribed under Section 1.1.1. Nevertheless, commercial bank using supervisory slotting criteria is exempt from having two-dimensional internal rating system, since PD and LGD of specialised lending are interdependent. Thus,

commercial bank may have a single-rating dimension rating system that reflects EL by incorporating both PD and LGD considerations.

1.1.3 Minimum requirements for retail exposures

(1) Commercial bank's internal rating system for retail exposure shall reflect both obligor risk and transaction risks of each facility or transaction. That is the internal rating system shall be able to quantify PD and LGD of each pool of obligor. In this regard, commercial bank shall be able to assign exposure into a particular pool and demonstrate to the Bank of Thailand that their rating process can provide a meaningful differentiation of exposures based on their credit risk level by classifying homogeneous exposures into the same group and providing accurate risk estimates for each pool of obligor.

(2) Commercial bank shall estimate PD, LGD, and EAD for each pool of exposure where multiple pools may have identical PD, LGD, and EAD estimates. Commercial bank should consider the following risk drivers when assigning exposures to the same pool.

(2.1) Obligor's characteristics e.g. obligor type, demographics such as occupation or age

(2.2) Transaction's characteristics e.g. loan to value, seasoning effect, product and collateral types, guarantees or credit derivatives, and seniority of claim on collateral.

(2.3) Status of obligor e.g. defaulted debtor and non-defaulted debtor

1.2 Rating structure

1.2.1 Minimum requirements for sovereign, financial institution and corporate exposures

A commercial bank shall have internal rating system (both obligor rating and facility rating) that have meaningful distribution of exposures across rating grades. Commercial bank shall have internal rating structure as follows:

(1) Obligor rating

(1.1) A Commercial bank shall have at least 7 rating grades for non-defaulted exposures and at least 1 rating grade for defaulted exposures. Nevertheless, the Bank of Thailand may request, on case by case basis, commercial banks which lend to obligors with diverse credit quality to have a greater number of rating grades.

(1.2) A Commercial bank shall have a distinct definition of each rating grade to be used for risk assessment and PD estimation of obligors in each rating grade. The rating grade definition shall include a description of the degree of default risk and the criteria used for distinguishing level of credit risk of each rating grade. Furthermore, commercial banks may use + or – signs to expand the number of rating grades provided that commercial banks have developed complete rating descriptions and criteria for assignment and separately estimate PD for the rating with + or – signs.

(1.3) In case where commercial banks have loan portfolios concentrated in a particular market segment or range of default risk, commercial banks shall have enough rating grades within that range to avoid undue concentrations of obligors in particular rating grades. In case where there are significant concentrations in a particular grade, commercial banks shall provide empirical evidence or historical data to verify that all obligors concentrated on that rating grade has similar PD and the default risk of all obligors fall within that PD band of such rating grade .

(2) Facility rating

The Bank of Thailand does not prescribe the minimum number of rating grades for commercial banks using the AIRB. Nevertheless, commercial banks shall have a sufficient number of facility rating grades to differentiate LGD in each facility rating grade. In addition, the criteria used to define facility grades must be grounded in empirical evidence.

1.2.2 Minimum requirements for specialised lending

A Commercial bank using the corporate risk weight function in calculating credit risk-weighted assets for specialised lending exposure shall comply with the minimum capital requirements of corporate exposure prescribed above in Section 1.2.1. Nevertheless, a commercial bank using the supervisory slotting criteria shall have at least of 4 rating grades for non-defaulted exposures and at least 1 rating grade for defaulted exposures.

1.2.3 Minimum requirements for retail exposures

(1) A Commercial bank shall be able to estimate PD, LGD, and EAD for each pool of exposures identified and the number of exposures in a given pool shall be sufficient so as to allow for meaningful quantification and validation of such risk components.

(2) A Commercial bank should not have the number of exposures concentrated within a particular pool, except where the commercial bank can demonstrate that exposures within such pool have identical PD and LGD.

1.3 Rating criteria

1.3.1 A Commercial bank shall have specific rating definition of each rating, processes and criteria for assigning exposures to grades within a rating system, in plausible and intuitive fashion. Commercial banks shall be able to clearly demonstrate the differentiation of risk under each rating grade. In this regard, the internal rating system of commercial banks shall have the following characteristics:

(1) The rating grade descriptions and criteria must be sufficiently detailed to allow those staffs in charged with assigning ratings and those in different departments or branches to consistently assign the same grade to obligors or facilities posing similar risk.

(2) Written rating definitions and criteria shall be clear and detailed and enough to allow the third parties, such as internal audit department, other independent units within commercial banks, and bank examiners, to understand rating assignment process to the extent that such parties are able to replicate rating assignments and evaluate the appropriateness of each rating grade.

(3) Rating assignment criteria shall be consistent with credit approval standards and debt restructuring policies of commercial banks.

1.3.2 A Commercial bank shall consistently use all relevant and current information of obligor in assigning obligor ratings and facility ratings. If the commercial banks have considered that the available information is insufficient, more conservative approach should be used. Although the commercial bank can use ratings from external credit assessment institutions (ECAIs) as the primary factor in determining an internal rating assignment, commercial bank shall also take into account other relevant information.

1.3.3 For specialised lending within the corporate asset class, commercial banks using the supervisory slotting criteria shall assign rating to such obligors based on commercial banks' internal criteria, system, and process which must be in compliance with the minimum requirements prescribed by the Bank of Thailand. Commercial banks then shall map internal rating grades into 5 supervisory rating grades as prescribed by the Bank of Thailand in Attachment 1.1 where rating assessment factors and characteristic of obligors falling under each sub-class of specialised lending are provided. Although commercial banks' internal criteria for rating assignment is different from the supervisory criteria

prescribed by the Bank of Thailand, commercial banks shall be able to demonstrate that such mapping produce a consistent result to a certain extent.

1.4 Rating assignment horizon

1.4.1 A commercial bank should use a time horizon longer than 1 year in assigning rating grade in order to ensure that obligors rating reflect their ability and willingness to contractually perform despite adverse economic conditions or occurrence of unexpected event. For example a bank may base rating assignments on specific, appropriate stress scenarios. Alternatively, a bank may take into account borrower characteristics that are reflective of the borrower's vulnerability to adverse economic conditions or unexpected events, without explicitly specifying a stress scenario. The range of economic conditions that are considered when making assessments shall be consistent with current conditions and those that are likely to occur over a business cycle within the respective industry or geographic region

Moreover, for highly leveraged obligors e.g. Hedge fund or for obligors whose assets are predominantly traded assets, PD estimate for this group of obligors must reflect the performance of the quality of obligors' assets during the periods of stressed volatilities e.g. crisis period[2].

1.4.2 A commercial bank should take conservatively views when analyzing the impact of economic conditions and unexpected events that may impact financial conditions of obligors. Furthermore, where limited data are available, a bank shall adopt a conservative bias to its analysis.

1.5 Minimum requirements in use of model

Statistical models e.g. credit scoring or other technical methods play an important role in the rating assignment and the estimation of loss which thereby reducing errors made by human judgment in rating assignment. However, statistical model and technical methods may also be a source of rating error due to a limitation of available information. Thus, sufficient human judgment and human oversight is necessary to ensure that all relevant and material information is also taken into consideration, and that the model is used appropriately.

The minimum requirements for the use of model are as follows:

[2] **Please refer to the further details of regulation from Basel III counterparty credit risk – Frequently asked questions, November 2011 by BCBS http://www.bis.org/publ/bcbs228.htm**

1.5.1 A commercial bank shall demonstrate to the Bank of Thailand that their model or a procedure used for rating assignment have good predictive power and do not distort regulatory capital requirements. In addition, the variables that are input to the model shall form a reasonable set of predictors and the output from the model shall be accurate on average.

1.5.2 A commercial bank shall have in place a process for vetting data inputs into the model which includes an assessment of the accuracy, completeness and appropriateness of the data used for rating assignment.

1.5.3 A commercial bank shall demonstrate that the data used to develop the model are representative of the population of the bank's actual obligors, facilities, or transactions.

1.5.4 A commercial bank shall have written guidance describing how human judgment and model results are combined where the judgment shall take into account all relevant and material information not considered by the model.

1.5.5 A Commercial bank shall have procedures for human review of model-based rating assignments. Such procedures should focus on finding and limiting errors associated with the model and shall also include ongoing efforts to improve the model's performance.

1.5.6 A commercial bank shall have model validation process that should be done on a regular basis. The model validation process includes monitoring of model performance and model relationships as well as testing of model outputs against outcomes. **The model validation process shall cover characteristics of the model e.g. discriminatory power, rank ordering and rating stability etc.**

1.6 Documentation of rating system design

1.6.1 A commercial bank shall document in writing their internal rating systems' design and development and operational details. The documentation shall demonstrate commercial bank's compliance with the minimum standards, and shall, at least, address the topics as follows:

(1) Portfolio differentiation

(2) Rating criteria

(3) Roles and responsibilities of the parties related to rating assignment

(4) Definition of rating exception and parties that have authority to approve exceptions

(5) Frequency of rating reviews

(6) Management oversight of the rating process

(7) Rationale for the choice of criteria or factors used for rating assignment, where such criteria shall be able to meaningfully differentiate risk of obligors in each grade. The criteria or factors for rating assignment shall be periodically reviewed to determine whether such criteria or factors remain fully applicable to the current portfolios of commercial banks and to other external factors.

(8) History of changes in internal rating system including changes made subsequent to the last examination by the Bank of Thailand. The organization of rating assignment, including the internal control structure, shall also be documented.

(9) Specific definition of "default" and "loss" used internally by commercial banks which shall be consistent with the definition prescribed in Section 5 : Risk Quantification.

1.6.2 A Commercial bank using statistical model in the rating process shall document their methodologies which include information as follows:

(1) Details of the theory, assumptions, statistical and mathematical methodologies applied in the rating assignment, the assignment of estimates to grades, individual obligor, and pool of obligors, or facility, as well as data sources used to estimate the model

(2) Statistical process for validating the model; for example, out-of-sample performance test or out-of-time performance test

(3) Circumstance under which the model does not perform effectively

1.6.3 A commercial bank that purchase model from a third-party vendor or hire a consultant for their model development stage, shall comply with the minimum requirements prescribed by the Bank of Thailand regarding internal rating system and shall prepare documents related to rating assignment. Model's vendor or consultant and commercial banks are responsible for providing explanations until the Bank of Thailand satisfies that the internal rating system is in compliance with the minimum requirements prescribed by the Bank of Thailand.

2. Risk rating system operations

A commercial bank shall comply with 5 minimum requirements as follows:

2.1 Coverage of rating

2.1.1 All sovereign, financial institution, and corporate exposures as well as guarantors or protection sellers[3] that the Bank of Thailand recognised as credit risk mitigation shall be assigned an obligor rating; likewise, each transaction shall be assigned a facility rating. A commercial bank shall use such ratings as part of the loan approval process.

2.1.2 For retail exposure, a commercial bank shall categorize homogeneous retail exposure into the same pool and assign rating to the pool. A commercial bank shall use such ratings as part of the loan approval process.

2.1.3 In general, a commercial bank shall assign rating to each legal entity separately. However, the commercial bank may assign the same or different rating to other individual entities in the obligor's connected group, provided that commercial banks have established clear and appropriate policies.

2.2 Integrity of rating process

2.2.1 Minimum requirements for sovereign, bank and corporate exposures

(1) Rating assignment and rating review process of commercial banks shall be conducted or approved by a party that does not directly stand to benefit from the extension of credit. In addition, policies and procedures in rating process of commercial banks shall reinforce and foster the independence of the rating process[4]. Commercial bank's credit policies and operational processes shall be documented for the Bank of Thailand to examine.

(2) A commercial bank shall have their obligor rating and facility rating reviewed at least on an annual basis. Higher risk obligors or problem exposures shall be subject to more frequent rating review. In addition, commercial banks shall change their rating immediately if there is any change in factor that materially impact their obligors or facilities.

(3) A commercial bank shall have process to monitor and update relevant information on obligors' financial condition that impact their ability to repay

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[3] Refer to the definition from the Bank of Thailand Re: Permission for Commercial Banks to Undertake Credit Derivatives.

[4] In practice there are various forms of the independence of rating assignment. Thus, bank examiners shall consider the appropriateness of this requirement on case by case basis.

debt, and other factors that affect LGD or EAD e.g. collateral characteristics. Commercial banks shall be able to update the rating grade in a timely basis.

2.2.2 Minimum requirements for retail exposures

(1) A commercial bank shall review the loss characteristics and delinquency status of each pool of obligor on at least an annual basis.

(2) A commercial bank shall review the status of individual obligors within each pool as a means of ensuring that exposures continue to be assigned to the correct pool. Nevertheless, commercial banks may conduct such review for some representative samples of the obligors in the pool.

2.3 Overrides

2.3.1 For rating assignment based on expert judgment and the outputs are overridden, a commercial bank shall clearly specify **override limit** and situations in which bank officers may override. A commercial bank shall have guidelines and identify the personnel who are responsible for approving such overrides.

2.3.2 For model-based ratings, commercial banks shall have guidelines and process for monitoring the cases where human judgment override the model's rating, variables are excluded, and inputs are altered as well as identifying the personnel who are responsible for approving the overrides and **override limit**.

2.3.3 A commercial bank shall collect overrides data separately in order to use them for evaluating their performance.

2.4 Data maintenance

A commercial bank shall collect data on key characteristics of obligor, facility, and transaction in order to 1) provide effective support to its internal credit risk measurement and management process 2) enable the bank to meet the other requirements 3) serve as a basis for reporting to the Bank of Thailand. The collected data should be sufficiently detailed to allow rating assignment review and improvement for both obligor rating and facility rating; for example, commercial banks increase the sophistication of commercial banks' internal rating system by increasing the number of rating grades in internal rating system.

In addition, commercial banks shall collect data on their internal rating system for public disclosure as prescribed by in the Notification of the Bank of Thailand Re: Disclosure of Capital Maintenance for Commercial Banks.

2.4.1 Minimum requirements for sovereign, financial institution and corporate exposures

(1) A commercial bank shall collect the historical data on rating assigned to obligors and guarantors or protection sellers recognised as credit risk mitigation by the Bank of Thailand since ratings were assigned. Commercial banks shall have information regarding the dates the ratings were assigned, the methodology and model used, data used to derive rating, and person responsible for the rating assignment.

(2) A commercial bank shall collect default data which can identify obligors and types of transaction or facility, timing and circumstances of default, PD in relative to actual default rate of obligors in each rating grade and rating migration in order to track and assess predictive power of internal rating system. Commercial banks shall also retain data on the internal rating development, testing, and use of internal rating system, and estimation of risk components.

(3) A commercial bank using the AIRB shall collect a historical data on the LGD and EAD estimates of each transaction or facility, the key data used to derive the LGD and EAD estimates, the person responsible or model used in estimation. Commercial banks shall also compare the estimated LGD and EAD with the realized PD and LGD of each facility.

(4) A commercial bank recognizing the credit risk mitigation of guarantees and credit derivatives through LGD shall collect LGD of the facility before and after adjusting the effects of guarantees and credit derivatives. In addition, commercial banks shall retain information on loss and recovery of defaulted exposure e.g. amounts recovered, source of recovery, collaterals, guarantees or credit derivatives, time period required for recovery and collection costs.

(5) Although commercial banks using the FIRB shall use supervisory LGD prescribed by the Bank of Thailand, FIRB banks are encouraged to collect relevant data on LGD estimation e.g. loss data, recovery experience for corporate exposures, or loss data of specialised lending using the supervisory slotting criteria in calculation of credit risk-weighted assets.

2.4.2 Minimum requirements for retail exposures

(1) Commercial banks shall retain data in the process of allocating exposures to pools including data on obligor, transaction risk characteristics used either directly or through use of model, and data on **delinquency**.

(2) Commercial banks shall retain data on the estimated PDs, LGDs, and EADs of each pool of obligors.

(3) Commercial banks shall retain the data on the pools to which such exposures were assigned over the year prior to default and the realized outcomes on LGD and EAD.

2.5 Stress test used in assessment of capital adequacy

2.5.1 Commercial banks shall have stress testing processes for use in the assessment of capital adequacy. Stress testing shall involve identifying possible events or future changes in economic conditions that could have unfavourable effects on a commercial bank's credit exposures as well as assessment of the commercial banks' ability to withstand such changes. Examples of scenarios that could be used are 1) economic or industry downturns 2) market risk events (e.g. volatility of interest rate and foreign exchange) and 3) liquidity problem in the financial system.

2.5.2 In addition to the general stress tests, commercial banks shall also conduct credit risk stress test to assess the effect on capital requirement under the IRB. The scenarios and approaches employed under stress test would be chosen by commercial banks as they deem appropriate to the characteristics of their transactions. This shall subject to a review by the Bank of Thailand. However, in some cases, the Bank of Thailand may request commercial banks to conduct stress test based on the scenarios prescribed by the Bank of Thailand. It is not required that commercial banks shall apply worst-case scenarios for stress test but they should select the reasonable and conservative scenarios. The commercial banks' stress test should consider at least the effect of mild recession scenario. For example, the effect on PD, LGD and EAD of commercial banks given 2 consecutive quarters of zero economic growth. Commercial banks must conservatively take into account the risk diversification from commercial banks' transactions in various geographical regions or countries.

2.5.3 Commercial banks using the double default framework shall consider as part of their stress test framework the impact from deterioration in the credit quality of guarantor or protection seller, particularly, the impact of guarantor or protection seller failing

to comply with the minimum requirement due to rating change. In addition, commercial banks should consider the impact from increase in risk and capital requirements resulted from the default of one but not both of the obligor and guarantor or protection seller.

2.5.4 Information that commercial banks can use in stress test are as follows :

(1) bank's own data that allow estimation of the rating migration of at least some of its exposures.

(2) the impact of smaller deterioration in the credit environment on the obligor's ratings.

(3) the migration assigned by ECAI rating which may result in change of the rating that the commercial bank has assigned to obligors.

2.5.5 Commercial banks shall refer to the guidelines on stress test according to the Circular on The Best Practices in Risk Management.

3. Corporate governance and oversight

Commercial banks shall comply with 3 minimum requirements as follows:

3.1 Corporate governance

3.1.1 Procedure and process of the rating and estimation of risk components shall be approved by the commercial bank's board of directors or a designated committee. These parties shall possess a general understanding of commercial bank's internal rating system and detailed comprehension of the internal rating report. In this regard, senior management is responsible for providing the notice to the board of directors or a designated committee on any changes or exceptions from established policies that will materially impact the operations of commercial bank's internal rating system.

3.1.2 Senior management shall have a good understanding of internal rating system design and operation, and shall approve any material differences between actual practices and the established procedure, as well as ensure, on an ongoing basis, that the internal rating system is operating effectively. Management and officers in credit control function shall meet regularly to discuss the performance of the rating process, areas needing improvement, status of efforts to improve the identified deficiencies in the internal rating system.

3.1.3 Commercial banks shall have a report on internal rating. The internal rating report must be an essential part of the reporting to the board of directors (or other

assigned committee) and senior management. Reporting shall include the information on risk profile by rating grade, migration across rating grades, and estimation of relevant parameters of each rating grade, comparison of actual default rates against estimates (including LGD and EAD for commercial banks using the AIRB). Reporting frequency depends on type and significance of information and level of the recipient.

3.2 Credit risk control

3.2.1 Commercial banks shall have credit control units that are independent from the management functions and personnel responsible for credit approval. The credit control units are responsible for the design or selection, implementation, and evaluation of internal rating system.

3.2.2 Scope of responsibility of the credit control units shall, at least, cover the following areas.

(1) Testing and monitoring rating grades assigned to obligors

(2) Preparing reports and data analysis from commercial banks' internal rating systems including **historical default data of each rating sorted by rating at the time of default comparing with data on one-year prior to default,** obligors' rating migration analyses, and monitoring of trends in key rating criteria.

(3) Implementing procedures to verify that rating definitions are consistently applied across related departments.

(4) Implementing procedures to control, monitor, and document any changes to the rating process and reasons or needs for such changes.

(5) Reviewing rating criteria to evaluate the predictive power of internal rating system. Changes to the rating process, criteria or parameters used to assign rating shall be documented and retained for the Bank of Thailand's examination.

3.2.3 Credit risk control unit shall actively participate in development, selection, implementation, and validation of rating models. In addition, credit risk control unit must be responsible for models used in the rating process, the on-going model validation, as well as review and alterations to rating models used in rating process.

3.3 Internal and external audit

3.3.1 Commercial banks shall have internal audit function or internal independent function responsible for reviewing and documenting the audit findings in the following areas, at least, on annual basis.

(1) Internal rating system design and development and their operations

(2) Operations of credit control unit

(3) Operations of credit department of commercial banks

(4) Estimation and validation of PD, LGD, and EAD

(5) Compliance on all relevant minimum requirements under the IRB

3.3.2 The Bank of Thailand does not require external audit of the commercial bank's rating assignment process and estimation of risk parameters if commercial banks have established their own internal audit function or equally internal independent function.

4. Use of internal rating

4.1 Commercial banks shall not use their internal rating system only as a tool for estimation of variables for calculating of credit risk-weighted assets under the IRB or for satisfying the minimum standards prescribed by the Bank of Thailand. Internal rating system and loss and default estimates shall play an essential role in the credit approval, risk management, internal capital allocations, and corporate governance functions of commercial banks.

4.2 Risk components estimates used for calculating credit risk-weighted assets under the IRB may be different from those used for internal risk management due to the rationale of implementation. For example, pricing models are likely to use PDs and LGDs relevant to the life of the asset while 1-year period is applied under the IRB. Such differences shall be documented and retained for the Bank of Thailand's examination.

4.3 Commercial banks shall have a credible track record in the use of internal rating information and other risk components. Commercial banks shall demonstrate that they have been using the internal rating system and risk components that are broadly consistent with the minimum requirements under the IRB, for at least 3 years[5] starting from the day that

[5] The implementation period for the use internal rating system and risk components implemented may overlap with the minimum data period required for estimation of risk components. For example, if commercial banks plan to use the FIRB for calculating credit risk-weighted assets at the end of 2011, commercial banks must start collecting data for PD estimate from the end of 2006 to comply with the minimum requirement regarding

commercial banks use internal rating system for risk management until the day that commercial banks use the IRB for calculating credit risk-weighted assets. Improvements to the existing internal rating system will not be considered a new starting date of the 3-year requirement.

5. Risk quantification

Commercial banks shall comply with 10 minimum requirements as follows:

5.1 Overall requirements for PD, LGD, and EAD estimation

5.1.1 Commercial banks using the IRB must estimate a PD for each rating grade of sovereign, bank and corporate exposures and for each pool in the case of retail exposures. Commercial banks are not required to estimate PD for equity exposure using the market-based approach and specialised lending using the supervisory slotting criteria.

5.1.2 Commercial banks shall use relevant data and approaches in estimating PD, LGD, and EAD. Commercial banks may use internal data or data from external sources or from pooled data. Commercial banks shall demonstrate that their estimates are derived from sufficient long run historical data, with reliable supporting evidences, and are not purely based on judgmental considerations. Any changes in lending practice or the process for pursuing recoveries over the observation period must be taken into account. Commercial banks' estimates shall promptly reflect the implications of technical advances and new data and other information, as it becomes available. Commercial banks shall review their estimates at least on an annual basis.

5.1.3 Lending standards and other relevant characteristics of data from sample of obligors used for estimations shall be closely matched to or comparable with those of commercial banks' obligors and lending standards. Commercial banks shall demonstrate that market or economic conditions that underlie the data are relevant to the current and foreseeable conditions. Furthermore, the number of obligors in the sample and the data period shall be sufficient to provide the commercial banks with confidence in the accuracy and robustness of their risk component estimates. The estimation technique shall perform well in out- of-sample tests.

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the minimum data for PD estimation which needs at least 5-year historical data. Commercial banks must demonstrate to the Bank of Thailand that such estimates have been used and commercial banks have used rating system for internal management for at least 3 years. In this case, the time period of the two conditions can overlap.

5.1.4 Estimates of PDs, LGDs, and EADs may involve unpredictable errors. In order to avoid the underestimation of risk components, commercial banks shall add a margin of conservatism to their estimates to cover the unpredictable errors.

5.2 Definition of default

5.2.1 A default is considered to have occurred, when either or both of the two following events has taken place.

(1) The commercial bank considers that the obligor is unlikely to pay its credit obligations to them in full, without considering any recoveries that they may obtain from enforcing collaterals. The elements to be taken as indications of unlikeliness to pay should include the following events.

(1.1) The commercial bank puts the credit obligation on non-accrued status.

(1.2) The commercial bank writes-off obligor or sets aside additional provision as the obligor is unlikely to make payment or significant decline in obligor's credit quality is observed.

(1.3) The commercial bank sells the credit obligation at a material loss.

(1.4) The commercial bank consents to a debt restructuring of the credit obligation resulting in a diminished financial obligation or postponement of principal, interest, or other fees at significant level, where it is perceived that obligor's financial conditions is deteriorating.

(1.5) The commercial bank has filed for obligor's bankruptcy.

(1.6) The obligor has sought for protection from bankruptcy or has been placed in bankruptcy by other creditors resulting in delay payment to commercial banks.

(2) The debtor is classified as substandard assets or lower in accordance with the Notification of the Bank of Thailand Re: the Regulation on Asset Classification and Provisioning for Financial Institutions. Commercial banks may also use the 90-days past due period as a criteria of default from payment past due and apply the criteria on consistent and continuous basis.

5.2.2 For retail exposures, commercial banks can apply the definition of default at the level of account or facility rather than at the level of the obligor. Therefore, when an obligor defaulted on one account or facility, commercial banks are not required to treat all other accounts or facilities of such obligor as defaulted.

5.2.3 Commercial banks shall collect actual default data using the definition mentioned above and use such definition for estimating PDs, LGDs, and EADs. Commercial banks shall comply with the following requirements.

(1) Commercial banks can use default data from external sources. However, if the definition of default of external data differs from the definition prescribed by the Bank of Thailand, commercial banks shall demonstrate to the Bank of Thailand that they have already made adjustments to align such default data with the reference definition of default and the minimum requirements in Section 5.6 : PD estimation.

(2) Commercial banks can use internal data collected before this Notification comes into force or before commercial banks use the IRB in calculating credit risk-weighted assets. In case where the definition of default of such internal data is different from the definition prescribed by the Bank of Thailand, commercial banks shall demonstrate to the Bank of Thailand that they have already made adjustments to align such default data with the reference definition of default and the minimum requirements in Section 5.6 : PD estimation.

(3) After this Notification comes into force or after commercial banks using the IRB in calculating credit risk-weighted assets, commercial banks shall use the definition of default prescribed under this Notification for collecting data.

5.2.4 Where commercial banks consider that a previously defaulted obligor's status no longer fall into the reference definition of default, commercial banks can classify such obligor as non-defaulted obligor. In this regard, rating assigned to the obligor and the estimated LGD shall be the rating or LGD for non-defaulted obligor. However, if such obligor has subsequently fallen into the reference definition of default, a second default would be deemed to have occurred.

5.3 Re-ageing

A commercial bank shall have clearly articulated and documented policies regarding the counting of days past due, re-aging of facilities, granting extensions of past due date or deferrals of past due date to obligors. Such policies shall be applied consistently and include the following information.

5.3.1 Approval authorities and relevant reporting requirements

5.3.2 Minimum age of a facility before it is eligible for re-aging

5.3.3 The number of days past due of each facility that are eligible for re-aging

5.3.4 Maximum number of re-ageing per facility

5.3.5 Reassessment of the obligor's capacity to repay

5.4 Treatment of overdrafts

5.4.1 In case where a commercial bank has authorised overdraft to obligor, commercial bank shall set the credit limit and inform the obligor accordingly. In case of non-authorized overdrafts, the credit limit is 0. Commercial banks shall monitor the overdraft drawn by the obligor. When credit limit was breached, or credit line was cancelled, or the past due account was not repaid and fallen into the definition of substandard assets or lower in accordance with the Notification of the Bank of Thailand Re: Regulations on Asset Classification and Provisioning for Financial Institutions, such obligor will be deemed to be a defaulted obligor. Commercial banks may also use the 90-days past due period as a criteria of default which should be applied on consistent and continuous basis.

5.4.2 Commercial banks shall have a rigorous system for assessing the creditworthiness of obligors who are offered overdraft account.

5.5 Definition of loss

5.5.1 The definition of loss for LGD estimation is economic loss which takes into account the difference between EAD and the present value of expected cash flow using appropriate discount rate as well as considering direct and indirect costs associated with debt collection and time period for collecting debt. Commercial banks shall not simply measure the loss recorded in accounting records by comparing the amount lent to obligor and the payment received.

5.5.2 In estimating LGD, commercial banks can take into account their expertise in debt collection that significantly influences their recovery rate. Commercial banks shall have sufficient supporting empirical evidences of the impacts of commercial banks' expertise to LGD estimation/adjustment.

5.6 Requirement specific to PD estimation

5.6.1 Minimum requirements for sovereign, bank and corporate exposures

(1) Commercial banks using the IRB shall estimate PD in each rating grade of obligor by taking into account average long-run experience of each rating grade. Commercial banks can apply the following techniques for estimation.

(1.1) Using internal default experience of commercial banks

(1.1.1) Commercial banks may use data on internal default experience for the PD estimation. Commercial bank shall be able to demonstrate that their PD estimates are reflective of their actual default experiences.

(1.1.2) When there are any differences in the internal rating system that generated the data and the current internal rating system, or when limited data are available, or when the standard for credit approval or internal rating system has changed, commercial banks shall add a greater margin of conservatism in its estimation of PD. In such circumstances, PD may be adjusted higher.

(1.1.3) Commercial banks can use pooled data across institutes in estimating PD. In this case, commercial banks shall be able to demonstrate that the internal rating systems and rating criteria of other commercial banks participated in data pooling are comparable to commercial banks' system/criteria.

(1.2) Mapping to external data

(1.2.1) Commercial banks can map their internal rating grades to the ECAIs rating grades and then apply PD observed from the ECAIs rating in determining the PD of obligors in each rating grade.

(1.2.2) In mapping rating grade, commercial banks shall compare criteria or factors that commercial banks use for rating with the criteria used by the ECAIs and compare internal rating grade and ECAIs grade assigned to any common obligors. Bias judgments and inconsistencies in mapping rating grade shall be avoided.

(1.2.3) Definition of default of ECAIs shall be consistent with the minimum requirements in Section 5.2 : Definition of default. Factors or data that ECAIs used for estimation shall be oriented to the risk to default of the obligor and does not reflect transaction characteristics.

(1.2.4) Commercial banks shall document mapping guidelines. In the case where there is a difference in definition of default, commercial banks shall take into account such difference by scaling up PD estimate. The adjustment shall be supported by a reasonable explanation.

(1.3) Statistical default model

Commercial banks are allowed to use simple average[6] of PD estimates for individual obligors in a given rating grade, where such PD estimates are drawn from statistical models. Commercial banks must comply with the minimum requirements in Section 1.5 : Minimum requirements in use of model.

(2) Commercial banks may use only one or a combination of techniques prescribed in Section 5.6.1 (1) for PD estimation. For example, commercial banks may have a primary technique and using others for comparison or adjustment of estimates in order to make PD estimate become more appropriate.

(3) Commercial banks shall recognise the importance of using judgment to supplement the estimation technique especially in case where there is limitation of information or techniques. The application of a technique without reasonable supporting analysis is not acceptable by the Bank of Thailand.

(4) Commercial banks may use internal data or external data sources or pooled data or a combination of 3 sources of data for PD estimation. In this regard, the length of the underlying historical observation period shall be at least 5 years for at least one source. Where the observation period of any data source is longer and materially relevant to obligors, such longer observation period shall be used in PD estimation.

5.6.2 Minimum requirements for retail exposures

(1) Since commercial banks use different approaches in assigning obligors to pools, commercial banks shall use their internal data as a primary source of information for estimating loss characteristics.

(2) Commercial banks are allowed to use data from external sources or data from statistical model for quantification, provided they can demonstrate to the Bank of Thailand that:

(2.1) Commercial banks' processes of assigning each retail exposure to the pool are clearly consistent with the process used by external data source.

(2.2) Risk profiles of commercial banks' obligors are clearly consistent with the risk profile of those from external data source.

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[6] For example, in year 2007, there are 3 obligors in grade 1 which are : Company A (PD_A = 0.09%), Company B (PD_B = 0.07%) and Company C (PD_C = 0.05%). Thus, commercial banks can calculate the PD of grade 1 obligor in year 2007 by using the simple average approach as follows PD grade 1_{2007} = (0.09% + 0.07% + 0.05%) / 3 = 0.07%

(3) Long-run average estimates of PD and long-run default-weighted average loss rate given default of retail exposures can be derived from dividing an estimate of expected long-run loss rate by one of the previous risk components in order to estimate the remaining variables as follows:

(3.1) Estimating default-weighted average LGD by dividing expected long-run loss rate by appropriate long-run average estimate of PD.

(3.2) Estimating long-run average estimate of PD by dividing expected long-run loss rate by long-run default-weighted average LGD.

In this regard, the LGD used for calculating credit risk-weighted assets under the IRB shall be no less that long-run default-weighted average LGD and shall meet the minimum requirements under Section 5.7 : Requirements specific to own-LGD estimate.

(4) Commercial banks may use internal data or external data sources or pooled data or a combination of 3 sources of data for estimation of loss characteristics. In this regard, the observation period shall be at least 5 years for at least one source. Where the observation period of any data source is longer and materially relevant to obligors, commercial banks shall use such longer observation period from that source. Commercial banks are not required to give equal importance to historical data in each year, if they can demonstrate to the Bank of Thailand that more recent data are a better predictor of loss rates.

(5) Some long-term retail exposures may be subject to seasoning effect, where its origination is materially related. In such circumstance, the probability of default may increase as the life of exposure gets longer. Therefore, commercial banks should also consider the life of exposure since its origination in the PD estimation as well as in current and future capital adequacy assessment. Commercial banks may be required to adjust the PD estimates upward, if the Bank of Thailand deems that they do not take into account the seasoning effect in PD estimation.

5.7 Requirements specific to own-LGD estimates

5.7.1 Minimum requirements for all types of exposure

(1) Commercial banks shall estimate LGD[7] for each facility by taking into account the economic downturn and other relevant risks. LGD estimated shall not be less

[7] For more details of LGD estimation, please refer to the Guidance on Paragraph 468 of the Framework Document, July 2005 by the BCBS. http://www.bis.org/publ/bcbs115.htm.

than the long-run default-weighted average loss rate given default, which is calculated from average economic loss of all observed defaults within the data source for that type of facility. For certain types of exposure, loss severities may not vary in accordance with economic condition, therefore, the difference between estimated LGD and long-run default-weighted average LGD may be immaterial. However, for certain types of exposure, the volatility of loss severities resulted from economic cycle or economic condition shall be taken into account for LGD estimation. For this case, LGD estimation may be based on the average of loss severities observed during the period of economic downturn with high credit losses or forecasts based on conservative assumptions or other similar approaches. Both of internal and external data may be used in LGD estimation during such period.

(2) Commercial banks shall estimate LGD in a more conservative manner, when it is observed that there is significant degree of independence between the risk of the obligors and that of the collaterals or collateral providers or when there is currency mismatch between exposures and collaterals or guarantors or protection sellers.

(3) Market values of collaterals shall not be only one factor taken into account for LGD estimation. Historical data on recovery in case of default (Recovery rate) shall also be taken into account for LGD estimation in order to reflect the potential inability of commercial banks to foreclose or liquidate collaterals expeditiously.

(4) In case where LGD directly correlates to collaterals, commercial banks shall have internal requirements for collateral management, operational procedures, legal certainty and risk management process that is consistent with conditions as prescribed in the Notification of the Bank of Thailand Re: Regulations on Calculation of Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA).

(5) Commercial banks shall realise that actual losses may be higher than the expected amount, therefore, the LGD estimation of defaulted exposure shall reflect additional unexpected losses during loss recovery period. Commercial banks shall also estimate the expected losses of each defaulted exposure based on current economic condition or credit status (Best estimate of EL). The difference between LGD and best estimate of EL is the capital requirement (K) to be used for calculating credit risk-weighted asset of defaulted exposure.

In case where provision reserved for defaulted exposure is greater than the best estimate of EL on that exposure, commercial banks shall be able to justify such differences to the Bank of Thailand.

5.7.2 Additional minimum requirements for sovereign, bank and corporate exposures

(1) Data used in LGD estimation shall be historical **loss data** from any source of which the observation period shall be at least 1 business cycle and shall not be less than a period of 7 years.

(2) In case where any data source of commercial banks spans longer observation period and is materially relevant to commercial banks' exposures, commercial banks shall use the longer observation period from that source as well.

5.7.3 Additional minimum requirements for retail exposure

(1) Data used in LGD estimation shall be historical **loss data** from any source of which the observation period shall be at least 5 years. If data available are limited, commercial banks shall estimate LGD in a more conservative manner.

(2) Commercial banks are not required to give equal importance to historical data of each year, if commercial banks are able demonstrate to the Bank of Thailand that more recent data are better predictors of losses.

5.8 Requirements specific to own-EAD estimates

5.8.1 Minimum requirements for all type of exposures

(1) Commercial banks are able to use on-balance sheet netting between assets (loans) and liabilities (deposits) of the same counterparty. By using on-balance sheet netting technique, EAD will be reduced from the recognition of credit risk mitigation. Commercial banks shall comply with the minimum requirements for on-balance sheet netting, currency mismatch and maturity mismatch as prescribed in the Notification of the Bank of Thailand Re: Regulations on Calculation of Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA).

(2) Commercial banks using the AIRB shall consider the possibility of additional drawing by the obligor up to and after the event of default and shall have clear procedures and guidelines on EAD estimation for each type of loan facility.

(3) Commercial banks shall estimate long-run default-weighted average EAD. The level of EAD may be adjusted upward to reflect possibility of error in estimation. Commercial banks shall incorporate a larger margin of conservatism where there is positive correlation between EAD and default rate.

(4) For exposures for which EAD estimates are volatile over the economic cycle, commercial banks shall estimate EAD during the period of economic downturn in case where such estimate is more conservative than the long-run default-weighted average EAD. Commercial banks that use their internal model to estimate EAD may take into account drivers that are volatile with economic conditions in EAD estimation. In case where internal data sufficiently spans over long period, commercial banks may use such data for determining the impact from previous recession. In case where long-run data is not available, commercial banks may use the external data for EAD estimation in a conservative manner.

(5) The requirements that commercial banks use for EAD estimation shall be reasonable and plausible by taking into account an analysis on all relevant and material data. Furthermore, commercial banks shall review EAD of all types of facility whenever new information is available, and at least annually.

(6) Commercial banks shall have policies and strategies for monitoring debt repayment to prevent additional drawing in circumstances that could lead to default, such as covenant violations or events that are considered as default under the credit agreement.

(7) Commercial banks shall have adequate systems or procedures to monitor outstanding exposures compared against credit line, changes in debt outstanding of each exposure and each grade, as well as overall debt outstanding balances on a daily basis.

5.8.2 Additional minimum requirements for sovereign, bank and corporate exposures

(1) Data used in EAD estimation shall be historical data from any data source of which the observation period shall cover at least 1 complete business cycle and shall not be less than a period of 7 years.

(2) In case where any data source of commercial banks spans longer observation period and is materially relevant to commercial banks' exposures, commercial banks shall use the longer observation period of data from that source as well.

(3) EAD shall be calculated by using a default-weighted average not a time-weighted average.

5.8.3 Additional minimum requirements for retail exposures

(1) The minimum observation period of data used to estimate EAD shall be historical data that covers at least 5 years, continuously. In case where data is limited, commercial banks shall conduct such estimation in a more conservative manner.

(2) Commercial banks are not required to give equal importance to historical data of each year, if commercial banks are able to demonstrate to the Bank of Thailand that the more recent data are better predictors of drawdown.

5.9 Minimum requirements for assessing the effect of guarantees and credit derivatives

5.9.1 Minimum requirements for sovereign, bank, and corporate exposures under the AIRB with own LGD estimation, and minimum requirements for retail exposures

(1) Guarantees

(1.1) Commercial banks with approval for using their own LGD estimates may reflect the credit risk mitigating effects of guarantees through an adjustment to either LGD or PD. Whichever adjustment approach is chosen, commercial banks shall apply the same approach consistently to all transactions under the same type of guarantee.

(1.2) For retail exposures, commercial banks may reflect the credit risk mitigating effects of guarantees through an adjustment to either LGD or PD for individual obligation or a pool of exposure. Whichever adjustment approach is chosen, commercial banks shall consistently apply the same approach to all transactions under the same type of guarantee.

(1.3) Through an adjustment to either PD or LGD, the risk weight of exposures with guarantees shall not be lower than that of direct exposures to the guarantor. The Bank of Thailand does not allow commercial banks to take into account the effect from imperfection correlation between PD of the exposure and the guarantor in constructing and developing internal rating system and rating assignment process. Therefore, PD or LGD adjustment under guarantee shall not take into account the double default effect as well. Nonetheless, commercial banks are able to take into account the double default effect in calculating credit risk-weighted asset under the requirements and procedures as prescribed by the Bank of Thailand.

(1.4) Commercial banks shall assign rating to exposures and guarantors at the outset and on-going basis and commercial banks shall

(1.4.1) Comply with the minimum requirements for rating assignment and establish a system to regularly monitor the guarantor's condition as well as ability or willingness to fulfil its obligations.

(1.4.2) Gather all relevant information of exposures both with and without guarantee as well as the information of the guarantors as prescribed under 2.4 (Data maintenance).

On this, for a case of retail exposures with guarantees, commercial banks shall also comply with the aforementioned requirements when assigning retail exposure into the pool and when estimating PD.

(1.5) Commercial banks shall establish risk management process for the concentration of guarantors. Especially, commercial banks shall assess risks arising from the concentration of major guarantors and the concentration of guarantors in each business sector in accordance with the Notification of the Bank of Thailand Re: Regulation on Supervisory Review Process (Pillar 2).

(2) Eligible guarantors and guarantees

(2.1) The Bank of Thailand does not impose any restrictions on the types of eligible guarantors. A Commercial bank, on its own discretion, may specify qualifications or requirements of eligible guarantors to be applied for credit risk mitigation in calculating credit risk-weighted assets. The commercial banks shall require guarantors to have guarantee contracts specifying that the amount and the tenor of the guarantee are binding and legally enforceable in taking control over guarantors' assets. The contracts shall not contain any clause allowing the guarantor to terminate the guarantee.

(2.2) A Commercial bank is able to use a conditional guarantee which allows the guarantor to limit a scope of guarantee. Commercial banks shall demonstrate to the Bank of Thailand that commercial banks take into account the effect on risk mitigation that may be deteriorated under the conditional guarantee.

(3) PD or LGD adjustment in case of guarantees

(3.1) Commercial banks shall have clear requirements for adjusting exposure rating grade or LGD (or the process of allocating exposures to pool in case of eligible purchased receivables or retail exposures) to reflect the impact of the guarantee in

credit risk-weighted asset calculation. Such requirements shall have detail of internal rating assignments that is consistent with the minimum requirements as prescribed by the Bank of Thailand under 1.1 (Rating dimension) and 1.3 (Rating requirement), and consistent with all the relevant minimum requirements for assignment of obligor and facility rating.

(3.2) In prescribing requirements for PD or LGD adjustment, as well as rating assignment (or the process of allocating exposures to pool in case of eligible purchased receivables or retail exposures), commercial banks shall take all relevant information into account.

(3.3) Requirements for PD or LGD adjustment, and rating assignment (or the process of allocating exposures to pool in case of eligible purchased receivables or retail exposures) shall be reasonable and explainable. Such requirements shall address the guarantor's ability and willingness to repay, period of repayment, correlation between repayment ability of the guarantor and the obligor, and other residual risks, such as currency mismatch between the underlying exposures and the guarantees.

(4) Credit derivatives

(4.1) In case of the single-name credit derivatives, commercial banks shall comply with the same minimum requirements as prescribed in (1) – (3) above by treating credit derivatives as guarantees and protection sellers as guarantors.

(4.2) Commercial banks shall prescribe clear requirements for adjustment to exposure rating or LGD (or the process of allocating exposures to pool in case of eligible purchased receivables or retail exposures) in case where credit derivatives partly covers the exposure (Partial coverage) or where there is the currency mismatch between credit derivatives and underlying obligation[3]. The Bank of Thailand does not allow commercial banks to adjust exposures' rating or LGD in case where there are differences between the underlying obligation and the reference obligation[3], except the adjustment is in accordance with the requirements as prescribed in the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA).

(4.3) In addition, such requirements shall take into account the payout structure of the credit derivatives and shall conservatively assess the impact of such structure on the level and timing of recoveries as well as remaining residual risks.

5.9.2 Minimum requirements for sovereign, bank and corporate exposures to apply supervisory LGD under the FIRB

Commercial banks adopting the FIRB shall comply with the minimum requirements under 5.9.1 when applying supervisory LGD except for the following cases:

(1) Commercial banks are not able to reflect credit risk mitigating effect of guarantees or derivatives through LGD adjustment, only PD adjustment is allowed.

(2) Guarantors or protection sellers shall be approved by the Bank of Thailand under the requirements as prescribed in the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA), or shall be corporate entities that are internally rated and associated with a PD **below that of an obligor.**

5.10 PD and LGD (or EL) estimation for purchased receivables

Commercial banks that calculate credit risk-weighted asset for purchased receivables (retail exposures or eligible corporate exposures) by applying top-down approach for default risk and /or adopting IRB for dilution risk shall comply with the following minimum requirements.

5.10.1 Commercial banks shall group the receivables into sufficiently homogeneous pools in order to determine accurate estimates of PD and LGD (or EL) for default risk and EL for dilution risk. Moreover, data and methods used to estimate PD, LGD and EL of purchased receivables shall be complied with the minimum requirements for retail exposures.

5.10.2 Commercial banks shall take into account all relevant data relating to quality of purchased receivables in their estimation, such as homogeneous pools provided by the seller or external/internal data source. In addition, commercial banks shall assess whether information received from the seller, especially the data on type, volume and outstanding quality of the purchased receivables are agreed upon by both parties.

5.10.3 Commercial banks that have purchased receivables shall demonstrate to the Bank of Thailand to ensure that advances paid to sellers can be recovered from liquidation of receivables pool or collected from purchased receivables. Commercial banks are able to apply the Top-down approach in case where the purchased receivables have the same characteristics as prescribed in Attachment 4 and commercial banks shall comply with the following minimum requirements, divided into 5 topics, as follows:

(1) Legal certainty

(1.1) Commercial banks shall have established procedures to ensure that they have rights to control over the repayment from purchased receivables under all foreseeable situations, as well as the case where sellers or servicer confronts financial distress or bankruptcy.

(1.2) In case where the purchased obligors make payments directly to the seller or servicer, commercial banks shall regularly verify that such payments are transferred in full amount to commercial banks and within the contractual agreement. In addition, the rights to control over the repayment shall be protected to avoid significantly delayed payment due to bankruptcy stays or legal challenge.

(2) Effectiveness of monitoring system

Commercial banks shall be able to monitor the quality of the purchased receivables and the financial conditions of seller or servicer. Particularly in the followings:

(2.1) Commercial banks shall assess the correlation between the quality of the purchased receivables and the financial conditions of the seller and the servicer, and shall prescribe policies or procedures to protect against unexpected events arising from deterioration in the quality of purchased receivables and high correlation between financial conditions of seller and servicer, as well as shall assign internal rating for the seller and the servicer.

(2.2) Commercial banks shall have clear and effective policies and procedures for determining eligibility of the seller and the servicer. Commercial banks shall conduct periodic reviews of the seller and the servicer to verify accuracy of reports prepared by the seller or servicer, detect fraud or operational weakness, and verify quality of the seller's credit policies and servicer's collection policies and procedures. The finding of these reviews shall be documented.

(2.3) Commercial banks shall be able to assess the characteristics of the purchased receivables pool in the following issues.

(2.3.1) Advance that breaks the purchase rate (Over-advances)

(2.3.2) Seller's profile, such as past due debts

(2.3.3) Payment terms

(2.3.4) Whether the seller is both debtor and creditor of the purchased obligors (Contra account) since the purchased obligors may offset their debt obligation with the seller, therefore commercial banks are not able to collect any proceeds from such purchased receivables.

(2.4) Commercial banks shall have effective policies and procedures to monitor single-obligor concentrations both within and across the pool of purchased receivables.

(2.5) Commercial banks shall receive timely and sufficiently detailed reports that specify ageing and dilution of receivables to ensure compliance with the internal requirements and management of the purchased receivables as well as policies in determining advance payment to the seller of receivables. Such reports shall provide a tool to monitor seller's terms of sale and dilution of receivables.

(3) Effectiveness of work-out system

The effective work-out system requires procedures to detect deterioration in the seller's financial condition and quality of the purchased receivables at an early stage, and shall be able to deal with problems proactively especially for the followings.

(3.1) Commercial banks should have clear and effective policies, procedures and information system to:

(3.1.1) Monitor compliance with all agreements in facility contract, such as covenants, setting of credit line, concentration limit and conditions that commercial banks (buyer) do not purchase additional receivables from the seller as agreed upon (early amortization trigger), such as there is an event indicating significant deteriorations in quality of purchased receivables.

(3.1.2) Monitor compliance with the commercial banks' internal policies, such as advance rate or eligible receivables. The bank's system should track covenant violations or waiver or exceptions to policies or procedures as prescribed by commercial banks.

(3.2) Commercial banks should have policies and procedures for approving, detecting, monitoring and correcting the case of over-advance.

(3.3) Commercial banks should have clear and effective policies and procedures for dealing with the seller or the servicer with deteriorated financial conditions,

such as early amortization trigger, requirements to protect covenant violations, and efficient policies and procedures to deal with legal operations occurred with purchased receivables.

(4) Effectiveness of systems for collateral control, credit or cash management

Commercial banks shall have clear and effective policies to manage, control purchased receivables, credit lending and cash management especially for the followings.

(4.1) Written internal policies shall specify all material details of receivables purchase programmes, such as purchase rate, eligible collateral, necessary documents, concentration limit and cash management. Such requirements shall cover all material factors, such as financial conditions of seller or servicer, concentration of risks, trends in the quality of purchased receivables and seller's customer base.

(4.2) Internal system shall ensure that receivables can be purchased only against specified supporting collateral and documentation, such as invoices, servicer certificate and shipping documents.

(5) Examination on compliance with the commercial banks' internal polices and procedure

Commercial banks should have internal control system for assessing compliance with internal policies and procedures in the followings.

(5.1) Regular internal or external audits of all important processes of the commercial banks' receivables purchase programme.

(5.2) Examination on segregation of duties:

(5.2.1) between the assessment of the seller or servicer, and the assessment of the obligor

(5.2.2) between the assessment of the seller or the servicer, and the assessment review of the seller or the servicer

(5.3) Back office operations with respect to qualifications, experience, number of staff and operation systems

6. Validation of internal estimate

6.1 A Commercial bank shall establish a system to validate accuracy and consistency of the internal rating system, the rating assignment process and estimation of all risk components. In addition, commercial banks shall demonstrate to the Bank of Thailand that the internal validation process is able to appropriately assess the performance of the internal rating system and estimation of risk components.

6.2 Commercial banks shall regularly compare the actual default rates with estimated PD for each rating grade of the obligors and shall demonstrate to the Bank of Thailand that the actual default rates do not significantly differ from the estimates for each rating grade. In addition, commercial banks shall prescribe the significant level in written agreement. Commercial banks adopting the AIRB shall also compare the estimated LGD and EAD with actual LGD and EAD. Such comparisons make use of historical data that are as long as possible. Moreover, commercial banks shall prepare the documents indicating methodologies and data used in the comparison, and update the analysis and documentation at least annually.

6.3 Commercial banks shall also use other quantitative validation tools, and compare the estimates with relevant external data sources. Such analysis shall be based on data that are appropriate to portfolios of commercial banks. The data shall be updated regularly and cover relevant observation period. Moreover, assessment of the commercial banks' internal rating system shall cover long historical data, at least one business cycle.

6.4 Commercial banks shall demonstrate that other quantitative testing methods and other validation methods do not vary across the business cycle, all changes in methods and data used for validation (both data sources and observation periods) shall be clearly and thoroughly documented.

6.5 Commercial banks shall have well-documented internal requirements for a case where there are differences between actual PD, LGD and EAD and actual values causing the deterioration in credibility of the estimation. In such case, commercial banks shall review the estimates by adjusting them upward to reflect default and loss experience. On this, the internal requirements should take into account the business cycles and volatility of experienced default rate as well.

6.6 Commercial banks that use supervisory risk components as specified by the Bank of Thailand instead of their own estimates should compare the actual LGD and EAD with those prescribed by the Bank of Thailand, and should incorporate actual LGD and EAD into the assessment of economic capital of commercial banks as well.

6.7 Commercial banks shall refer to the best practices for risk management regarding model validation as prescribed in the Bank of Thailand Circular Re: Best Practices for Risk Management.

7. Minimum requirements for applying LGD and EAD as prescribed by the Bank of Thailand

Commercial banks adopting the FIRB shall comply with the minimum requirements as prescribed by the Bank of Thailand in the Notification of the Bank of Thailand Re: Regulation on Calculation of Credit Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA) (Minimum requirements for credit risk mitigation and minimum requirements for use of financial collateral for credit risk mitigation).

In recognising other types of collateral for credit risk mitigation, commercial banks shall comply with the following requirements.

7.1 Commercial real estate (CRE) and residential real estate (RRE)

7.1.1 Definition of eligibility of commercial real estate (CRE) and residential real estate (RRE) as collateral

(1) Eligible CRE and RRE collateral for sovereign, banks and corporate exposure shall have the following characteristics[8].

(1.1) Obligor's ability to repay does not significantly depend on performance or cash inflow of the underlying real estate or project pledged as collateral, but rather on cash flow generated from other sources.

(1.2) The value of collateral pledged shall not significantly depend on the obligor's operating performance.

Nonetheless, real estate such as land and buildings for business operation are considered eligible collateral as long as the obligor's ability to earn income of debtor does not directly depend on such real estate.

(2) Eligible CRE and RRE collateral for sovereign, bank and corporate exposures are exclusive of income producing real estate (IPRE) since its characteristics are not in accordance with the requirements under (1.1) and (1.2) (above)

[8] The Bank of Thailand recognises multifamily residential real estate not meeting the requirements under (1) (above) as eligible collateral only for the case of claims on state enterprises which is owner of the real estate project financially supported by the government, such as the National Housing Organization.

Nonetheless, commercial banks are allowed to recognise some types of IPRE collateral such as office buildings, multi-purpose commercial buildings and multi-tenanted commercial buildings etc. as credit risk mitigation, where they can provide supporting data or evidence that the real estate market in Thailand is well-developed and long-established. The characteristics of such real estate market shall satisfy the following conditions.

(2.1) Losses of collateralised exposures of these types of credit shall not exceed 0.3% of total outstanding loans in any given year. The collateral value of which is calculated by 50% of market value of collateral or 60% of the mortgage-lending-value (MLV), whichever is lower.

(2.2) Overall losses from these types of credits each year must not exceed 0.5% of total outstanding.

7.1.2 Operational requirements for eligible CRE and RRE

Eligible CRE and RRE collateral shall meet the requirements set out under 7.1.1. In addition, a bank shall adhere to the following operational requirements.

(1) Commercial banks shall be able to legally enforce the collateral, obtain a senior right of claim over that collateral, and proceed to submit the legal file in a timely manner.

(2) Commercial banks shall assign collateral value equal to or less than current market value of the real estate, that is, the value of real estate that can be used for trading between willing buyer and seller on appraisal/valuation date of the real estate under trading condition that the buyer and the seller do not have mutual benefits.

(3) Commercial banks shall appraise collateral under the requirements as prescribed in the Bank of Thailand Guidelines Re: Guidelines on Appraising Collateral and Non Performing Assets Acquired from Debt Repayment. Commercial banks should increase frequencies of appraisal in case where market conditions change materially or there is a sign indicating that collateral value may reduce significantly, or when the obligor defaults. Commercial banks may apply statistical methods to indicate significant deterioration in collateral value, such as benchmarking with the house price indices or conducting sampling test.

(4) In case of second lien debt or lower, a bank shall take into account the sum of debt outstanding of second lien and all more senior liens in calculating the ratio of collateral value to exposure (C/E). This can have an impact to the comparison between

such ratio and C* (means the minimum ratio of collateral value (C) to exposure (E), it is regarded that this portion of exposure is secured) and C** (means the minimum ratio of collateral value to exposure, it is regarded that this portion of exposure is fully secured and commercial banks are able to use LGD as prescribed) in Attachment 1.

(5) Commercial banks shall establish collateral management policy in accordance with the following requirements.

(5.1) Commercial banks shall have written document specifying types of eligible CRE and RRE collateral and the ratio of loan to collateral value.

(5.2) Commercial banks shall prescribe procedures to ensure that the real estate pledged as collateral is appropriately insured against damage or deterioration.

(5.3) Commercial banks shall establish ongoing monitoring system to track whether other creditors or other related persons have senior rights to receive payment from real estate pledged as collateral, such as tax payment to authority.

(5.4) Commercial banks shall monitor conditions of collateral whether it can cause any damage to the environment, such as presence of toxic materials on such real estate.

7.2 Receivables

7.2.1 Definition of eligible receivables

Eligible receivables recognised as credit risk mitigation in the calculation of credit risk-weighted asset means trading receivables or financial receivables of commercial banks with an **original maturity** less than or equal to 1 year, including receivables from sales of goods or services, and general lending to buyers, suppliers, renter, government authorities, public entities or other parties that are not related to commercial trade of goods or services. In this regard, receivables related to securitization or credit derivatives are excluded.

7.2.2 Operational requirements for eligible receivables

(1) Requirements on legal certainty

(1.1) A commercial bank shall have a robust legal mechanism to ensure that the lender have clear rights over the proceeds from the collateral.

(1.2) Commercial banks shall have senior claim on collateral under the relevant laws.

(1.3) Documents or supporting evidences shall be legally binding to all related parties, and commercial banks shall regularly conduct legal review to verify their enforceability.

(1.4) Collateral arrangements shall be well-documented to ensure that the proceeds from collateral can be collected in a timely manner. In the event of the obligor's financial difficulties or default, commercial banks should have legal authority to sell receivable pledged as collateral without prior consent from the obligors.

(2) Requirements on risk management

(2.1) A commercial bank shall establish process for credit risk assessment of receivable pledged as collateral. The process shall include an analysis on business and industry conditions of the obligors, business type of receivables, and a review of reliability and creditability of obligor's credit policy.

(2.2) The ratio of the exposure amount to the value of the receivables pledged as collateral shall be properly prescribed by taking into account the cost of debt collection, concentration within receivables pool pledged by an individual obligor or potential concentration risk within the commercial bank's total exposures.

(2.3) A commercial bank shall have an ongoing monitoring process that is appropriate to the type of collateral. This process should include collateral specification and assessment, such as ageing, examination on collateral and concentration within a pool of receivables pledged as collateral, examination on the proceeds received, and financial analysis of the obligor.

(2.4) Receivables pledged as collateral should not correlate with the obligor. In case of significantly high correlation, e.g. the financial condition of the receivables pledged as collateral depends on the performance of the obligor, or the receivables pledged as collateral and the borrower are in the same industry. Commercial banks should take into account such risk in setting the ratio of the collateral to the amount of exposure (margin). The Bank of Thailand does not recognise the receivables from the obligor's affiliated companies or staffs of affiliated companies as credit risk mitigants.

(2.5) A commercial bank should have a documented process for monitoring receivables payment during financial deterioration.

7.3 Other collaterals

7.3.1 Definition of other eligible collaterals

Other collaterals that the Bank of Thailand recognises as eligible for credit risk mitigation in the credit risk-weighted asset calculation shall be in accordance with the 2 following conditions.

(1) The existence of liquid markets that allows for efficient trading of collaterals.

(2) The existence of market prices to ensure that collateral value applied by commercial banks does not deviate significantly from these market prices.

Currently, the Bank of Thailand recognises automobiles, motorcycles, ships/fleet, airplanes and commodities traded in the Agriculture Commodity Futures Exchange Market of Thailand (AFET) as other eligible collaterals.

7.3.2 Requirements for other eligible collateral

To recognise eligible collaterals as credit risk mitigation, commercial banks shall comply with the requirements as prescribed under 7.1.2 and the following requirements.

(1) A commercial bank shall have the first lien on the proceeds of the collateral prior to any other creditors except tax creditor (Revenue Department).

(2) Credit agreement shall include specification of collateral and frequency of appraisal.

(3) A commercial bank shall specify in its credit policy the types of collateral, policies and procedures for each type of collateral. These shall be properly documented and available for examination.

(4) A commercial bank shall specify the following in its credit policies: the collateral requirement relative to the exposure, the ability to liquidate collateral, the ability to conduct reasonable appraisal or revaluation, the frequency of appraisal and the volatility of the collateral value. In addition, such policies should include procedures for periodic revaluation to ensure that collateral value is appropriately adjusted by taking into account obsolescence or deterioration in collateral value.

(5) In case of the inventories pledged as collateral, the revaluation process shall include assessment on the quality of the collaterals.

8. Requirements for recognition of leasing

8.1 Minimum requirements for leasing

Commercial banks shall comply with the same requirements as specified for CRE/RRE collateral under 7.1.2 or other eligible collaterals under 7.3.2, as the case may be, and shall comply with additional requirements, as follows.

8.1.1 A commercial bank, as a lessor, shall have robust risk management with respect to the location, the usage, the age and deterioration of asset.

8.1.2 A commercial banks, as a lessor, shall have legal ownership and be able to exercise the rights of lessor in a timely manner.

8.1.3 Amortization rate of lease payments used by commercial banks shall not significantly differ from depreciation rate of asset to the extent that credit risk of commercial banks is over-mitigated.

8.2 Risk-weighted asset calculation for leasing

Risk-weighted asset calculation for the exposure from leasing can be divided in 2 cases, as follows.

8.2.1 Leasing without residual value risk[9]

Commercial banks shall calculate credit risk-weighted asset for this type of exposure as if commercial banks lend to the lessee and have the leased asset as collateral. The calculation formula depend on the types of lessee. Collaterals used for credit risk mitigation shall be in accordance with the requirements as specified by the Bank of Thailand (Credit risk mitigation).

8.2.2 Leasing with residual value risk

Commercial banks shall calculate credit risk-weighted asset for this type of exposure by dividing calculation into 2 portions, as follows.

(1) Risk-weighted asset for default risk

[9] Residual value risk means the risk of loss from the asset fair value drop to be lower than its residual value estimated on the lease inception date.

Commercial banks shall calculate EAD from the sum of cash flows from lease payment discounted by the appropriate discount rate. The calculation formula depends on the types of lessee. PD is equal to PD of lessee, and LGD is applied in accordance with the approach adopted by commercial banks.

(2) Risk-weighted asset for residual value risk

Commercial banks shall calculate credit risk-weighted asset by multiplying the residual value by 100% risk weight.

9. Risk-weighted asset calculation for equity exposure

9.1 Internal models market-based approach

Commercial banks that adopt an internal model approach in the credit risk-weighted asset calculation for equity exposure shall demonstrate that they are able to comply with both qualitative and quantitative minimum requirements at the outset and on an ongoing basis. Nevertheless, commercial banks that fail to comply with such minimum requirements on an ongoing basis shall develop working plans to achieve immediate return to full compliance and submit them to the Bank of Thailand for approval. Commercial banks shall implement such working plans in a timely manner. During non-compliance period, commercial banks shall apply the simple risk weight approach in their risk-weighted asset calculation.

9.2 Risk-weighted asset calculation and risk quantification

The minimum quantitative requirements for credit risk-weighted asset calculation for equity exposure under internal model are as follows.

9.2.1 Commercial banks shall calculate the credit risk-weighted asset for equity exposure by using potential loss from an instantaneous shock that is equal to the difference between quarterly returns of equity exposure and returns of risk free financial instruments at 99% one-tailed confidential interval.

9.2.2 The loss estimated under 9.2.1 shall take into account adverse market fluctuations relating to long-term risk of commercial banks arising from the equity exposure.

(1) Data used in the estimation shall be observed within sufficiently long period and reflect risk exposure of commercial banks from having equity exposure so that loss estimation is statistically reliable and is not based exclusively on judgments.

(2) Commercial banks shall demonstrate to the Bank of Thailand that the shocks employed in the internal model provide conservative estimates of potential loss over a long term market or business cycle.

(3) If commercial banks do not use sufficiently long-run data, such as not covering period of severe declines in market prices of equities held by commercial banks, the Bank of Thailand would deem that the losses are under estimated, unless supporting evidences are provided to indicate that the model or data are appropriately adjusted to deal with such event. The adjustment shall be conducted through a well-developed and documented consideration and analysis to ensure that the estimates calculated from the model are realistic and conservative.

(4) In constructing Value-at-Risk (VaR) model to estimate quarterly potential losses, commercial banks may use quarterly data or convert shorter-term data to quarterly equivalent data by using appropriate technique supported by reliable evidences. In addition, this conversion shall be conducted through a well-developed and well-documented consideration and analysis.

(5) Where only limited data are available or where technical limitations are such that estimates from any single method will be of uncertain quality, commercial banks shall adjust loss estimated from the model upward to the appropriate level and shall avoid underestimation of loss.

9.2.3 Commercial banks may apply any types of VaR model in the estimation, such as Variance-covariance, Historical simulation or Monte Carlo simulation. Nonetheless, the model applied shall captures all types of material risks from having equity exposures, both general market risk and specific risk. The model applied shall be able to adequately explain historical price changes and capture both magnitude and changes in the portfolio concentration, as well as adverse market conditions. Moreover, the data applied in the estimation shall be a good representative that reflects the risk of equity exposure.

9.2.4 Commercial banks may apply modelling techniques, such as Historical scenario analysis in calculating risk-weighted asset for equity exposures. Commercial banks shall demonstrate to the Bank of Thailand that their methodologies and results are able to estimate potential loss at 99% one-tailed confidential interval as prescribed under 9.2.1.

9.2.5 Commercial banks shall apply the model that is appropriate for the risk profile and complexity of their equity exposures. In case where the equity holdings are highly correlated with the value of reference equities, especially in a non-linear form, such

as equity derivatives and convertible instruments, commercial banks shall apply the model that is able to appropriately capture risks relating to such equity.

9.2.6 Commercial banks may apply a correlation of equity exposure for their internal risk assessment under the approval from the Bank of Thailand. In case where explicit correlation model is applied, such as Variance/covariance and VaR, commercial banks shall document and conduct supporting empirical analysis. The Bank of Thailand determines appropriateness of implicit correlation assumption applied by commercial banks through a review on model construction and techniques.

9.2.7 In case where commercial banks apply mapping method, by mapping equity exposures with a proxy or market index or other risk factors, commercial banks shall be able to explain clearly, reasonably and conceptually. Techniques and mapping process shall be documented and supported by theoretical and empirical evidence. Moreover, use of expert judgments in quantitative techniques to estimate volatility of return shall take into account all relevant and material information.

9.2.8 Commercial banks may apply single or multi-factor models in respect to the characteristics of their equity exposures, such as listing in the stock exchange, industry type of equities. Commercial banks have rights in choosing the factors but they shall be able to demonstrate through the empirical analysis that the factors chosen are appropriate to the model and capture all material risks both general market risk and specific risk.

9.2.9 In assessing volatility of return for equity exposures, commercial banks shall apply relevant and material information and methodology. Commercial banks may apply independently reviewed internal data, external data or pooled data. The number of risk exposure in the sample and period of data used for estimation shall be sufficient to ensure accurate and robust estimates. Moreover, commercial banks should have appropriate measures to limit sampling bias and survivorship bias in estimating volatility of return.

9.2.10 Commercial banks shall have comprehensive and robust stress test by taking into account price fluctuation that may arise under hypothetical scenarios or historical scenarios. The stress test should reflect worst-case loss from equity exposures both listed in the stock exchange and other equities. At least, commercial banks shall conduct the stress test that takes into account an event occurred beyond the level of confidence interval prescribed in the model.

9.3 Risk management process and controls

Commercial banks' internal requirements to manage banking book equity exposures shall be in accordance with the requirements as specified by the Bank of Thailand. Moreover, in developing and applying internal model for calculation of risk-weighted asset, commercial banks shall have policies, procedures and control to ensure that the model and model development process are reliable, or at least, the following requirements should be taken into account.

9.3.1 The internal model shall be a part of overall risk management process and risk management of equity exposures in banking book of commercial banks. Commercial banks shall use such model to:

(1) set investment hurdle rate and evaluate investment choices

(2) assess equity portfolios performance

(3) allocate economic capital for equity exposures and evaluate adequacy of capital in accordance with the Internal Capital Adequacy Assessment Process (ICAAP) as prescribed in the Notification of the Bank of Thailand Re: Regulation on Supervisory Review Process (Pillar 2).

Moreover, commercial banks shall be able to demonstrate that outputs from the internal model play an important role in the commercial banks' investment management process, for example, such outputs should be presented in the minutes of investment committee meeting.

9.3.2 Commercial banks shall have independent management system and control procedures to ensure that all elements of internal model development process are reviewed independently and regularly. The review includes approval of the model revision, verification of input data and estimates generated from the model. Moreover, commercial banks shall place importance on the mapping and proxy techniques, as well as other material components of the model. According to such review, commercial banks shall assess accuracy, completeness and appropriateness of inputs and outputs generated from the model, and shall identify and mitigate errors of the model. The model review process should be conducted by independent risk control unit, internal audit unit or external auditors.

9.3.3 Commercial banks shall have systems and procedures that are adequate for monitoring investment limits and risk level of the equity exposures.

9.3.4 The units responsible for the model development and implementation shall be independent from the units responsible for investment management.

9.3.5 All relevant units responsible for any aspect of the model development process shall be adequately qualified and capable. The management of commercial banks shall allocate sufficiently skilled and competent resources to this function.

9.4 Model validation and documentation

Commercial banks that use the internal model for the calculation of credit risk-weighted asset shall 1) establish a robust system to validate the accuracy and consistency of the model, as well as inputs used in the model. 2) document all material components of the model and model development process. 3) have an internal audit department or other independent units responsible for conducting a review on model validation.

The Bank of Thailand is responsible for conducting a review on the model development process, model validation system, as well as other supporting documents and examination results from internal and external departments of commercial banks.

9.4.1 Validation

(1) A commercial bank shall establish a system for to validate the accuracy and consistency of the internal model and the model development process. Moreover, commercial banks must be able to demonstrate to the Bank of Thailand that such processes are able to assess competencies of the model and model development process in a reliable manner.

(2) A commercial bank shall regularly compare actual profits or losses with the modelled estimates, and demonstrate whether actual profits or losses are within the expected range through the comparisons of data over the historical period that is available. The comparison shall be documented and revised at least annually.

(3) A commercial bank should make use of other quantitative validation tools as well as comparisons with external data sources. This should be done by using historical data that are appropriate to commercial banks' equity portfolios, are regularly updated and cover at least one business cycle. Moreover, commercial banks shall demonstrate to the Bank of Thailand that their quantitative validation and data used are consistent over time, and shall clearly document any changes in the estimation methods or data used (both data sources and periods).

(4) A commercial bank that use internal model shall have clear and complete standards for a model review as it is required to regularly assess the credibility of internal model. This should be done by comparing the actual values with the estimates in order to revise the model on an ongoing basis. On this, the standards for the model review shall take into account the economic conditions and the volatility of returns of equity exposures. Moreover, the model revision under the results of such review shall be well-documented and in line with the standards for the model review of commercial banks.

(5) Commercial banks that use the internal model shall develop and maintain database of equity exposure in terms of the actual quarterly returns and estimates from the model. The database shall be regularly used in conducting back testing for the loss estimates. Moreover, commercial banks should conduct back testing for volatility estimates and proxies that are used in the model as well. The Bank of Thailand examiners may require commercial banks, on a case-by-case basis, to scale the quarterly projected estimates to a shorter time horizon, as well as collect actual data and conduct back testing for such period.

9.4.2 Model documentation

Commercial banks shall demonstrate to the Bank of Thailand that their internal model has good predictive power and that the credit risk-weighted asset calculation will not be distorted by the model output. Therefore, commercial banks shall document or provide written supporting documents related to all material factors used in the model and the model development process, as well as operational instructions. Such documents shall be demonstrated to the Bank of Thailand to ensure the commercial bank's compliance with both qualitative and quantitative minimum requirements as specified by the Bank of Thailand. Commercial banks shall explain how to apply the model in respect to type of portfolios, estimation methodologies, and responsibilities of staffs involved in the model development, approval and review process. On this, the supported documents for the use of model shall cover the followings.

(1) A Commercial bank shall document rationales for its choices of the internal model and shall be able to demonstrate that the model and the modelling procedures provide reliable results and reflect risk profiles of equity exposure of commercial banks. Internal model and model development process shall be regularly reviewed to determine whether they remain applicable to current portfolios and business environments. Moreover, any changes in the internal model or implementation process after the latest examination conducted by the Bank of Thailand, including changes of internal model, as prescribed in commercial banks' requirements for the internal model review shall be documented.

(2) Model documentation should:

(2.1) provide a detailed outline of the theory, assumptions, mathematical concepts or empirical analysis applied for specifying variables and data sources used in the estimation;

(2.2) establish rigorous statistical processes for validating the selection of variables;

(2.3) indicate circumstances under which the model does not work effectively.

(3) In case where mapping or proxy approach is applied, commercial banks shall demonstrate to the Bank of Thailand that the mapping or proxy approach is appropriate to the risk of commercial bank's equity exposures. Commercial banks shall have documents indicating relevant factors, such as type of business, balance sheet characteristics, location, company age, industry sector. Commercial banks shall demonstrate that their mapping or proxy methods:

(3.1) are comparable to the commercial bank's equity portfolios;

(3.2) are derived from historical economic or market conditions that are relevant and material to the commercial bank's equity portfolios;

(3.3) are able to effectively estimate risk components of the commercial bank's equity portfolios

10. Disclosure requirements

A commercial bank adopting the IRB shall comply with the requirements of information disclosures as prescribed in the Notification of the Bank of Thailand Re: Public Disclosure of Capital Maintenance Information for Commercial Banks. In case where commercial banks are not able to comply with the requirements, the Bank of Thailand may consider terminating the approval for credit risk-weighted asset calculation under the IRB.

Attachment 8

Approval requirements and framework for the IRB implementation

A Commercial bank that wish to adopt the IRB approach for the credit risk-weighted asset calculation shall seek prior approval from the Bank of Thailand and shall meet the minimum requirements as prescribed by the Bank of Thailand. The commercial bank shall apply the IRB to all its asset classes and material[1] business units[2], both in terms of asset size and risk profile. Such materiality is determined by the proportion of credit risk-weighted asset calculated under the IRB to total credit risk-weighted assets. Nonetheless, commercial banks adopting the IRB within specified period are able to adopt phased roll-out of the IRB since the immediate adoption of the IRB to all material asset classes and business units may create undue burden and operational costs to the commercial banks.

A Commercial bank adopting the IRB approach for credit risk-weighted asset calculation are required to calculate credit risk-weighted asset and maintain the capital requirement in parallel with their previous approach. The objective is to ensure that the commercial banks are well-prepared for the implementation of the IRB.

A commercial bank starting to adopt the IRB approach for the calculation of capital requirement shall maintain the capital level above the specified level (capital floor) during its initial stage of the IRB implementation This is to prevent a significant decline of capital level from the change of the credit risk-weighted asset calculation.

The Bank of Thailand specifies guidelines on the approval requirements and IRB implementation framework for commercial banks to be complied with, as follows:

I. The IRB implementation

A commercial bank wishing to adopt the IRB for credit risk-weighted asset calculation shall comply with the following requirements:

1. Application for the IRB implementation

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[1] In determining immateriality of business units, commercial banks shall refer to the following requirements.

(1) A business unit that is independent from other business units in terms of techniques, geographic location or management. Therefore, it is not worth to apply the IRB approach due to unnecessary operational burden and cost.

(2) A small business unit with insufficient customer base and small transactions or not worth developing the internal rating and apply the IRB to such business unit.

[2] Business units include units, juristic persons or business lines etc. having independent management either in the legal aspect or in the internal organizational structure. Geographical location may be used as one of the criteria, for example, subsidiaries or foreign branches of commercial banks.

1.1 For general case, commercial banks shall prepare at least 3 copies of the application and supplementary documents **as prescribed by the Bank of Thailand** for the approval of the IRB implementation. The required documents shall be submitted to **the Financial Institution Applications Department**, Bank of Thailand at least 6 months prior to the parallel calculation.

For other specific cases, such as commercial banks that initially operate their businesses in Thailand , or commercial banks adopting the SA as specified in the Notification of the Bank of Thailand Re: Regulations on Calculation of Risk-Weighted Assets for Commercial Banks under the Standardised Approach (SA) but later merged with other commercial banks adopting the IRB and wish to change their credit risk-weighted calculation method to the IRB, the commercial banks shall submit **the application for the IRB and supplementary documents** to the Supervision Group, the Bank of Thailand for approval. The Bank of Thailand is empowered to specify the implementation timelines and guidelines for these commercial banks on a case-by-case basis.

1.2 Commercial banks shall demonstrate, in their **supplementary documents under 1.1,** that the credit risk-weighted calculation under the IRB is in accordance with the implementation framework as prescribed in this document. Moreover, commercial banks shall demonstrate the self-assessment of compliance with minimum requirements as prescribed for credit risk-weighted asset calculation under the IRB as well as capital impact due to the change in credit risk-weighted asset calculation method.

On this, the Bank of Thailand may request commercial banks to submit additional documents or information in supplement for the approval determination.

2. Application in the case of significant changes

In case where a commercial bank proposes a significant change to its credit risk-weighted asset calculation under the IRB, after it has been approved to adopt the IRB, or during the period of approval process, as well as where a commercial bank request to use credit risk mitigation under the double default effects, the commercial bank shall comply with the following requirements:

2.1 If the commercial banks wish to revise or modify the internal rating system or the model used for estimating risk components, the commercial banks shall comply with the guidelines to be specified by the Bank of Thailand. During this period, the commercial banks shall consult with the examiners on a case-by-case basis. In this regard, in case where there is significant revision or modification to the internal rating or the model used for estimating risk components, the Bank of Thailand may specify the followings:

(1) Minimum period for the parallel calculation under the adjusted or modified internal rating system or the model used for estimating risk components and/or

(2) Minimum period for integrating the internal rating system or the model used for estimating risk components to the credit approval process, risk management and internal funds allocation.

2.2 In case of significant changes to the credit risk management system that is relevant to the credit risk-weighted asset calculation under the IRB approach, e.g. a merger or acquisition, the commercial banks shall promptly notify **the Financial Institution Applications Department**, Bank of Thailand. In this regard, for commercial banks wishing to continue adopting the IRB, they shall seek prior approval for the modifications of the system to the Bank of Thailand. This shall be approved on a case-by-case basis **with additional requirements prescribed**, such as credit risk-weighted calculation method during the transition period, conditions or minimum requirements for adopting the IRB.

II. IRB Implementation for material portfolios

1. A Commercial bank adopting the IRB for credit risk-weighted asset calculation shall adopt the IRB across all material, in terms of asset size and risk profile, asset classes and business units.

2. Once the commercial bank adopt the IRB for a particular asset class (or sub-asset class in case of retail exposure) in a given business unit, it is required to adopt the IRB for all exposures within the asset class (or sub-asset class of retail exposure) in the same business unit. In addition, in case where the commercial banks adopt the IRB for corporate exposures, commercial banks shall adopt the IRB for specialised lending sub-class of corporate exposures as well.

3. Commercial banks shall adopt the IRB for their equity exposures, if they are considered material as prescribed by the Bank of Thailand.[4]

4. The Bank of Thailand may allow commercial banks to adopt the SA for

4.1 some asset classes or sub-asset classes in case of retail exposures

4.2 some asset classes within immaterial business units of the commercial bank's financial business group[5]

[4] Commercial banks shall refer to "materiality of equity exposure" as prescribed in Attachment 3 in the topic of "Exceptions of Equity Exposure for the IRB adoption"

4.3 some transactions in the IRB-adopted asset class and/or business unit for which commercial banks are unable to apply the IRB to these transactions due to their exceptional characteristics.

Commercial banks shall demonstrate to the Bank of Thailand that the exposures mentioned under 4.1 – 4.3 are insignificant in terms of size and risk profile.

5. The Bank of Thailand may request commercial banks to maintain additional capital for exposures permitted to adopt the SA for credit risk-weighted asset calculation, if it is deemed that the risks of these exposures are higher than calculated value e.g. investment in equity exposures with high risk. In addition, the Bank of Thailand may request commercial banks to comply with other supervisory measures, such as reduce their credit exposures or may revoke the approval for adopting the SA in those portfolios. In this regard, the commercial banks shall prepare an implementation plan for the credit risk-weighted asset calculation under the IRB within a properly specified timeframe.

6. The Bank of Thailand allows commercial banks to adopt the SA for some asset classes or sub-asset classes, or asset classes of some business units, or some transactions as prescribed under item 4., if the sum of credit risk–weighted assets under the SA does not exceed 15 percent of total credit risk-weighted assets of the commercial banks (credit risk weighted assets of equity exposures are excluded from both denominator and nominator). Consequently, the proportion of the credit risk-weighted asset under the IRB shall be at least 85 percent of total credit risk-weighted assets, that is

$$\frac{RWAs_{IRB}}{RWAs_{SA} + RWAs_{IRB}} \geq 85\%$$

The commercial banks are required to maintain the IRB coverage ratio at the outset of the IRB credit risk-weighted asset calculation for the minimum capital requirement. The IRB coverage ratio shall be maintained on an ongoing basis except for the commercial banks that adopt the IRB by the year-end of 2014, which the Bank of Thailand allows the adoption of the IRB phased rollout within 3 years (Please see further details as prescribed in III). The commercial bank shall outline the detail of asset classes, business units or transactions, as well as immaterial proportion of the credit risk-weighted asset in its application for the IRB implementation submitted to the Bank of Thailand for approval.

[5] "to define a corporate entity within the financial business group" please refer to the definition as prescribed in the approval letter on establishment of the financial business group under the Bank of Thailand Notification Re: Guideline on Consolidated Supervision

7. The Bank of Thailand may not allow some asset classes or sub-asset classes, or portfolios within some business units, or some transactions to be classified as immaterial, if it is deemed that commercial banks are ready to adopt the IRB for such asset classes without too much burden or cost.

8. The Bank of Thailand may allow commercial banks to maintain the IRB coverage ratio temporarily less than that prescribed under item 6 on a case-by-case basis, if it deems necessary and reasonable. For example, the commercial banks that merge with the non-IRB commercial banks, may require additional time period for the transition to the IRB. In this regard, commercial banks shall provide supportive information and submit the plan to achieve the IRB coverage ratio requirement within an appropriate timeframe to the Bank of Thailand.

III. Rollout of the IRB Approach

1. The Bank of Thailand allows a commercial bank that adopt the IRB approach by the year end of 2014 with the IRB coverage of at least 60 percent of total credit risk-weighted asset to adopt IRB phased rollout for some asset classes (or some sub-asset classes in case of retail exposure) or some business units, or some transactions. This can be applied in accordance with the readiness of commercial banks within 3 years since the starting date of the IRB implementation, such as

1.1 A commercial bank may begin adopting the IRB approach for some asset classes (or some sub-asset classes in case of retail exposure) under the same business unit. For example, the IRB may be initially applied to its corporate exposures for a certain period and later to other asset classes under the same business unit until covering all of its material portfolios.

1.2 A commercial bank may begin adopting the IRB for some business units, and later apply the IRB to all material business units under the banking consolidated group. For example, the IRB may be initially applied to the headquarter, and later to other branches overseas until all covering all of its material business units.

1.3 A commercial bank may begin adopting the FIRB, and later adopt the AIRB for some risk components[6]. For example, the commercial bank requesting to adopt the AIRB are able to adopt the IRB by initially using their own PD estimates, and later, using their own LGD, EAD, and M estimates.

[6] Except for Retail exposure, where the Bank of Thailand permits commercial banks to employ the AIRB only.

2. The Bank of Thailand allows a commercial bank to adopt the SA for material assets during 3-year period of the IRB phased rollout. However, to ensure that the commercial bank is able to adopt the IRB within the 3-year period, the commercial bank should initially adopt the IRB for the large-size and high risk asset classes or business units in the first year, and gradually adopt the IRB for other assets in later years. Furthermore, by the end of the 3rd year, the commercial bank shall adopt the IRB for all material asset classes and business units as specified under II.

3. For commercial banks applying the IRB phased rollout within the time period as specified by the Bank of Thailand, the commercial banks shall provide the clear and reasonable IRB implementation plan in conjunction with the **application for the IRB implementation and supplementary documents** submitted to the Bank of Thailand as specified under I.

IV. Parallel Calculation

1. Commercial banks adopting the IRB shall calculate credit risk-weighted asset under the new approach in parallel with the previous approach (at least 1 year for the FIRB and at least 2 years for the AIRB[7]) before starting to adopt the IRB for credit risk-weighted assets calculation, as follows

1.1 **A Commercial bank with a transition from the SA approach to the IRB approach** (with and without the phased rollout) shall calculate credit risk-weighted asset under the IRB in parallel with the SA.

1.2 A Commercial bank **with a transition from** the FIRB approach to the AIRB approach shall calculate credit risk-weighted asset under the AIRB in parallel with the FIRB.

2. Commercial banks shall submit the results of parallel calculation to the Bank of Thailand in **the excel-formatted files, which can be downloaded from the Bank of Thailand website (www.bot.or.th).**

3. During the IRB parallel calculation period, the commercial bank is expected to adopt the IRB with sufficient proportion of credit risk-weighted asset. This is to facilitate a comparison between credit risk-weighted assets calculated under each approach.

[7] The FIRB bank or the AIRB bank is designated according to the approach applied to its material portfolio, except for Retail exposure, which is allowed to employ the AIRB only.

4. The Bank of Thailand may consider extending parallel calculation period if it is deemed that the commercial bank are not prepared to adopt the IRB for credit risk-weighted asset calculation.

V. Capital Floor

1. Commercial banks that adopt the FIRB approach and the AIRB approach for their credit risk-weighted asset calculation shall maintain their capital level no less than the capital floor specified by the Bank of Thailand. The FIRB bank and the AIRB bank shall maintain the capital floor for 3 years and 2 years respectively since the first year of adoption. This is to prevent the significant decline of commercial banks' capital fund from the transition of credit risk-weighted asset calculation.

2. To assess the level of the minimum capital requirement from credit risk-weighted asset calculation, commercial banks shall comply with the following procedures.

2.1 Calculate the capital floor by multiplying the minimum capital required under the previous approach by the adjustment factor.

2.1.1 Calculate the minimum capital requirement for total risk-weighted asset that comprises (1) Credit risk-weighted asset calculated under the previous approach (Basel I approach[8], the SA[9], or the FIRB [10]) (2) Market risk-weighted asset calculated under current method, and (3) Equivalent to operational risk-weighted asset calculated under previous method or current method (BIA , ASA or SA-OR), as the case may be. The sum of the risk-weighted assets calculated under (1), (2) and (3) shall be multiplied by the capital ratio as specified in the Notification of the Bank of Thailand Re: Guideline on Minimum Capital Requirement for Commercial Banks.

2.1.2 The capital deduction items[11] as specified in the Notification of the Bank of Thailand Re: The Capital Components for Commercial are added back to the outcome from 2.1.1

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[8] For commercial banks that start adopting the FIRB at the end of 2008 or the AIRB at the end of 2009, they shall refer to the guideline on credit risk-weighted asset calculation **under the previously adopted approach.**

[9] For commercial banks **with a transition** from the SA approach to the FIRB approach or AIRB approach

[10] For commercial banks **with a transition** from the FIRB approach to the AIRB approach

[11] **In case of commercial banks previously adopting the Basel I approach for credit risk-weighted asset calculation, commercial banks shall ,in calculating capital floor, refer to "deduction items" as prescribed in the Bank of Thailand Notification Re: Capital Components which is previously adopted for the credit risk-weighted asset calculation.**

2.1.3 The outcome from 2.1.2 is deducted by the provisions recognised in Tier 2[11] capital according to the Notification of the Bank of Thailand Re: The Capital Components for Commercial Banks.

2.1.4 The outcome from 2.1.3 is adjusted by the adjustment factor which is the ratio specifying the level of capital floor. The % of adjustment factor is subject to the approach of the IRB adopted, as well as the year that commercial banks begin adopting the IRB, as follows

Table: Adjustment Factor for the Capital Floor Calculation

Capital Calculation Method	1st year of implementation	2nd year of implementation	3rd year of implementation
FIRB	Floor 95%	Floor 90%	Floor 80%
AIRB	Floor 90%	Floor 80%	

2.2 Calculate and adjust the minimum capital requirement under the IRB (The FIRB and AIRB) as follows:

2.2.1 Calculate the minimum capital requirement for total risk weighted assets that comprises (1) Credit risk-weighted assets calculated under the IRB for material asset classes, combined with credit risk-weighted asset calculated under the SA for immaterial asset classes (2) Market risk-weighted asset calculated by current method, and (3) Equivalent to operational risk-weighted asset calculated under current method. The sum of risk-weighted asset calculated under (1), (2) and (3) shall be multiplied by the capital ratio as specified in the Notification of the Bank of Thailand Re: Guideline on Minimum Capital Requirement for Commercial Banks.

2.2.2 The outcome from 2.2.1 is deducted by the capital surplus recognised in Tier 2 capital (in case where the capital reserve is greater than the expected loss), or is added back with the shortfall (in case where the capital reserve is less than the expected loss) under the requirements as specified in Attachment 6.

2.2.3 Other capital deduction items (excluding the shortfall under 2.2.2) are added back to the outcome from 2.2.2. The Commercial banks shall refer “capital deduction items” to the regulations as specified in the Notification of the Bank of Thailand Re: Capital Components for Commercial Banks.

2.2.4 For commercial banks that adopt the SA for insignificant asset classes, the outcome from 2.2.3 is deducted by the provision of that asset classified as "Normal" recognised in Tier 2 as prescribed in the Notification of the Bank of Thailand Re: Capital Components for Commercial Banks.

2.3 Commercial banks shall calculate total risk-weighted asset for the calculation of capital requirement as follows:

2.3.1 Where the outcome under 2.1 is greater than that under 2.2.

The difference shall be divided by 8.5%, and combine with the risk-weighted assets under 2.2.1 for the calculation of the minimum capital requirement.

2.3.2 Where the outcome under 2.1 is less than that under 2.2.

The total risk-weighted assets under 2.2.1 shall be used for the calculation of minimum capital requirement.

3. The Bank of Thailand may consider, on a case-by-case basis, extending the capital floor period, for example, where the capital requirement of commercial banks adopting the IRB is significant lower than that under the previous approach.

Transitional Provision : Guidelines on Calculation of Risk-Weighted Assets under Basel III

Item	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
1. Intangible assets	**20 %** of the value - deducted from Common equity tier1[1]	**40 %** of the value - deducted from Common equity tier1[1]	**60 %** of the value - deducted from Common equity tier1[1]	**80 %** of the value - deducted from Common equity tier1[1]	**100 %** of the value - deducted from Common equity tier1[1]
	80% of the value - apply 100% risk weight	**60%** of the value - apply 100% risk weight	**40%** of the value - apply 100% risk weight	**20%** of the value - apply 100% risk weight	**-**

[1] Deduct from Common equity tier 1 for locally incorporated commercial banks and deduct from Total capital for foreign bank branches due to different components of capital

Item	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
2. Investments in equity and warrants, direct or indirect holdings of Tier 1 and Tier 2 capital instruments issued by companies operating financial business and supporting business[4], in the case where commercial banks' holding of shares is equal to or less than 10 percent of total shares issued and paid-in of each entity, for the portion that shall be deducted from the capital in accordance with the Notification of the Bank of Thailand Re: the Components of Capital for locally incorporated commercial banks and the Notification of the Bank of Thailand Re: the Components of Capital for foreign bank branches	**20%** of value of investment that shall be deducted from the capital - deducted from Common equity tier 1[1]/ Additional tier 1[2]/Tier 2[3] according to the type of investment	**40%** of value of investment that shall be deducted from the capital - deducted from Common equity tier 1[1]/ Additional tier 1[2]/Tier 2[3] according to the type of investment	**60%** of value of investment that shall be deducted from the capital - deducted from Common equity tier 1[1]/ Additional tier 1[2]/Tier 2[3] according to the type of investment	**80%** of value of investment that shall be deducted from the capital - deducted from Common equity tier 1[1]/ Additional tier 1[2]/Tier 2[3] according to the type of investment	**100%** of value of investment that shall be deducted from the capital - deducted from Common equity tier 1[1]/ Additional tier 1[2]/Tier 2[3] according to the type of investment
	80% of investment value that shall be deducted from the capital - calculate risk-weighted assets for equity securities or debt securities according to the type of investment	**60%** of investment value that shall be deducted from the capital - calculate risk-weighted assets of equity securities or debt securities according to the type of investment	**40%** of investment value that shall be deducted from the capital - calculate risk-weighted assets of equity securities or debt securities according to the type of investment	**20%** of investment value that shall be deducted from the capital - calculate risk-weighted assets of equity securities or debt securities according to the type of investment	

[2] Means Tier 1 capital which is the financial securities as prescribed in the Notification of the Bank of Thailand Re: Components of Capital for Locally Incorporated Commercial Banks

[3] Means Tier 2 capital as prescribed in the Notification of the Bank of Thailand Re: Components of Capital for Locally Incorporated Commercial Banks

[4] Except for companies under the full consolidation group subjecting to be reported on the consolidated financial statements, companies operating supporting business or companies acquired under debt restructuring scheme.

Item	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
3. Investments in equity and warrants, direct or indirect holdings of Tier 1 and Tier 2 capital instruments issued by companies operating financial business and supporting business[4], in the case where commercial banks' holding of shares is more than 10 percent of total shares issued and paid-in of each entity, for the portion that shall be deducted from the capital, in accordance with the Notification of the Bank of Thailand Re: the Components of Capital for locally incorporated commercial banks and the Notification of the Bank of Thailand Re: the Components of Capital for foreign bank branches	**20%** of value of investment that shall be deducted from Capital - deduct from Common equity tier 1[1] in accordance with type of investment	**40%** of investment value that shall be deducted from Capital - deduct from Common equity tier 1[1] in accordance with type of investment	**60%** of investment value that shall be deducted from Capital - deduct from Common equity tier 1[1] in accordance with type of investment	**80%** of investment value that shall be deducted from Capital - deduct from Common equity tier 1[1] in accordance with type of investment	**100%** of investment value that shall be deducted from Capital - deduct from Common equity tier 1[1] in accordance with type of investment
	80% of investment value that shall be deducted from Capital - calculate risk-weighted assets according to related regulations and risk weight shall not be lower than 250%	**60%** of investment value that shall be deducted from Capital - calculate risk-weighted assets according to related regulations and risk weight shall not be lower than 250%	**40%** of investment value that shall be deducted from Capital - calculate risk-weighted assets according to related regulations and risk weight shall not be lower than 250%	**20%** of investment value that shall be deducted from Capital - calculate risk-weighted assets according to related regulations and risk weight shall not be lower than 250%	**-**

Item	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
4. Investments in Tier 1 capital instruments and Tier 2 capital instruments issued by companies operating financial business and supporting business[4], in the case where commercial banks' holding of shares <u>is more than 10 percent</u> of total shares issued and paid-in of each entity, <u>for the portion that shall be fully deducted from the capital</u>, in accordance with the Notification of the Bank of Thailand Re: the Components of Capital for locally incorporated commercial banks	**20%** of value of investment that shall be deducted from Capital - deduct from Additional tier 1[2]/ Tier 2[3] according to type of investment	**40%** of value of investment that shall be deducted from Capital - deduct from Additional tier 1[2]/ Tier 2[3] according to type of investment	**60%** of value of investment that shall be deducted from Capital - deduct from Additional tier 1[2]/ Tier 2[3] according to type of investment	**80%** of value of investment that shall be deducted from Capital - deduct from Additional tier 1[2]/ Tier 2[3] according to type of investment	**100%** of value of investment that shall be deducted from Capital - deduct from Additional tier 1[2] /Tier 2[3] according to type of investment
	80% of investment value that shall be deducted from Capital - calculate risk-weighted assets of equity securities or debt securities according to type of investment	**60%** of investment value that shall be deducted from Capital - calculate risk-weighted assets of equity securities or debt securities according to type of investment	**40%** of investment value that shall be deducted from Capital - calculate risk-weighted assets of equity securities or debt securities according to type of investment	**20%** of investment value that shall be deducted from Capital - calculate risk-weighted assets of equity securities or debt securities according to type of investment	-