Part Four Market Risk

### I. Introduction

#### A. Definition of market risk

Market risk is defined as the risk of losses in on and off-balance-sheet positions of a bank arising from movements in market prices (e.g., movements of market interest rates, exchange rates, stock prices and commodity prices). Banks can use the standardized measurement method and the internal models approach to measure their market risks.

#### B. Scope of market risk

Banks should categorize their positions held into trading book and banking book items by the purpose of the position (trading book is defined below; positions not categorized under the trading book are categorized as banking book position), and distinguish the market risks faced by each position into four types – interest rate, equities, foreign exchange and commodities. The capital charges for interest rate and equities related market risk will apply to the current trading book items only, while the capital charges for foreign exchange and commodities related market risk will apply to banks' all currency and commodity positions.





#### C. Definition of trading book and related provisions

1. A trading book consists of positions in financial instruments and physical commodities held either with trading intent or in order to hedge other positions in the trading book. To be eligible for trading book capital treatment, financial instruments must either be free of any restrictive covenants on their tradability or able to be hedged completely. In addition, banks should frequently and accurately value and actively manage those positions.

- 2. A financial instrument is any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity. Financial instruments include both primary financial instruments (or cash instruments) and derivative financial instruments. A financial asset is any asset that is cash, evidence manifesting corporate ownership, the right to receive cash or another financial asset, or the contractual right to exchange financial assets on potentially favorable terms. A financial liability is the contractual obligation to deliver cash or another financial asset or to exchange financial liabilities under conditions that are potentially unfavorable.
- 3. Positions held with trading intent are those held intentionally for short-term resale and/or with the intent of benefiting from actual or expected short-term price movements or to lock in arbitrage profits, for example, proprietary positions, positions arising from client servicing (e.g. matched trade brokering) and market making. Specifically, according to the purpose of holding, trading book positions are summarized as follows:
  - a. Positions held with the intent of benefiting from actual or expected differences between buying and selling prices.
  - b. Positions held with the intent of benefiting from other price or interest rate movements.
  - c. Positions held due to brokering or proprietary business.
  - d. Positions held to offset all or large part of the risk of another position or portfolio in the trading book.
  - e. Positions held due to trading within the preset investment line.

The aforesaid positions must be free of any restrictive covenants on their tradability or can be hedged completely.

- 4. Banks must have clearly defined policies and procedures for determining which exposures to include in, and to exclude from, the trading book for purposes of calculating their regulatory capital, to ensure compliance with the criteria for trading book set forth in these Instructions and taking into account the bank's risk management capabilities and practices. Banks should fully document compliance with these trading book related policies and procedures and conduct periodic internal audit. The trading book policies and procedures shall, at a minimum, cover the following particulars:
  - a. The business activities the bank considers to be trading and as trading book positions for regulatory capital purposes.
  - b. Policies and procedures according to which positions are marked-to-market daily by reference to an active market.
  - c. For positions that are marked-to-model, policies and procedures according to which the bank identifies the material risks of the exposure, control the material risks of the exposure through hedging instruments in an active market, and derives reliable estimates for the key assumptions and parameters used in the model for estimating the reasonable prices of positions.

- d. Policies and procedures requiring the bank to generate valuations for the trading book positions that can be validated externally in a consistent manner.
- e. Policies and procedures in response to the situation where legal restrictions or other operational requirements would impede the bank's ability to liquidate the trading book position in a timely manner.
- f. Policies and procedures according to which the bank actively risk manages the trading book positions.
- g. Policies and procedures according to which the bank may transfer positions or risk exposures between the banking and the trading books.

The aforesaid items provide a set of key points that must be addressed by the policies and procedures for overall management of a bank's trading book and are not intended to provide a set of criteria for trading book positions.

- 5. The management of trading book positions for regulatory capital purpose must meet the following minimum requirements:
  - a. Clearly documented trading strategy for the position, financial instrument or portfolios, approved by senior management (including expected holding duration);
  - b. Clearly defined policies and procedures for position management, which must include:
    - positions are managed by the trading desk according to the vested authority;
    - position limits are set and monitored for appropriateness;
    - dealers have the autonomy to enter into and manage the position within agreed limits and according to the approved strategy;
    - positions are marked to market at least daily and when marking to model the parameters must be assessed on a daily basis;
    - positions are reported to senior management according to the bank's risk management process<sup>1</sup>;
    - positions are actively monitored with reference to market information sources (assessment should be made of the market liquidity or the ability to hedge positions or the portfolio risk profiles). Also, the bank should assess the quality and availability of market inputs to the valuation model, level of market turnover, sizes of positions traded in the market, etc.
  - c. Clearly defined policy and procedures for the bank's trading strategy to manage the trading position, including the monitoring of turnover and less liquid positions in the bank's trading book.
- 6. When a bank uses a credit derivative booked in the trading book to hedge a banking book credit risk exposure (i.e. internal hedging), the risk mitigation effect of the hedge is not recognized for capital charge purposes unless the bank purchases from an eligible third party protection provider a qualified credit derivative meeting the requirements. Where such third

Including proprietary positions transferred from underwriting operation after the expiration of underwriting period.

party protection is purchased and is recognized as a hedge of a banking book exposure for regulatory capital purposes, neither the internal nor external credit derivative hedge would be included in the trading book for regulatory capital purposes.

- 7. Positions in the bank's own eligible regulatory capital instruments should be deducted from capital. Positions in other financial entities' eligible regulatory capital instruments are deducted from capital in reference to the rules for banking book. Where a bank demonstrates that it is an active market maker and has pertinent systems and control procedures in place for the trading of eligible capital instruments of other financial entities, it may apply to the FSC for major dealer exception that will exempt those instruments from being deducted from capital.
- 8. Repo-style transactions for trading purpose that a bank accounts for in its banking book may be included in the bank's trading book for regulatory capital purposes if applied on a consistent basis to all such repo-style transactions. For this purpose, repo-style transactions for trading purpose are defined as only those that both legs are in the form of either cash or securities includable in the trading book, comply with the policies and procedures for trading book just described and the minimum requirements for trading book management. Regardless of whether they are included in the trading book or the banking book, all repo-style transactions are subject to capital charge for banking book counterparty risk.
- 9. The valuation system for trading book positions must meet the following requirements:
  - a. Valuation and control mechanism

Banks must establish and maintain an effective valuation and control mechanism sufficient to give management and the supervisory authority the confidence that their valuation estimates are reliable. Such systems must be integrated with other risk management systems of the bank (such as credit line management system). The trading book valuation system requires specifically the following:

- (1) Clearly defined valuation policies and procedures, including the responsibilities of the various functions involved in the valuation, sources of market information and review of their appropriateness, frequency of valuation, timing of closing prices, procedures for adjusting valuations, end of the month and special verification procedures; and
- (2) Clear and independent front office reporting system for the department accountable for the valuation process. The reporting system ultimately reports to the board of directors.
- b. Valuation methodologies
  - (1) Mark to market

Banks must mark-to-market as much as possible. Marking-to-market is at least the daily valuation of positions at readily available information with independent sources, for example, the exchange prices, screen prices, or quotes from several independent reputable brokers. Unless the bank is a significant market maker and it can close out at mid-market, or the product is traded in the centralized trading market that is highly

liquid and its closing price is representative of market price, otherwise the bid/offer information should be used for valuation of positions held to reflect accurately the replacement costs of financial instruments.

(2) Mark to model

Where marking-to-market is not possible, banks may mark-to-model with prudence. Marking-to-model is defined as any valuation of trading position based on market parameters. When marking to model, exercise extra prudence and consider the following factors when assessing whether a mark-to-model valuation is appropriate:

- (A) Senior management should be aware of the instruments in the trading book which are subject to mark to model and should understand the materiality of the uncertainty this creates, and disclose it in the risk management report or business management report.
- (B) Market parameters should be sourced, to the extent possible, in line with market prices. The bank should regularly examine the appropriateness of the market parameters for the particular position being valued.
- (C) Where possible, generally accepted valuation methodologies should be used.
- (D) Where the bank uses internally developed model, the model should be built on appropriate assumptions. In considering the bank's internal control, risk management framework and mathematical capability, the internal model should be assessed by an internal qualified department independent of the development process or an independent and qualified external institution. The model should be developed or approved independently of the front office. It should also be independently tested, including validating the mathematics, the assumptions and the software system.
- (E) There should be formal change control procedures in place and a secure copy of the model should be held and periodically used to check valuations.
- (F) Risk management department should be aware of the deficiencies of the models used and how best to reflect those deficiencies in the valuation output.
- (G) The model should be subject to periodic review to determine the accuracy of its performance, e.g. assessing the appropriateness of the assumptions, analysis of profit and loss versus risk factors, comparison of actual closing prices to model outputs.
- (H) Where necessary, valuation adjustments should be made as appropriate to cover the uncertainty of the model valuation.
- (3) Independent price verification

Independent price verification is different from daily mark-to-market. While daily

mark-to-market may be performed by dealers and reported to the management between formal reporting dates, independent price verification is the process by which market prices or model parameters are regularly verified for accuracy. Because information from verification of market price or model parameters determines the performance, it needs to be more accurate and should be performed by a unit independent of the dealing department, at least monthly (or more frequently, depending on the nature of the market/trading activity). Independent verification of the prices of trading positions can reveal error in daily marks to market.

#### 10. Valuation adjustments or reserves

- a. Banks must establish and maintain procedures for considering valuation adjustments/reserves for the trading book. Banks using third-party valuations, including marking to model, should consider whether valuation adjustments are necessary.
- b. When carrying out valuation adjustments or reserves, banks should consider at a minimum: unearned credit spreads, close-out costs, operational risks, early termination, investing and funding costs, and future administrative costs and model risk.
- c. Given that market risk is assessed under the 10-day holding period assumption, which may not be consistent with the bank's ability to dispose or close out positions under normal market conditions, banks must make downward valuation adjustments/reserves for these less liquid positions, and this assessment should be carried on an on-going basis. When establishing valuation adjustments or reserves, banks should consider the possible liquidation prices for concentrated positions and/or stale positions. Banks must consider all relevant factors when determining the determining the valuation adjustments/reserves for less liquid positions. These factors must include, at a minimum, the amount of time it would take to close out the positions or transfer the risk, the average volatility of bid/offer spreads, the availability of independent market quotes (including the number and market status of market makers), the average and volatility of trading volumes, market concentrations, the aging of positions, the extent to which valuation relies on marking-to-model, and the impact of model risks.
- d. When charging for valuation adjustments or reserves according to the Instructions herein, the amount exceeding asset valuations made under the financial accounting standards shall be reflected in Tier 1 regulatory capital

### **II. Standardized Measurement Method**

When adopting the standardized approach to estimate the capital requirement for market risk, the market risk for capital charge purpose shall be categorized into four types – interest rate risk, equities risk, foreign exchange risk and commodities risk.

#### A. Interest rate risk

- 1. Scope of interest rate risk
  - a. Positions in the trading book related to interest rate risks, including bonds, credit derivatives and other interest rate related transactions, for example, fixed and floating rate debt securities, total return swap, credit default swap, credit linked notes, bond futures and similar instruments as well as interest rate derivatives.
  - b. Interest rate derivatives in the trading book could include the following transactions:
    - Exchange-traded futures
    - Over-the-counter forward contract
    - Forward rate agreement, swap and forward foreign exchange transactions.
    - Exchange-traded options.

#### 2. Specific risk

- a. Meaning: Specific risk arises from an adverse movement in the price of an individual security owing to factors related to the individual issuer. Capital charge for specific risk will be estimated based on the long and short positions (i.e. gross position) of each security.
- b. Capital charge for specific interest rate risk: Apply different capital charge rate to each debt instrument based on market price, issuer, external credit rating and term.

Category	Condition Term		Capital charge rate	
Zero risk weight government debt instruments	Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 0% risk weight under the standardized approach to credit risk.	All	0%	
Qualifying debt instruments	1.Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 20%-50% risk weight under the	Residual term to maturity 6 months or less	0.25%	

### Table 2 Capital Charge rate for Specific Interest Rate Risk

Category	Condition	Term	Capital charge rate	
	<ul> <li>standardized approach to credit risk.</li> <li>2. Debt instruments issued by a public sector entity other than central government, International Bank for Reconstruction and Davalopment (IRRD) and other</li> </ul>	Residual term to maturity greater than 6 months and up to 24 months (including)	1.00%	
	<ul> <li>Development (IBKD) and other multilateral development banks.</li> <li>3.Debt instruments issued, warranted or guaranteed by a bank or a bills finance company with investment-grade external rating.</li> <li>4. Debt instruments with investment-grade rating or approved by the supervisory authority (see Table 3 for details).</li> </ul>	Residual term to maturity exceeding 24 months	1.60%	
Trading book securitization debt instruments	Charge specific risk capital based on the risk weights under the standardized approach for asset securitization.	All	1.60% 4% 8% 28% Total deduction	
Qualifying capital instruments of other financial institutions held in the trading book	In reference to the provisions in Standardized Approach to credit risk, the book amount of qualifying capital instruments issued by banks, securities firms, insurance companies, bills finance companies, financial holding companies or other financial institutions (e.g. subordinate debt or convertible bonds) shall be deducted from capital.	All	Total deduction	
Other non-qualifying	Debt instruments with external credit rating of B+ or lower, or with poor credit record.	All	12.00%	
debt instruments	All other types of debt instruments		8.00%	

Refer to Table 3 – Calculation of Capital Charge for Specific Interest Rate Risk for the types, scope and related description of debt instruments listed in Table 2.

- c. For banks using standardized approach for measuring credit risk, unrated securities, but deemed to be of comparable investment quality by the bank, *and* the issuer has securities listed on a recognized stock exchange may be included in the "qualifying" category, subject to the approval of supervisory authority. For banks using the IRB approach for measuring credit risk, unrated securities must meet both conditions below to be included in the "qualifying" category:
  - The securities are rated equivalent to investment grade (the debt security has a one-year probability of default (PD) equal to or less than the one year PD implied by the long-run average one-year PD of a security rated investment grade or better by a qualifying rating agency) under the bank's internal rating system, which the supervisory authority has confirmed complies with the requirements for an IRB approach; and
  - The stocks of the issuer are traded normally on a recognized stock exchange.
- d. Specific risk capital charge for hedged positions
  - If the values of two legs (i.e. long and short) always move in the opposite direction and broadly to the same extent, neither position requires specific risk capital charge. For example:
    - (a) the two legs consist of completely identical instruments, or
    - (b) a long cash position is hedged by a total rate of return swap (or vice versa) and there is an exact match between the underlying exposure and the contract obligation.
  - (2) A bank may offset 80% of specific risk capital charge when the value of two legs (i.e. long and short) always moves in the opposite direction but not broadly to the same extent. That is, 80% of the specific risk capital charge for the leg with higher capital requirement may be offset, while the specific risk capital charge for the other leg may be zero. This would be the case when a long cash position is hedged by a credit default swap or a credit linked note (or vice versa) and there is an exact match in terms of the contract obligation, the maturity of both the contract obligation and the credit derivative, and the currency of the underlying exposure. In addition, key features of the credit derivative contract (e.g. credit event definitions, settlement mechanisms) should not cause the price movement of the credit derivative to materially deviate from the price movements of the cash position, and the extent of transaction transfer risk is not

restricted (i.e. there are no restrictive payout provisions, such as fixed payouts and materiality thresholds).

- (3) Partial offset of specific risk capital charge is allowed when the value of two legs (i.e. long and short) usually moves in the opposite directions, but there is currency mismatch, term mismatch or asset mismatch (the asset mismatch must meet the provisions in standardized approach to credit risk on the asset mismatch of credit derivatives). In such event, the bank only need to assess the higher of the two capital requirements, instead of adding the specific risk capital requirements for the long and the short positions.
- (4) For positions that do not meet the criteria described above, specific capital charge must be assessed for both positions.
- e. With regard to the first-to-default and second-to-default credit derivatives in the trading book, the standardized approach to credit risk will also apply to the assessment of exposures. Banks buying the credit linked notes of this kind of products would be treated as if they were protection sellers and would be required to add the specific risk charges. Issuers of these notes would be treated as if they were protection buyers and are therefore allowed to offset specific risk for one of the underlying assets with the lowest specific risk charge.
- 3. General market risk
  - a. Meaning:

General market risk arises from an adverse movement of market interest rate. General interest rate risk capital charges should be calculated for each currency separately and then summed with no offsetting between the long and short positions of different currencies<sup>2</sup>.

b. Methods for assessing general market risk capital charge:

Banks have the choice to select maturity method or duration method<sup>3</sup> for assessing the capital charge for general market risk. Banks that use the duration method must have the capability to calculate accurately the price sensitivity of each position (see Annex) and have the approval of the supervisory authority.

<sup>&</sup>lt;sup>2</sup> In the case of those currencies in which business is insignificant, separate maturity ladders for each currency are not required. Rather the net long or short position for the currency is included in one of the time band.

The matched positions of the same or similar instruments may be fully offset and exempted from the calculation of general market risk.

c. In the maturity method and the duration method, the capital charge shall include four components: (Table 6)

Overall net open position; Vertical disallowance; Horizontal disallowance; and Net charge for positions in options<sup>4</sup>.

- d. Maturity method
  - The long or short positions in debt securities and other sources of interest rate exposures including derivative instruments are slotted into a maturity ladder comprising thirteen time-bands (for instruments with coupon rate over 3%) or fifteen time-bands (for instruments with coupon rate under 3%) based on maturity and coupon rate (see Table 4 for time bands).
  - Fixed rate debt instruments should be slotted in time bands according to the residual term to maturity, while floating-rate debt instruments according to the residual term to the next interest rate pricing date.
  - Steps for calculating capital charge:
    - Weight the positions in each time-band

Multiply the long and short positions (market value) in each time band by the prescribed capital charge rate (Table 4) to obtain the weighted longs and shorts in the time band.

- Capital charge for overall net open position: Offset the weighted longs and shorts above to obtain the absolute value as the overall net open position, and levy 100% capital charge.
- Capital charge for vertical disallowance:

Weighted longs and shorts in the same time band are offsettable. However, a 10% capital charge should be levied on the offsetting position (i.e. matched positions) to reflect basis risk<sup>5</sup> and gap risk.

Capital charge for same-zone horizontal disallowance: Weighted longs and shorts in different time bands within the same zone may be offset against each other. Capital

<sup>&</sup>lt;sup>4</sup> Capital charge for options with interest rate or bonds as underlying should be calculated according to the provisions under the "Treatment of options" where market risk may be assessed by simplified approach, delta-plus approach or scenario approach.

Basis risk is the risk exposure to a transaction or a portfolio where the price difference between the derivative and the underlying differs at the time of transaction and the time of exercise.

charge for the offsetting positions (i.e. matched positions) will be assessed according to ratios set out in Table 5.

- Capital charge for cross-zone horizontal disallowance: The non-offset net weighted longs and shorts in different zones may be offset against each other. Capital charge for the offsetting positions (i.e. matched positions) will be assessed according to the ratios set out in Table 5, depending on whether the two offsetting zones are adjacent zones.
- Sum up the capital charge for overall net open position, vertical disallowance, same-zone horizontal disallowance, non-offset portion of the cross-zone horizontal disallowance as the capital charge for general market risk.
- 4. Interest rate derivatives and repo-style transactions
  - a. Risks requiring capital charge

Besides on balance-sheet positions, the measurement of interest rate risk should include all interest rate derivatives and repo-style transactions in the trading book that react to changes in interest rates. For measuring the interest rate risk of those transactions, the transactions should be converted into positions in the relevant underlying and become subject to specific and general market risk charges as described above. For OTC interest rate derivatives and repo-style transactions, there is separate capital charge for counterparty risk. See Table 7 for the types of risk associated with interest rate derivatives and repo-style transactions that require capital charge.

b. Calculation of positions

The amount of capital charge should be the notional principal of the interest rate derivative or repo-style transaction or market value of the principal amount of the underlying decided by the following principles:

- Futures and forward contracts, including forward rate agreements These instruments are treated as a combination of a long and a short position in a notional security. The maturity of the instrument will be the period until delivery or exercise of the contract for one leg, and the period until delivery or exercise of the contract plus the life of the underlying for the other leg.
- Swaps

Swaps will be treated as two notional positions in government securities. For example, an interest rate swap under which a bank is receiving floating rate interest and paying fixed will be treated as a long position in a floating rate instrument of maturity equivalent to the period until the next interest fixing and a short position in a fixed-rate instrument of maturity equivalent to the residual life of the swap.

- Instructions for calculating the capital charges and maturities for interest rate derivatives and repo-style transactions are illustrated in Table 8.
- c. Counterparty risk

Counterparty risk charge must be calculated for OTC derivatives and repo-style transactions that have not reached delivery date or are not delivered when expired according to the rules for credit risk and included in the total amount of risk-weighted assets<sup>6</sup>.

d. Distinction between counterparty risk and specific risk

Example:

Bank A and Bank B enter a forward contract where Bank A will sell Bank B the bonds issued by Company C. If the transaction is completed and Bank B enters the transaction in its trading book, Bank B will face specific risk associated with Company C (issuer risk) for holding its bonds. However before the contract is performed, Bank B faces the counterparty (Bank A) non-performance risk. In addition, if Bank A and Bank B sign a interest rate swap contract and assuming the transaction does not have an underlying, there will no specific risk present, but counterparty non-performance risk.

- e. Capital charge method for specific risk and general market risk<sup>7</sup>
  - Step 1: Convert the interest rate derivative or repo-style transaction into positions in the relevant underlying, such as government bond position or corporate bond position<sup>8</sup>.
  - Step 2: The amount of the relevant underlying position is notional principal or the market value of the principal amount of underlying.
  - Step 3: Slot the relevant positions into relevant time bands by their nature (residual term to maturity and coupon rate) under the maturity method (or duration method) for the calculation of general market risk (see Step 5 for offsetting rules).
  - Step 4: Calculate the specific risk of relevant positions according to Table 3; interest

<sup>&</sup>lt;sup>o</sup> This part is credit risk charge, but market risk charge. The purpose of this section is to point out that separate counterparty party risk charge must be assessed for this type of exposure. Refer to provisions related for credit risk for calculation.

<sup>&</sup>lt;sup>'</sup> The counterparty risk charge should be calculated according to credit risk related provisions.

<sup>&</sup>lt;sup>°</sup> Derivatives without underlying (i.e. without an issuer) need to have specific risk charge, but capital charge for credit risk is required.

rate swaps, cross-currency swaps, forward rate agreements, forward foreign exchange positions, and interest rates that do not involve issuer risk are treated as instruments without specific risk and not subject to specific risk charge.

- Step 5: When calculating general market risk of relevant positions according to the maturity method (or duration method), the matched positions of the same or similar instrument may be offset and are not subject to general market risk. However instruments with external rating of BB+ or lower, or unrated may not be offset.
  - The long and short positions in identical credit instrument may be fully offset and are not subject to general market risk charge, provided they have the same issuer, coupon rate, currency and maturity. A matched position in a future or forward and its corresponding underlying may also be fully offset.
  - Opposite positions in the same category of instruments can in certain circumstances be regarded as matched and allowed to offset fully. These positions must be of the same nominal value and be denominated in the same currency and meet the following conditions:
    - Futures: The offsetting positions must be for identical products and mature within seven days of each other.
    - Swaps and forward rate agreements (FRAs):
    - Floating rate position: Identical reference interest rate.
    - Fixed rate position: The coupon rates are closely matched, e.g. within 15 basis points; and
    - Swaps, FRAs and forwards:

The next interest fixing date or the residual maturity for fixed rate or forward contracts must correspond within the following limits: i. less than one month: same day;

ii. between one month and one year: within seven days;iii. over one year: within thirty days.

5. Annex 1- Tables

Table 3 Calculation of Capital Charge for Specific Interest Ra
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Capital	Item	Description
charge rate		

Capital	Item	Description
charge rate		
0%	<ul> <li>A. Zero risk weight government</li> <li>debt instruments <sup>a</sup></li> <li>Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 0% risk weight under the standardized approach to credit risk.</li> </ul>	<ul> <li>a. The category "government" will include all forms of government paper including bonds, Treasury bills and other short-term instruments.</li> <li>b. Multilateral development bank includes International Bank for Reconstruction and Development (IBRD)</li> </ul>
0.25% 1.00% 1.60%	<ul> <li>B. Qualifying debt instruments</li> <li>1. Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 20%-50% risk weight under the standardized approach to credit risk.</li> <li>2. Debt instruments issued by a public sector entity other than central government, International Bank for Reconstruction and Development (IBRD) and other multilateral development banks with investment-grade external rating<sup>c</sup>.</li> <li>3. Debt instruments issued, warranted or guaranteed by a bank or a bills finance company with investment-grade external rating.<sup>c</sup></li> </ul>	<ul> <li>(also called World Bank), the Inter-American Development Bank (IADB), the Asian Development Bank (ADB), the African Development Bank (AfDB), the European Investment Bank (EIB), the International Monetary Fund (IMF), the Bank of International Settlements (BIS), Central American Bank for Economic Integration (CABEI), the Caribbean Development Bank (CDB), the European Bank for Reconstruction and Development (EBRD), the International Finance Corporation (IFC), the Nordic Investment Bank (NIB), the Islamic Development Bank (CEDB).</li> <li>c. Qualified credit rating agencies and investment grade:</li> </ul>

Capital	Item	Description			
charge rate					
	4. Debt instruments meeting one of the	Credit rating agency	Equity	Money	
	conditions below:		Equity	market	
	(1) rated investment-grade by at least two	1. Applicable to all issuers:	Pag2	D3	
		Standard & Poor's Corporation	BBB-	A3	
	qualified external credit rating agencies	Fitch Investors Service, Inc	BBB-	F3	
	с.	2. Applicable to banking issuers:	BBB	٨З	
	(2) rated investment-grade by one	3. Applicable to Canadian issuers:	000-	70	
	qualified credit rating agency and not	Canadian Bond Rating Service	B++low	A-3	
	loss then investment grade by any other	Dominion Bond Rating Service 4 Applicable of Japanese issuers:	BBBIOW	R-2	
	less than investment-grade by any other	Japan Credit Rating Agency,Ltd.	BBB-	J-2	
	non-qualified credit rating agency.	Nippon Investor Services, Inc.	BBB-	a-3	
	(3) subject to supervisory approval, unrated,	Fitch Investors Service.Inc.	BBB-	A-2 F-3	
	but deemed to be of comparable	5. Applicable to U.S. issuers:	-	-	
	investment quality by the bank and the	Duff & Phelps, Inc.	BBB-	3	
	investment quanty by the bank, and the	o. Nated investment-grade by a domestic credit	rauny ayer	icy.	
	issuer has securities traded normally on				
	a recognized stock exchange.	d. The risk weight for securitization under		er the standardized	
	C. Trading book securitization debt	approach is 20%, 50%, 100%, 350%,	or total c	deduction,	
1.60%	instruments	which, if translated into specific risk ca	pital charg	ge rate, is	
4%	Charge specific risk capital based on	on 1.60%, 4%, 8%, 28% or total deduction.			
8%	the risk weights under the standardized	ed e. The amount to be deducted from the capital will be deduced			
28%	approach for asset securitization <sup>d</sup> .	50% each from Tier 1 capital and Tier 2 capital without be			
Total		subject to general credit risk charge.			
deduction <sup>e</sup>					
ueuucuon					
	D. Qualifying capital instruments of				
	other financial institutions held in				
	the trading book				
	In reference to the provisions in	f. The wale waight according to the standard	ized ennue	ach to	
	Standardized Approach to credit risk, the	1. The fisk weight according to the standard	ized appro	bach to	
Total	book amount of qualifying capital	creait risk for instruments with external ra	ung of B-	+ or lower,	
deduction <sup>e</sup>	instruments issued by banks, securities	or unrated is 100% or 150%, which, if trai	istated int	o specific	
	firms, insurance companies, bills finance	risk capital charge rate, is 8% or 12%.			
	companies, financial holding companies or				
	other financial institutions (e.g. subordinate				
	debt or convertible bonds) shall be deducted				
	from capital.				
	=				

Capital	Item	Description
charge rate		
	E. Other non-qualifying debt	
	instruments	
<b>Q</b> 0/	Debt instruments with external credit	
070	rating of B+ or lower, or unrated shall have	
1270	specific risk charge assessed according to	
	the risk weights provided by the	
	standardized approach to credit risk <sup>f</sup> .	

Time band		Conital aborra	Assumed shanges in	
Coupon 3% or more Coupon less than 3%		-Capital charge rate	yield	
1 month or less	1 month or less	0.00%	1.00%	
1 to 3 months	1 to 3 months	0.20%	1.00% 9	
3 to 6 months	3 to 6 months	0.40%	1.00%	
6 to 12 months	6 to 12 months	0.70%	1.00%	
1 to 2 years	1 to 1.9 years	1.25%	0.90%	
2 to 3 years	1.9 to 2.8 years	1.75%	0.80%	
3 to 4 years	2.8 to 3.6 years	2.25%	0.75%	
4 to 5 years	3.6 to 4.3 years	2.75%	0.75%	
5 to 7 years	4.3 to 5.7 years	3.25%	0.70%	
7 to 10 years	5.7 to 7.3 years	3.75%	0.65%	
10 to 15 years	7.3 to 9.3 years	4.50%	0.60%	
15 to 20 years	9.3 to 10.6 years	5.25%	0.60%	
Over 20 years	10.6 to 12 years	6.00%	0.60%	
	12 to 20 years	8.00%	0.60%	
	Over 20 years	12.50%	0.60%	

### Table 4 Maturity method – time bands and capital charge rates

<sup>&</sup>lt;sup>9</sup> Assuming the impact on price is 0.20% (i.e. capital charge rate) for every 1% change in yield.

Zones	Time band	Within	Between	Between
	time band	the zone	adjacent zones	zone 1 and 3
Zone 1	< 1 month			
	1-3 months			
	3-6 months	40%		
	6–12 months		40%	
Zone 2	1-2 years			
	2-3 years	30%		100%
	3-4 years			
Zone 3	4 – 5 years		40%	
	5 – 7 years			
	7 – 10 years	30%		
	10 – 15 years			
	15 – 20 years			
	Over 20 years			

### Table 5Horizontal Disallowance

### Table 6 Capital charge under maturity method (duration method)

Total capital charge and charge methodCalculationStep 1: Capital charge for overall net open position1. Capital charge for overall net open position is the longs and shorts of all debt instruments (** deduct "offsettable portion") multiplied by the prescribed capital charge rate to obtain the net weighted position (net long or net short), which is charge at 100%. Opposite positions of the same amount in the same issues (but not different issues by the same issuer), whether actual or notional, can be omitted from the interest rate maturity framework.2. "Offsettable portion" is the opposite positions of the same amount in the same issues held by the bank using maturity method (or duration method), whether actual or notional that can be exempted from the capital charge for interest rate risk exposures.Step 2: Capital charge for vertical disallowance: i.e. capital charge for matched positions in the sume time band: ** Maturity method: 10% charge.1. Matched positions in the same time band: Offset the weighted longs and shorts in the same time band, and the offset portion is called "matched position": the net longs or net shorts after offset are the unmatched position is each time band** Duration method: 5% charge.1. Matched position does not need to be distinguished as long or short ex: <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>							
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<ul> <li>i.e. capital charge for matched positions in the same time band;</li> <li>** Maturity method: 10% charge.</li> <li>** Duration method: 5% charge.</li> <li>2. Matched position does not need to be distinguished as long or short, ex.:</li> <li> <ul> <li>Long Short Matched Unmatched</li> <li>G</li> <li>G</li></ul></li></ul>	Step 2: Capital charge for vertical disallowance:	1. Matched positions in the same time band: Offset the					
same time band: ** Maturity method: 10% charge. ** Duration method: 5% charge. (). Matched position does not need to be distinguished as long or short, ex.: $ \frac{\text{Long}  \text{Short}  \text{Matched}  \text{Unmatched}}{6  4  4  2} \\ 2  5  2  -3 \\ \hline 6  6  6  0 $ 3. Capital charge for vertical disallowance (1) Capital charge for same-zone matched positions: Charge for matched position within zone 1 - 40% Charge for matched position within zone 2 - 30% offset portion is called "matched positions in each time band subject or spectively and shorts of unmatched positions in each time band subject to respectively and shorts of unmatched positions in each time band subject to respectively and shorts of unmatched positions in each time band within the same zone, and the offset portion is called the matched position in each time band within the same zone, and the offset portion is called the matched position in each zone.	i.e. capital charge for matched positions in the	weight	ed longs	and shor	ts in the san	ne time band, and	the
<ul> <li>** Maturity method: 10% charge.</li> <li>** Duration method: 5% charge.</li> <li>2. Matched position does not need to be distinguished as long or short, ex.:</li> <li> Long Short Matched Unmatched 6 4 4 2 2 5 2 -3 6 6 6 6 0 </li> <li>3. Capital charge for vertical disallowance is the total matched position in each time band subject to respectively a 10% or a 5% charge according to the maturity method or the duration method. Step 3: Horizontal disallowance (1) Capital charge for same-zone matched positions: Charge for matched position within zone 1 - 40% Charge for matched position within zone 2 - 30% net shorts after offset are the unmatched position in each time band. a short with a cone. a short with a cone 2 - 30% net shorts after offset is the unmatched position in each time band subject to respectively a 10% or a 5% charge according to the maturity method or the duration method. Step 3: Horizontal disallowance (1) Capital charge for same-zone matched position is to offset the longs and shorts of unmatched position is called the matched position; the net long or net short after offset is the unmatched position in each zone.</li></ul>	same time band:	offset portion is called "matched position"; the net longs or					
*** Duration method: 5% charge.       time band. •         2. Matched position does not need to be distinguished as long or short, ex.: <ul> <li></li></ul>	** Maturity method: 10% charge.	net sho	orts after	offset are	the unmate	ched positions in e	ach
2. Matched position does not need to be distinguished as long or short, ex.:         Long       Short       Matched       Unmatched         6       4       4       2         2       5       2       -3         6       6       6       0         3. Capital charge for vertical disallowance is the total matched position in each time band subject to respectively a 10% or a 5% charge according to the maturity method or the duration method.         Step 3: Horizontal disallowance       1. Same-zone matched position is to offset the longs and shorts of unmatched positions in each time band within the same zone, and the offset portion is called the matched position; the net long or net short after offset is the unmatched position in each zone.	** Duration method: 5% charge.	time b	and. °				
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$\frac{6}{2}  \frac{4}{5}  \frac{4}{2}  \frac{2}{-3}$ $\frac{2}{6}  \frac{5}{6}  \frac{2}{6}  \frac{-3}{6}$ $\frac{6}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}$ $\frac{3}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}$ $\frac{3}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}  \frac{6}{6}$ $\frac{3}{6}  \frac{6}{6}  $			Long	Short	Matched	Unmatched	-
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66603. Capital charge for vertical disallowance is the total matched position in each time band subject to respectively a 10% or a 5% charge according to the maturity method or the duration method.Step 3: Horizontal disallowance 			2	5	2	-3	-
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Charge for matched position within zone 1 - 40%net long or net short after offset is the unmatched position in each zone.	positions:	zone, and the offset portion is called the matched position; the					
Charge for matched position within zone 2 - 30% each zone.	Charge for matched position within zone 1 - 40%	net lon	g or net s	hort after	r offset is th	e unmatched posi	tion in
	Charge for matched position within zone 2 - 30%	each zo	one.				

Total capital charge and charge method			Calcul	ation		
Charge for matched position within zone 3 - 30%	2. The mat	ched position	ons in zone	1, zone 2	2 and zone3 ar	e
	respective	respectively subject to 40%, 30%, and 30% charge.				
(2) Charge for cross-zone matched positions	3. Matched	position be	etween zone	e 1 and zo	one 2 means	
Charge for matched positions between zone 1	offsetting	the long a	nd short un	matched	positions in zo	one 1
and zone 2 - 40%	and zone	2, and the	offset portio	on is the	matched posit	ion,
	which is	subject to a	40% charg	je.		
Charge for matched positions between zone 2	4. Matched	position be	etween zone	e 2 and zo	one 3 means a	fter the
and zone 3 - 40%	offset bet	ween zone	1 and zone	2, the re	maining unma	atched
	positions	in zone 2 a	are offset ag	ainst the	unmatched po	ositions
	in zone 3	, and the of	fset portion	is the m	atched positio	on,
	which is	subject to a	a 40% charg	ge.		
Charge for matched positions between zone 1	5. Matched	position b	etween zon	e 1 and z	one 3 means a	fter the
and zone 3 - 100%	offset bet	ween zone	1 and zone	2, and be	etween zone 2	and
	zone 3, tl	ne remainin	g unmatche	ed positio	ons in zone 1 a	and zone
	3 are offs	et against e	each other, a	and the of	ffset portion is	s the
	matched	position, w	hich is subj	ect to a 1	00% charge.	
	6. Calculat	ion of cross	s-zone matc	hed posit	tion	
	Example	1:				
		Within t	the zone		Cross-zone	
	Zone	Matched	Unmatched	Between	Between zone	Between
		position	position	zone 1	2 and zone 3	zone 1
				and zone		and
				2		zone 3
	Zone 1	0	3	3		
	Zone 2	0	-5		2	
	Zone 3	5	8			0
		Within t	he zone		Cross-zone	
	Zone Matched Unmatched Between Between zone Between			Between		
		position	position	zone 1	2 and zone 3	zone 1
				and zone		and
				2		zone 3
	Zone 1	0	-5	3		
	Zone 2	0	3		0	
	Zone 3	5	8			2

### Table 7 Summary of specific risk, general market risk and credit risk capital charge for interest rate derivatives, credit derivatives, and repo-style transactions

Type of transaction	Specific risk	General market risk	Counterparty risk
A. Exchange-traded futures			
1. Government bonds	V	V	X
2. Corporate bonds	V	v	X
3. Index on interest rate (e.g. LIBOR)	X	V	Х
B. OTC forward			
1. Government bonds	V	V	V
2. Corporate bonds	V	V	V
3. Index on interest rate (e.g. LIBOR)	X	v	V
C.Forward rate agreement (FRA)	X	V	V
D. Forward foreign exchange	X	V	V
E. Interest rate swap	X	V	V
F. Forex swap, cross-currency swap	X	V	V
G. Repo-style transaction (RP or loan transaction <sup>10</sup> , RS or borrowing transaction <sup>11</sup> )	X	V	V

<sup>&</sup>lt;sup>10</sup> The underlying debt instrument in a RP trade or loan transaction (e.g. bonds in a repo-trade or on loan) is treated as a long position, for which market risk (including specific risk and general market risk) should be assessed. The RP trade or the loan transaction is treated as a short position, for which general market risk and counterparty risk should be assessed, that is, the "general market risk" has a long position (the bonds held) and a short position (the RP or loan transaction), which belong to different time bands, and the capital charge for the "general market risk" is the sum of net weighted longs or the sum of net weighted shorts, whichever is greater. Thus capital charge is not repetitively calculated.

<sup>&</sup>lt;sup>11</sup> In a RS or borrowing transaction, the RS or the borrowing transaction itself is treated as a long position and market risk (general market risk) should be assessed. But because ultimately there is no debt instrument

Type of transaction	Specific risk	General market risk	Counterparty risk
H. Credit derivatives <sup>12</sup>			
1. Credit default swap (CDS)	V	X	V
2. Total return swap (TRS)	V	V	V
3. Credit linked note (CLN)	V	V	X

held, no specific risk (issuer risk) is incurred. But there is counterparty risk.

<sup>12</sup> Calculation of specific risk position of credit derivatives:

<sup>(1)</sup> To assess the specific risk of credit default swap (CDS), protection buyer is included in the short position based on the market value of reference asset. If there is more than one reference asset and credit protection is allocated by proportion, each reference asset is included in the short position based on its proportion (the treatment is the same for protection seller, which is included in the long position).

<sup>(2)</sup> To assess the specific risk of total return swap (TRS), protection buyer is included in the short position based on the market value of reference asset. If there is more than one reference asset and credit protection is allocated by proportion, each reference asset is included in the short position based on its proportion (the treatment is the same for protection seller, which is included in the long position).

<sup>(3)</sup> To assess the specific risk of credit linked note (CLN), protection buyer is included in the short position based on the market value of reference asset. If there is more than one reference asset and credit protection is allocated by proportion, each reference asset is included in the short position based on its proportion (the treatment is the same for protection seller, only the market value of reference asset and bonds issued by the protection buyer shall be included in the long position).

<sup>(4)</sup> To assess the specific risk of first-to-default credit derivative (F-t-D), the highest specific risk charge for the asset in the basket is included in the short position for protection buyer. For protection seller, all assets in the basket should be entered as long position. However when the capital charge is higher than the highest contract payable, the level of the latter will be used for calculating capital charge. Also, if a bank can demonstrate fully the high association among assets in the basket, the bank may enter the highest specific risk charge for assets in the basket as a long position, subject to the approval of the FSC.

<sup>(5)</sup> If the underlying of a credit derivative uses reference entity in place of reference asset so that there is not market price of the reference asset for entry, the amount of "notional principal" of the contract may be used instead.

Note:

- 1. V means capital charge for the exposure is required; X means no capital charge is required for the exposure.
- 2. There is no specific risk incurred for FRA, forward foreign exchange transaction, interest rate swap, foreign exchange swap and repo-style transaction, for there is no issuer.
- 3. The market value of credit default swap (CDS) is influenced mainly by the specific risk of reference asset, not the variation of market interest rates. Thus CDS is not included in the general market risk.
- 4. In credit-linked note, the counterparty has settled or delivered. Thus it is not included in counterparty risk.

# Table 8Instructions for conversion of positions on interest rate derivatives,<br/>credit derivatives and repo-style transactions for the calculation of general<br/>market risk

		General n						
Type of transaction	(Method f	for calculating the						
Type of transaction		maturi	ty date)		INTITIALK			
	Long Maturity Short M							
A. Exchange-traded					* Calculation of futures and			
futures <sup>13</sup>					forward contract positions:			
1. Government bonds					Treated as a long and a short			
Buy	Market value	Delivery date	Market	Delivery date	combination of the market price			
	of	+ underlying's	value of		or notional principal of the			
	underlying	residual term	underlying		underlying.			
		to maturity						
Sell	Market	Delivery date	Market	Delivery date	**Calculation of futures and			
	value of		value of	+ underlying's	forward contract date:			
	underlying		underlying	residual term	One leg is the contract maturity			
				to maturity	date and the other leg is the			
2. Corporate bonds	Same as				maturity date + underlying's			
	above				residual term to maturity.			
					Ex:			
3. Index on interest rate					For instance, a call option on a June			
(e.g. LIBOR)					three-month interest-rate future			
Buy	Notional	Delivery date	Notional	Delivery date	bought on April 30 (indexed to			
	principal	+ term of	principal		LIBOR) should be converted to a			
		underlying	1 1		specific risk free long position with			
					a maturity of five months and a			
Sell	Notional	Delivery date	Notional	Delivery date	short position with a maturity of			
	principal		principal	+ term of	two months. The coupon rate is			
				underlying	determined by the contract bought.			
<b>B. OTC forward</b> <sup>14</sup>								
1. Government bonds	Same as							
	futures							
2. Corporate bonds	Same as							
	futures							

<sup>&</sup>lt;sup>13</sup> Exchange-traded transactions do not have counterparty risk.

<sup>&</sup>lt;sup>14</sup> Counterparty credit risk charge should be added to OTC transactions.

Type of transaction	(Method 1	General r for calculating t maturi	narket risk he conversion ty date)	n amount and	Remark			
	Long	Maturity	Short	Maturity				
3. Index on interest rate	Same as futures							
C. FRAs Sell	Notional	Maturity date	Notional	Value date	* Treated as two specific risk free, zero coupon rate bond positions; the position amount is the			
	principal		principal		notional principal of contract; the maturity date of one leg is the contract date and the other is the			
Buy	Notional principal	Value date	Notional principal	Maturity date	value date.			
D. Forward foreign					* Forward foreign exchange must			
exchange	Contract	Delivery date	Contract	Delivery date	be treated as a long position and a			
Buy	amount (currency received)		amount (currency paid)		short position on the zero coupon bond for the currencies concerned with delivery date as the maturity date.			
Sell	Contract amount (currency paid)	Delivery date	Contract amount (currency received)	Delivery date				

		General n				
	(Method t	for calculating th				
Type of transaction		maturi	Remark			
	Long Maturity		Short	Maturity		
E. Interest rate swap					* Treated as position on the	
1. Receive fixed rate	Notional	Residual term	Notional	Next	notional principal of two bonds.	
Pay floating rate	principal	of contract	principal	rate-fixing date	The receiving part is treated as a	
				for floating rate	long position, and the paying part is	
					treated as a short position.	
					(1) Interest rate swap:	
					If Bank A receives floating rate	
					interest and pays fixed rate interest,	
					Bank A has a specific risk-free long	
					bond position with the notional	
					principal of the swap contract as	
					the position amount and the	
					residual term to the Next	
					rate-fixing date is the maturity date;	
					the coupon rate is determined by	
					the floating rate paid. Bank A also	
					has a short bond position with	
					residual term of the swap contract	
					as its maturity date and the coupon	
					rate is determined by the fixed rate	
					paid.	
2. Pay fixed rate	Notional	Next	Notional	Residual term	(2) If one side of the swap is paid	
Receive floating rate	principal	rate-fixing date	principal	of contract	by fixed or floating rate, while	
		for floating			the other side is some other	
		rate			reference price, e.g. stock index,	
					the interest rate component is	
					treated by the same principle as	
					described above, while the equity	
					components are included in the	
					equity framework.	
F. Currency swap					(1) Currency swap:	
Basic currency swap	Principal	Maturity date	Principal	Maturity date	Treated as a forward foreign	
(principal swap)	swap		swap		currency transactions with the	

		General r				
	(Method i	for calculating t				
Type of transaction		maturi	Remark			
	Long	Maturity	Short	Maturity		
	(currency to		(currency to		separate legs of cross-currency	
	be received		be paid		swaps being reported in the	
	upon		upon		relevant maturity ladders for	
	maturity)		maturity)		the currencies concerned.	
					(2) Foreign exchange risk charge	
					should be added to currency	
					swap.	
G. Repo-style transaction					* RP, RS, loan and borrowing are	
1.RP or loan transaction			Present value	Residual term	all converted into a bond	
			of contract	of RS or loan	position. In addition, the	
			price	transaction	underlying of RP or loan	
2.RS or borrowing	Present	Residual term			transaction is still treated as	
transaction	value of	of RS or loan			being held by the fund	
	contract	transaction			borrower of RP trade or lender	
	price				of the loan transaction. Its	
					market risk charge should be	
					the same as for cash position of	
					the debt instrument.	
					** RP or security lending is treated	
					as specific risk-free short bond	
					position; its maturity date is the	
					residual term of the RP or loan	
					transaction, and the coupon	
					rate is the contract rate.	
					*** RP or security borrowing is	
					treated as specific risk-free	
					long bond position; its maturity	
					date is the residual term of the	
					RP or loan transaction, and the	
					coupon rate is the contract rate.	

Type of transaction	(Method f	for calculating th	Dorrente				
Type of transaction		maturit	Kemark				
	Long	Maturity	Short	Maturity			
H. Credit derivatives							
1. TRS							
(1) Protection buyer	Notional	Next	Market value	Residual term	* The TRS is treated as the		
	principal	rate-fixing date	of reference	of contract	protection buyer selling the		
		for floating	asset		reference asset to the protection		
(2) Protection seller	Market value	rate	Notional	Next	seller and engaging in interest		
	of reference	Residual term	principal	rate-fixing date	rate swap; the part on interest		
	asset of contract			for floating rate	rate is treated by the same		
					principles as described above.		
2. CLN					*CLN is treated as the bonds issued		
(1) Protection buyer			Amount of	Residual term	by the protection buyer and held		
			bonds issued	of contract	by the protection seller; its		
			by		market risk charge should be the		
			protection		same as other debt instruments.		
(2) Protection seller	Amount of	Residual term	buyer				
	bonds issued	of contract					
	by						
	protection						
	buyer						

#### 6. Examples

Bank A has the following positions on the base date of calculation:

- 1. NTD position:
  - Commercial paper issued and guaranteed by domestic banks, external credit rating of A-, market value NT\$ 13,330,000, residual maturity 1 month, coupon rate 2.2%;
  - Bonds issued by own central government, market value NT\$75,000,000, residual maturity 4 years, coupon rate 2%;
  - Repo-style transaction: Own central government bond as underlying, residual maturity 20 days, present value of contract price NT\$ 15,555,000; the market value of central government bond NT\$15,000,000, residual maturity 5 years, coupon rate 2.1%;
  - RS-style transaction: Own central government bond as underlying, residual maturity 45 days, present value of contract price NT\$ 18,555,000;
  - Asset-backed security (originating bank): Market value \$13,000,000, external rating BB-, residual maturity 3 years, coupon rate 2.9%; asset-backed security (investing bank): Market value NT\$12,000,000, external rating BB-, residual maturity 3 years, coupon rate 2.9%;
  - Corporate bonds: Market value NT\$8,000,000, unrated, residual maturity 2 years, coupon rate 2.6%;
- 2. USD position:
  - U.S. treasury, external rating AAA, market value US\$3,220,000, residual maturity 3 years, coupon rate 3.5%;
  - U.S. federal reserve bank debenture, external rating A+, market value US\$2,330,000, residual maturity 6 years, coupon rate 4%;
  - Interest rate swap, notional principal US\$60,000,000, the bank receives floating rate interest (Libor + 1.05%) and pays fixed rate (4.2%), and next interest rate fixing after 9 months, residual life of swap 8 months;

- Cross-currency swap, residual life of swap 1 year, receiving NT\$28,500,000 and paying US\$1,000,000 upon maturity;
- Floating rate commercial paper issued by Indonesian Petroleum Corp., external rating B+, market value US\$5,000,000, residual maturity 1 year, coupon rate 4.7%.

## Bank <u>A</u> Interest rate risk- calculation of specific risk charge

December 30, 2004

	<u>eccinider 30,</u>	<u>2004</u> Unit	: \$1,000	Curre	ency: NTD	
Item	Term	Capital charge rate	Marke Charge rate (1)	t value Amount (2)	Capital charge (3)=(1)*(2)	Capital deduction (note)
<ul><li>A. Government debt instruments</li><li>1. Debt instrument issued, warranted or guaranteed by own central government or central bank.</li></ul>				90,000	0.00	
2. Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 0% risk weight under the standardized approach to credit risk.	All	0.00%	0.00%			
Subtotal				90,000	0.00	
<ul> <li>B. Qualifying debt instruments</li> <li>Debt instruments issued, warranted or guaranteed by a central government or a central bank with external rating subject to 20%-50% risk weight under the standardized approach to credit risk.</li> <li>Debt instruments issued by a public sector entity other than central government, IBRD and other multilateral development banks.</li> </ul>	1. Residual term of less than 6	0.25%	0.25% 1.00% 1.60% 0.25% 1.00% 1.60%			
3. Debt instruments issued, warranted or guaranteed by a bank or a bills finance company with investment-grade external rating.	months 2. Residual term greater than 6	1.00%	0.25% 1.00% 1.60%	13,330	33.33	
<ol> <li>Debt instruments meeting one of the conditions below:         <ol> <li>Rated investment-grade by at least two qualified external credit rating agencies.</li> <li>Rated investment-grade by one qualified credit rating agency and not less than investment-grade by any other non-qualified credit rating agency.</li> <li>Subject to supervisory approval, unrated, but deemed to be of comparable investment quality by the bank, and the issuer has securities traded on a recognized stock exchange.</li> </ol> </li> </ol>	<ul><li>months and up to 24 months (including)</li><li>3. Residual term to maturity exceeding 24 months</li></ul>	1.60%	0.25% 1.00% 1.60%			
Subtotal				13.330	33.33	
C. Trading book securitization debt instruments	All	1.60% 4.00% 8.00% 28.00% Total deduction	1.60% 4.00% 8.00% 28.00% Total deduction	12,000	3,360	13,000
Subtotal				12,000	3,360	13,000
D. Qualifying capital instruments of other financial institutions held in the trading book	All	Total deduction	Total deduction			
Subtotal				ļ!		
<ul> <li>E. Other non-qualifying debt instruments</li> <li>1. Debt instruments with external credit rating of B+ or lower, or with poor credit record.</li> <li>2. All other types of debt instruments</li> </ul>	All	12.00% 8.00%	12.00%			
2. An other types of debt instruments		0.0070	8.00%	8,000	640	
Subtotal				8,000	640	12.000
Iotal	1		1	123,330	4,033.33	13,000

Note: The amount of deduction will be deducted 50% from Tier 1 capital and 50% from Tier 2 capital.

### Bank A

### Interest rate risk- calculation of specific risk charge

December 30, 2004

Unit: \$1,000 Currency: NTD Market value Capital Capital Capital charge Term charge Charge Amount deduction Item (3)=(1)\*(2)rate rate (1) (note) (2)A. Government debt instruments 1. Debt instrument issued, warranted or guaranteed by own central government or central bank. 2. Debt instruments issued, warranted or guaranteed by a All 0.00%0.00% central government or a central bank with external 3,220 0.00 rating subject to 0% risk weight under the standardized approach to credit risk. Subtotal 3,220 0.00 B. Qualifying debt instruments 1. Debt instruments issued, warranted or guaranteed by a 0.25% central government or a central bank with external 1.00% ----rating subject to 20%-50% risk weight under the 1.60% 2,330 37.28 standardized approach to credit risk. Debt instruments issued by a public sector entity other 0.25% . . . . . . . . . . . 0.25% 1.Residual term than central government, IBRD and other multilateral 1.00% of less than 6 development banks. 1.60% months 3. Debt instruments issued, warranted or guaranteed by a 0.25% 1.00% bank or a bills finance company with investment-grade 1.00% 2. Residual term external rating. 1.60% greater than 6 months and up 0.25% 4. Debt instruments meeting one of the conditions below: to 24 months 1.60% 1.00% (1) Rated investment-grade by at least two qualified (including) external credit rating agencies. 1.60% (2) Rated investment-grade by one qualified credit rating 3. Residual term agency and not less than investment-grade by any to maturity other non-qualified credit rating agency. exceeding (3) Subject to supervisory approval, unrated, but deemed 24 months to be of comparable investment quality by the bank, and the issuer has securities traded on a recognized stock exchange. Subtotal 2,330 37.28 C. Trading book securitization debt instruments 1.60% 1.60% 4.00% 4.00% 8.00% 8.00% All 28.00% 28.00% Total Total deduction deduction Subtotal D. Qualifying capital instruments of other financial Total Total All institutions held in the trading book deduction deduction Subtotal E. Other non-qualifying debt instruments 1. Debt instruments with external credit rating of B+ or 12.00% 12.00% 5.000 600 lower, or with poor credit record. All 8.00% 2. All other types of debt instruments 8.00% Subtotal 5,000 600 637.28 Total 10,550

Note: The amount to be deducted will be deducted 50% from Tier 1 capital and 50% from Tier 2 capital.

# Bank A\_\_\_\_\_ Interest rate risk- calculation of general market risk charge (maturity method)

December 30, 2004

Unit: \$1,000 Currency: NTD

Zone	Time band		đ	Net position		Weighted position		Same time band		Within the same zone		Cross-zone matching		
	Coupon 3% or more	Coupon less than 3%	rate (1)	Longs (2)	Shorts (3)	Longs (1)*(2)	Shorts (1)*(3)	Matched position	Unmatched position	Matched position	Unmatched position	Zone 1 and zone 2	Zone 2 and zone 3	Zone 1 and zone 3
	1 month or less	1 month or less	0.00%	13,330	15,555	0.00	0.00							
Zone 1	1 to 3 months	1 to 3 months	0.20%	18,555		37.11				(D1)		(E)		(G)
Zone i	3 to 6 months	3 to 6 months	0.40%											
	6 to 12 months	6 to 12 months	0.70%	28,500		199.50								
	1 to 2 years	1 to 1.9 years	1.25%							(D2)				
Zone 2	2 to 3 years	1.9 to 2.8 years	1.75%	8,000		140								
	3 to 4 years	2.8 to 3.6 years	2.25%	12,000		270							(F)	
	4 to 5 years	3.6 to 4.3 years	2.75%	75,000		2,062.5								
	5 to 7 years	4.3 to 5.7 years	3.25%	15,000		487.5				(D3)				
	7 to 10 years	5.7 to 7.3 years	3.75%											
Zone 3	10 to 15 years	7.3 to 9.3 years	4.50%											
Zone 5	15 to 20 years	9.3 to 10.6 years	5.25%											
	Over 20 years	10.6 to 12 years	6.00%											
		12 to 20 years	8.00%											
		Over 20 years	12.50%											
						(A)	(B)	(C)						
Total						3,196.61	0.00							

Note (1): Total net open position = [Net of (A) - (B)]

Note (2): Vertical disallowance = (C) \*10%

Note (3): Horizontal disallowance: = (D1)\*40% + (D2)\*30% + (D3)\*30% + (E)\*40% + (F)\*40% + (G)\*100%

Total capital charge = Total net open position+ vertical disallowance + horizontal disallowance

 $= \left[ \text{Net of } (A) - (B) \right] + (C) * 10\% + (D1) * 40\% + (D2) * 30\% + (D3) * 30\% + (E) * 40\% + (F) * 40\% + (G) * 100\% = 3,196.61$ 

### Bank <u>A</u>

Interest rate risk- calculation of general market risk charge (maturity method)

### December 30, 2004

Unit: \$1,000 Currency: NTD

	Time	band		Net p	osition	Weig	ghted	Same	time band	Within th	e same zone	Cross	s-zone ma	tching
Zone	Coupon 3% or more	Coupon less than 3%	Charge rate (1)	Longs (2)	Shorts (3)	Longs (1)*(2)	Shorts (1)*(3)	Matched position	Unmatched position	Matched position	Unmatched position	Zone 1 and zone 2	Zone 2 and zone 3	Zone 1 and zone 3
	1 month or less	1 month or less	0.00%											
Zona 1	1 to 3 months	1 to 3 months	0.20%							(D1)		(E)		(G)
Zone i	3 to 6 months	3 to 6 months	0.40%							0	+448	0		448
	6 to 12 months	6 to 12 months	0.70%	65,000	1,000	455	7	7	448					
	1 to 2 years	1 to 1.9 years	1.25%							(D2)				
Zone 2	2 to 3 years	1.9 to 2.8 years	1.75%	3,220		56.35			56.35	0	+56.35			
	3 to 4 years	2.8 to 3.6 years	2.25%										(F)	
	4 to 5 years	3.6 to 4.3 years	2.75%										56.35	
	5 to 7 years	4.3 to 5.7 years	3.25%	2,330		75.73			75.73	(D3)				
	7 to 10 years	5.7 to 7.3 years	3.75%		60,000		2,250		-2,250	75.73	-2,174.27			
Zone 3	10 to 15 years	7.3 to 9.3 years	4.50%											
Zone 3	15 to 20 years	9.3 to 10.6 years	5.25%											
	Over 20 years	10.6 to 12 years	6.00%											
		12 to 20 years	8.00%											
		Over 20 years	12.50%											
						(A)	(B)	(C)						
Total						587.08	2,257	7						

Note (1): Total net open position = [Net of (A)-(B)] (take absolute value)

Note (2): Vertical disallowance = $(C)^*10\%$ 

Note (3): Horizontal disallowance = (D1)\*40% + (D2)\*30% + (D3)\*30% + (E)\*40% + (F)\*40% + (G)\*100%

Total capital charge = Total net open position+ vertical disallowance + horizontal disallowance

 $= \left[ \text{Net of (A)-(B)} \right]^{1} + (C)^{10\%} + (D1)^{40\%} + (D2)^{30\%} + (D3)^{30\%} + (E)^{40\%} + (F)^{40\%} + (G)^{100\%} + (G)^{10\%} + (G)^{100\%} + (G)^{100\%} + (G)^{100\%} + (G)^{10\%} +$ 

= [587.08-2,257] +7\*10%+75.73\*30%+56.35\*40%+448\*100%=2,163.88

\*\*C+D1+D2+D3+E+F+G= the lesser of A or B
# A Bank

# Summary of Interest Rate Risk Charge

# <u>2004 (yr) 12</u> (mo) <u>30</u> (day) Unit: \$1,000

Currency	Spec	cific risk	General market	Exchange	Total interest rate	Amount of
	Capital	Capital	risk charge (3)	rate (4)	risk charge	capital
	charge (1)	deduction (2)			(NTD) 【(1)+(3)】 ×	deduction (2)
					(4)	×(4)
NTD	4,033.33	13,000	3,489.11		7,522.44	13,000
USD	637.28	0	2,163.88	34.5	96,640.02	0
British						
pound						
Japanese						
yen						
Euro						
Total					104,162.46	13,000

# 7. Annex - duration method<sup>15</sup>

### a. Definition:

Banks adopting duration method need to calculate modified duration for different debt instruments and allot the durations to fifteen time bands (see Table 9 – Time-bands and assumed change in yield).

- b. Points to note:
  - Once electing the duration method, a bank must use the method on a continuous basis, unless a change in method is approved by the supervisory authority;
  - The models used by the bank for calculating duration will be subject to supervisory monitoring.
- c. Steps for calculating capital charge:
  - Weighted positions in the same time-band (net long or net short position): Multiply each long and short position in the same time-band by the assumed change in yield and modified duration to obtain the weighted longs and shorts in each time-band, and then the net weighted long or short position, which is subject to 100% capital charge.
  - Matched and unmatched positions in the same time-band:

Offset the long and short positions in the same time-band to obtain the matched position (i.e. the offsetting position) and unmatched position (net long or net short after offsetting), and the same as in maturity method, assess capital charge for the matched position in each time-band (i.e. vertical disallowance). However, in the duration method, only 5% vertical disallowance is charged, which is different from the maturity method.

- The capital charges for horizontal disallowance within the same zone and between zones are the same as maturity method (see Table 6).
- d. Calculation of duration period:
  - Formula for calculating duration period:

<sup>&</sup>lt;sup>15</sup> By the duration-based equivalent measures, banks using the duration method can convert their positions into certain benchmark, such as the average duration of 4-year U.S. Treasury note, 3-month euro futures or other commodities, and compare the price sensitivity of exposures in reference to the benchmark. However to use the average duration method, a bank must be familiar with the price volatility of the derivative's underlying, using the price value of a basis point multiplied by the price volatility to obtain the value of exposure. However such approach is unable to show the convexity and correlation coefficient of the investment. In addition, average duration assumes horizontal movement of the yield curve. That means, the bank needs to the control the risk associated with non-horizontal movement of the yield curve, which could be assessed by the correlation coefficient of interest rate and exchange rate.

$$D = \frac{\sum_{t=1}^{N} CF_t \times DF_t \times t}{\sum_{t=1}^{N} CF_t \times DF_t} = \frac{\sum_{t=1}^{N} PV_t \times t}{\sum_{t=1}^{N} PV_t}$$

**D**: Duration

t: Term of bond

CF<sub>t</sub>: Cash flow of bond at term t

DF<sub>t</sub>:  $DF_t = \frac{1}{(1+R)^t}$ , discount factor, where R is the yield of bond

 $\ensuremath{\text{PV}_{\text{t}}}\xspace$  . Net present value of future cash flow for each term

N: Number of interest payment remaining to the maturity date

According to the aforesaid formula, duration is defined as "the ratio of the product of present value of cash flow of each term multiplied by a weight of corresponding length of time to the non-weighted present value."

#### • Modified duration:

Banks should calculate modified duration to calculate the price elasticity of debt instruments for the assessment of general market risk charge.

Let P be the present value of bond, then

$$P = \sum_{t=1}^{N} CF_{T} * DF_{T} = \frac{CF_{1}}{(1+R)} + \frac{CF_{2}}{(1+R)^{2}} + \dots + \frac{CF_{N}}{(1+R)^{N}}$$

Therefore, the effect of change in yield on bond prices is:

$$\frac{dP}{dR} = \frac{-CF_1}{(1+R)^2} + \frac{-2CF_2}{(1+R)^3} + \frac{-3CF_3}{(1+R)^4} + \dots + \frac{-NCF_N}{(1+R)^{N+1}}$$

$$= \frac{-1}{(1+R)} \left[ \frac{CF_1}{(1+R)} + \frac{2CF_2}{(1+R)^2} + \dots + \frac{NCF_N}{(1+R)^N} \right]$$

Also,

$$D = \frac{1 * \frac{CF_1}{(1+R)} + 2 * \frac{CF_2}{(1+R)^2} + \dots + N * \frac{CF_N}{(1+R)^N}}{\frac{CF_1}{(1+R)} + \frac{CF_2}{(1+R)^2} + \dots + \frac{CF_N}{(1+R)^N}}$$
$$D = \frac{1 * \frac{CF_1}{(1+R)} + 2 * \frac{CF_2}{(1+R)^2} + \dots + N * \frac{CF_N}{(1+R)^N}}{P}}{P}$$
$$\therefore \frac{dP}{dR} = \frac{-1}{(1+R)} * P * D \Rightarrow \frac{\frac{dP}{P}}{\frac{dR}{(1+R)}} = -D \Rightarrow \frac{dP}{P} = -D\left(\frac{dR}{(1+R)}\right)$$
$$\therefore dP = -MD * P * dR$$

where MD is the modified duration.

$$MD = \frac{D}{(1+R)}$$

As shown by the formula above, when market rate rises, bond prices drop, and the magnitude of drop is positively proportional to the modified duration.

• Calculation of duration for floating rate debt instruments

The description above is for calculating the duration of fixed-rate debt instrument. The duration of floating-rate debt instrument is the duration from the time of purchase to the next rate-fixing date.

Assume the bank purchases a floating-rate bond in the middle of the first year of issue (t=1/2), the bond does not a maturity date, and pays interest and fixes the next-term interest rate at the end of each year, then



X CF1, CF2, CF3----- Interest payable each term. Therefore, the present value of the bond is:

$$P = \frac{CF_1}{(1+\frac{1}{2}R)} + \frac{CF_2}{(1+\frac{1}{2}R)(1+R)} + \frac{CF_3}{(1+\frac{1}{2}R)(1+R)^2} + \dots + \frac{CF_{\infty}}{(1+\frac{1}{2}R)(1+R)^{\infty-1}}$$
$$= \frac{CF_1}{(1+\frac{1}{2}R)} + \frac{1}{(1+\frac{1}{2}R)} \left[ \frac{CF_2}{(1+R)} + \frac{CF_3}{(1+R)^2} + \dots + \frac{CF_{\infty}}{(1+R)^{\infty-1}} \right]$$

If the bond is sold at the end of the first year, its present value is:

$$P_{1} = \frac{CF_{2}}{(1+R)} + \frac{CF_{3}}{(1+R)^{2}} + \dots + \frac{CF_{\infty}}{(1+R)^{\infty-1}}$$

Thus, as long as the coupon rate fixed for the term is equal to the coupon rate,  $P_1$  will not be influenced by interest rate change. Thus

$$P = \frac{C_1}{(1+\frac{1}{2}R)} + \frac{P_1}{(1+\frac{1}{2}R)}$$

where  $C_1$  and  $P_1$  are fixed cash flow. Thus buying this floating rate bond is treated as buying two kinds of single-payment deep-discount bond with 1/2 year to maturity. Because the duration and maturity of deep-discount bond are the same, the duration of the floating rate bond is D=1/2. That is, the duration of a floating rate debt instrument is the duration from the time of purchase to the next rate-fixing date.

#### e. Example -- duration

Calculation of modified duration:

Assuming a six-year fixed rate bond, face value \$1000, interest paid annually, coupon rate and yield both 8%.

t	CFt	DFt	PVt	$PV_t \times t$
(1)	(2)	(3)	$(4) = (2) \times (3)$	(4)×(1)
1	80	0.9259	74.07	74.07
2	80	0.8573	68.59	137.18
3	80	0.7938	63.51	190.53
4	80	0.7350	58.80	235.20
5	80	0.6806	54.45	272.25
6	1080	0.6302	680.58	4083.48
		Total	1000	4992.71

$$D = \frac{\sum_{t=1}^{N} CF_t \times DF_t \times t}{\sum_{t=1}^{N} CF_t \times DF_t} = \frac{\sum_{t=1}^{N} PV_t \times t}{\sum_{t=1}^{N} PV_t} = 4.993 \text{ years}$$
  
Therefore,  $MD = \frac{4.993}{(1+0.08)} = 4.623$ 

f. If duration method is adopted for assessing interest rate risk, see Table 9 for time-bands and assumed change in yield.

	<b>y</b>	iciu	
Time-band	Assumed change	Time-band	Assumed change
	in yield		in yield
Zone 1		Zone 3	
1 month or less	1.00%	3.6 to 4.3 years	0.75%
1 to 3 months	1.00%	4.3 to 5.7 years	0.70%
3 to 6 months	1.00%	5.7 to 7.3 years	0.65%
6 to 12 months	1.00%	7.3 to 9.3 years	0.60%
Zone 2		9.3 to 10.6 years	0.60%
1 to 1.9 years	0.90%	10.6 to 12 years	0.60%
1.9 to 2.8 years	0.80%	12 to 20 years	0.60%
2.8 to 3.6 years	0.75%	Over 20 years	0.60%

# Table 9Duration method – time-bands and assumed changes in<br/>yield

g. Calculation of position under duration method: Market price x MD x assumed change in yield.

# B. Equity position risk

# 1. Introduction

a. Market risk

The market risk of holding equities includes the specific risk arising from change of market price of an individual equity and general market risk arising from price change in the overall market.

b. Calculation of specific risk

Specific risk is defined as the sum of the absolute value of net long position and the absolute value of net short position on equities and equity derivatives. The capital charge for specific risk could be 2%, 4%, or 8%. The applications of respective capital charge will be detailed in the sections on equities and equity derivatives.

c. Calculation of general market risk

General market risk is assessed by the overall net position in an equity market, i.e. the difference between the sum of the longs and the sum of the shorts. Positions in different equity markets may not be offset. The general market risk charge is 8%.

	Specific risk	General market risk
Source of risk	The risk of price change of	The risk of price change in
	individual equity held	the market as a whole
Calculation	The sum of the absolute	The difference between
method	value of net long position	the sum of the longs and
	and the absolute value of	the sum of the shorts in an
	net short position on	equity market (i.e. the
	equities	overall net position)
Capital charge	2%, 4%, and 8%	8%

# Table 10: Market risk of equities

# 2. Equity position

a. Scope of application

Applicable to all instruments that exhibit market behavior similar to equities in the trading book, including: common stocks, whether voting or non-voting, convertible securities that behave like equities, and commitments to buy or sell equity securities.

- common stocks, whether voting or non-voting;
- convertible securities that behave like equities;
- commitments to buy or sell equity securities;

excluding non-convertible preference shares that are debt in nature<sup>16</sup>.

b. Calculation of positions

The calculation of equity position must be based on the market price of equity on the calculation base date, where the long and short positions of the same equity are offset to obtain its net position and summed up <u>by country</u>. Foreign currencies are converted based on real-time exchange rate on the calculation base date.

- c. Calculation of capital charges
  - (1) Specific risk
    - a) Banks shall deduct 50% each from Tier 1 capital and qualified Tier 2 capital the book value of qualifying capital instruments held in the trading book that are issued by banks, securities firms, insurance companies, bills companies, financial holding companies and other financial institutions without assessing general market risk charge. Banks that meet the provisions in paragraph 7 of section I. C Definition of trading book and related provisions and are exempted from deducting the position of certain instruments from capital with approval from the supervisory authority shall still assess market risk charge for those positions.
  - b) The capital charge for the specific risk of equities issued by non-finance entities is
     8% in principle. If the equity portfolio is both liquid and well-diversified, the capital charge will be 4%. The criteria for liquid and well-diversified are as follows respectively:
    - (a) Liquid:

Equities listed and traded in the countries (regions) provided in Table 11 are accepted as liquid.

# Table 11 Countries (regions) where equities meet the liquidityrequirement

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greek, Ireland, Italy, Japan, Luxemburg, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden, UK, USA, ROC, Singapore, Hong Kong

\* The list of "countries (regions) where equities meet the liquidity requirement" is subject to change as deemed necessary by the FSC.

<sup>&</sup>lt;sup>6</sup> These are debt instruments that which are covered by the interest rate risk requirements, not equity risk requirement.

(b) Well -diversified:

"Well-diversified" is defined as the position on a liquid individual equity in a bank's equity portfolio investment in a country does not exceed 10% of the bank's gross equity portfolio investment (the sum of the absolute values of long positions and short positions) in that country, and the combined position of liquid individual equities accounting for 5% to 10% of the bank's gross equity portfolio investment in a country does not exceed 50% of the bank's equity portfolio investment in that country<sup>17</sup>.

(2) General market risk

Capital charge for the general market risk of equity position is 8% of the absolute value of the overall net position of the bank's equity investments in the equity markets.



<sup>&</sup>lt;sup>17</sup> Options with equity as underling: (see section E. Treatment of options for detail)

<sup>(1)</sup> Where simplified approach is adopted, include the equity securities underlying options when calculating each equity security as a percentage of the gross position on the equity portfolio in that country; the specific risk and general market risk capital charges shall be calculated according to Table 6-E and then incorporated into Table 6-A (capital charges for interest rate, equity, foreign exchange and commodity exposures calculated by simplified approach should first be entered in Table 6-E and then summed up before being entered into Table 6-A).

<sup>(2)</sup> Where delta-plus approach is adopted, calculate capital charge according to the instructions in section E. Treatment of options by including the "delta-weighted positions" in calculating each equity security as a percentage of the gross position on the equity portfolio in that country; in the calculation of specific risk and general market risk capital charge, include the delta-weighted positions in Table 6-B1, and in addition, add capital requirements for gamma risk and vega risk (Table 6-E1(2)) to the market risk capital charge in Table 6-B.

- 3. Equity derivatives
  - a. Scope of application

Equity derivatives and off-balance-sheet positions which are affected by changes in equity prices should be included in the measurement of market risk capital charge for equities, including futures and swaps on both individual equities and on stock indices. However equity options and stock index options are dealt with according to options related rules.

b. Calculation of positions

When calculating specific and general market risks, the positions of equity derivatives shall be measured according to the following principles in addition to the relevant rules for the spot equity positions:

- (1) Futures and forward contracts relating to individual equities should be converted into positions in the relevant underlying and reported at current market prices;
- (2) Futures relating to stock indices listed in Table 12 (liquid and well-diversified stock indices) should be calculated by the market price of the stock index futures or the market prices of the constituent stocks in the index;
- (3) Futures relating to stock index not listed in Table 12 should be broken down and calculated by the market prices of the constituent stocks in the index;
- (4) Equity swaps should be treated as two notional equity positions (one long and one short);
- (5) Equity options and stock index options should be dealt with according to options related rules.
- (6) When calculating the equity derivative position, the long and short positions of individual equity or stock index in the same market can be offset according to the principles set out in Table 10 to obtain a net long or short position for the measurement of capital charge for specific risk and general market risk. For example, an equity futures and a position of the underlying in opposite direction may be offset against each. But the interest rate risk arising from the futures position should be included in the interest rate risk position and subject to general market risk treatment.
- (7) When a financial institution holds the depositary receipts against an opposite position in the underlying equity or identical equities in different markets, the financial institution may offset the positions in opposite directions, provided the cost of currency conversion is fully considered, that is, the exchange rate risk involved in the currency conversion has been reported in the foreign exchange risk position.
- c. Calculation of capital charges
  - (1) Market risk

The market risk capital charges for equity derivatives are summarized in Table 14.

Country (region)	Stock index	Country (region)	Stock index
Australia	All Ords	Netherlands	EOE25
Austria	ATX	Spain	IBEX35
Belgium	BEL20	Switzerland	SMI
Canada	TSE35	Sweden	OMX
France	CAC40	UK	FTSE 100
Germany	DAX	UK	FTSE mid-250
Japan	Nikkei225	Hong Kong	Hang Seng Index
Japan	Nikkei300	ROC	SIMEX MSCI Taiwan
USA	S&P 500	ROC	TAIEX
FT—Actuaries	World Indices	ROC	Taiwan 50

Table 12 Liquid and well-diversified stock indices

\* The list of "stock indices" is subject to change as deemed necessary by the FSC.

Table 13	Calculation	of Equity	Derivative	Positions
Table 15	Calculation	of Equity	Derrauve	I USITIONS

Position	Calculation
Equity futures and forwards	Converted to notional equity positions and calculated by market value
Futures relating to stock indices listed in Table 12	By the market price of the equity index futures or the market prices of constituent stocks in the index
Futures relating to stock index not listed in Table 12	Broken down into constituent stocks marked to market
Equity swap	Converted into two notional equity positions (one long and one short)
Equity options and stock index options	According to options related rules

# Table 14 Market risk capital charges for equity derivatives

Position	Specific risk	General market risk
----------	---------------	---------------------

Exchange-traded futures		
or OTC forwards		
- Individual equity	1. The positions on equities issued by other financial institutions should be deducted from capital.	<ol> <li>Equity derivative positions associated with financial institutions are not subject to general market risk charge.</li> </ol>
- Stock index	2. The positions on equities issued by non-financial institutions that meet the criteria for liquid and well-diversified are subject to 4% charge; otherwise 8% charge.	2. Equity derivative positions associated with non-finance entities should be included in spot equity position and subject to 8% capital charge based on the net overall position on the equity investments.
	<ol> <li>Positions relating to stock index listed in Table 12 are subject to 2% capital charge.</li> <li>Positions not relating to stock index listed in Table 12 are broken down into constituent stocks and subject to equity specific risk treatment based on whether the stock index meets the criteria for liquid and well-diversified.</li> </ol>	(Same as above)
Options	Dealt with according to section E.	Dealt with according to
	Treatment of options.	section E. Treatment of options.

(2) Counterparty risk

Over-the-counter transactions of equity derivative involve counterparty risk that are subject to counterparty credit risk charge according to the standardized approach to credit risk.

(3) Interest rate risk and exchange rate risk

The interest rate risk and exchange rate risk associated with an equity derivative transaction should be included in the interest rate and exchange rate risk measurement systems. The exchange rate risk shall be treated according to related

rules for exchange rate risk charge specified herein, while interest rate risk should be included in other interest risk positions and subject to general market risk treatment.

- (4) Specific risk charges for stock index arbitrage
- a) In the case of the stock index futures-related arbitrage strategies described below, the 2% specific risk capital charge may be applied to only one index with the opposite position exempt from a capital charge:
  - (a) When the bank takes an opposite position in exactly the same index at different dates or in different markets;
  - (b) When the bank has an opposite position in contracts at the same date in different but similar indices, subject to the consent of the FSC that the two indices contain sufficient common components to justify offsetting.
- b) Where a bank engages in a deliberate arbitrage strategy, in which a stock index futures contract listed in Table 12 matches a basket of stocks in opposite direction, and the bank meets both conditions below, the specific risk charge for the stock index is still 2%, while the specific risk charge for the stocks in opposite position can be lowered from 8% or 4% to 2%:
  - (a) The arbitrage trade has been deliberately entered into and separately controlled;
  - (b) The composition of the basket of stocks represents at least 90% of the index when broken down into its notional components. But when all of the stocks comprising the index are held in identical proportions to the composition of index, 2% specific risk capital should be charged for each side. When the value of the basket of stocks is not equal to the value of index futures, any excess value should be treated as a net long or short position and subject to specific risk and general market risk capital charges.

# 4. Examples

Assume Bank A holds \$550 million, \$1,800 million and \$400 million long positions on the stocks of ROC Companies B, C and D, \$30 million long position and \$80 million short position on CME-Dow Jones Taiwan Stock Index, \$100 million stocks of Bank G, \$1,200 million and \$700 million long positions on the stocks of US Companies E and F, and \$100 million long position and \$200 million short position on S&P 500, Bank's A specific risk and general market risk charges are as follows:

# (1) **ROC**

# • Capital charges for specific risk

Item	Individual e ir	equity or stock ndex	Net po (3)=(1	sition )-(2)	Specific risk charge (4)	
Equities and equity derivatives	Total longs (1)	Total shorts (2)	Net long (3)>0	Net short (3)<0	=   (3)   × capital charge rate	Capital deduction
100% deduction Bank G stocks						100
<b>8% capital charge</b> Company B stocks	550	0	550		44	
Company C stocks	1,800	0	1,800		144	
Company D stocks	400	0	400		32	
<u>2% capital charge</u> CME-Dow Jones Taiwan Index	30	80		50	1	
Total	2,780	80	2,750	50	221	100

# Capital charges for general market risk

Net longs total		Net short totals		Difference between net
			=	longs and net shorts
2,750		50		2,700
	-		-	
Absolute value of				Capital charge for general
difference in net longs and		80/		market risk
net shorts	X	8%	_	
2,700				216

# (2) USA

• Capital charges for specific risk

Item	Individual equity or stock		Net position		Specific risk	
	index		(3)=(1)-(2)		charge (4)	
Equities and equity derivatives	Total longs (1)	Total shorts (2)	Net long (3)>0	Net short (3)<0	=   (3)   × capital charge rate	Capital deduction
Capital charge 8%						
Company E stocks	1,200	0	1,200		96	
Company F stocks	700	0	700		56	
Capital charge 2% S&P500 index	100	200		100	2	
Total	2,000	200	1,900	100	154	

# Capital charges for general market risk

Net longs total		Net short totals		Difference between net
			=	longs and net shorts
1,900		100		1,800
Absolute value of				Capital charge for general
difference in net longs and		80/	_	market risk
net shorts	Х	8%	_	
1.800				144

Capital charge Country	Specific risk	General market risk	Total	Capital deduction
ROC	221	216	437	100
USA	154	144	298	
Total	375	360	735	100

Bank A's capital charges for equity positions:

# C. Foreign Exchange Risk (Including Gold)

Except to options transactions where the capital charge for market risk is calculated according to the "Treatment of options under standardized measurement method", when calculating the capital requirement for foreign exchange risk, first measure the exposure in a single currency position and convert it into national currency to calculate the long and short positions in each currency; next measure the capital requirements for different foreign currency portfolios and gold portfolio as described below:

### 1. Measuring the exposure in a single currency

A bank shall calculate the net open position in each currency (except for national currency) by summing up:

(1) Net spot position

All open positions on spot exchange, including all asset and liability items denominated in the currency.

(2) Net forward position

All currency forward positions.

(3) Guarantees

Guarantees (and similar instruments) that are certain to be called and are likely to be irrecoverable.

- (4) Hedged net income or expensesNet future income/expenses not yet accrued but already fully hedged in cash flow.
- 2. A basket of currency positions

A basket of currency positions (e.g. ECU) can be treated as a single currency or calculated separately based on its composition when measuring the open position of a bank. However any treatment shall be applied on a consistent basis.

- 3. When gold is a part of a forward contract and the contract pertains to interest rate or currency forward, its exposure will be calculated based on the provisions for interest rate and exchange rate. Foreign exchange and gold options will be dealt with according to options related rules.
- 4. The treatment of interest, other income and expenses

Interest accrued (i.e. earned but not yet received) should be included as a position. Accrued expenses should also be included. Unearned but expected future interest and anticipated expenses may be excluded unless the amounts are certain and banks have hedged their cash flows. If banks include future income/expenses they should do so on a consistent basis, and not be permitted to select only those expected future flows which reduce their position.

5. The measurement of currency forward and gold positions

Currency forward and gold positions are normally valued at current spot market exchange rates.

- 6. The treatment of structural positions
  - (1) A matched (long and short) currency position will protect a bank against loss from movements in exchange rates, but will not necessarily ensure that the bank's capital adequacy ratio will be kept at a constant level. For example, if a bank has its capital denominated in its national currency and has a portfolio of foreign currency assets and liabilities that is completely matched, when the domestic currency depreciates, the amount of risk-weighted asset denominated in foreign currency will increase due to change of exchange rate (it occurs to both credit risk and market risk), while the increase in foreign currency liability thereof is not included in the calculation of capital adequacy ratio. Thus when domestic currency depreciates, the bank's capital adequacy ratio might decrease even if the bank does not take on new risk-weighted assets. By running a short position in the national currency, the bank can protect its capital adequacy ratio. Any foreign currency positions which a bank has deliberately taken for such purpose belongs to the structural positions of foreign currency assets and liabilities, and may be excluded from the calculation of net open currency positions, provided each of the following conditions are met:
    - a. Such positions need to be of a "structural" nature that they are taken to hedge against the foreign currency risk of assets and liabilities and non-dealing in nature;
    - b. The "structural" position excluded does no more than protect the bank's capital adequacy ratio from this part of exchange rate volatility; and
    - c. Any exclusion of the structural position taken to hedge the exchange rate risk needs to be applied consistently.
  - (2) Bank's net investment in its foreign operations, including investment in foreign subsidiaries denominated in foreign currency and operating funds for its foreign branches denominated in foreign currencies may be treated as structural positions and excluded from the calculation of net open currency positions.
- No capital charge needs to apply to positions related to items that are deducted from a bank's capital when calculating its capital base, such as investments in foreign subsidiaries.
- 8. Measuring the foreign exchange risk in a portfolio of foreign currency positions (including gold):

- The nominal amount (or net present value) of the net position in each foreign currency is converted at spot rates into the national currency.
- (2) The overall net open position is measured by summing up:
  - . The sum of the net short positions or the sum of the net long positions, whichever is the greater, plus
  - . The net position (short or long) in gold, regardless of sign.
- (3) The capital charge will be 8% of the overall net open position.
- (4) An example of the calculation method is illustrated below:

Example of measure of foreign exchange risk with simplified method Unit: NT\$1,000

YEN	DM	GBP	FFR	USD	GOLD
+50	+100	+150	-20	-180	-35
+300		-2	200	35	

The capital charge would be 8% of the higher of either the net long currency positions or the net short currency positions (i.e. 300) and of the net position in gold  $(35) = 335 \times 8\% = 26.8$ .

# D. Commodity Risk

A commodity is defined as a physical product which is traded on a secondary market, e.g. agricultural products, minerals (including oil) and precious metals, excluding gold.

Aside from measuring the market risk for commodity positions, the funding of commodity positions may open a bank to interest rate or foreign exchange exposure and the relevant positions should be included in the measures of interest rate and foreign exchange risk. There should be separate capital charge of counterparty risk for over-the-counter derivatives assessed according to the standardized approach to credit risk.

Banks can measure the market risk of commodity positions using the maturity ladder approach or the simplified approach under the standardized methodology based on the net open position after offsetting long and short positions in each commodity. Long and short positions in different commodities are not offsettable, except for positions that are close settlement substitutes. Positions are considered offsettable if they have a minimum correlation of 0.9 between the price movements established over a minimum observation period of one year.

(A) Maturity ladder approach

- 1. Banks will first express each commodity position in terms of the standard unit of measurement (barrels, kilos, grams etc.). The net position in each commodity will then be converted at current spot rates into the national currency.
- 2. Positions in different commodities will first be entered into a maturity ladder (time bands) provided in Table 15. Physical stocks should be allocated to the first time-band.

······································	
Time band	Spread rate (%)
0 - 1 month	1.5
1 - 3 months	1.5
3 - 6 months	1.5
6 - 12 months	1.5
1 - 2 years	1.5
2 - 3 years	1.5
Over 3 years	1.5

## Table 15 Commodity's Spread Rates for Risk Offset

- 3. For each time-band, the sum of short and long positions which are matched will be multiplied by a spread rate of 1.5% for capital charge. A surcharge equal to 0.6% of the net position carried forward will be added in respect of each time-band that the net position is carried forward.
- 4. The residual net positions from nearer time-bands may be carried forward to offset exposures in time-bands that are further out. At the end of the carry-forward process, a capital charge of 15% will apply to the net position.
- 5. Determination of the expiry date for notional amount of derivatives and off-balance-sheet positions:
  - (1) Futures and forward contracts relating to individual commodities should be incorporated in the measurement system as notional amounts of barrels, kilos etc. and should be assigned a maturity with reference to expiry date.
  - (2) Commodity swaps where one leg is a fixed price and the other the current market price should use the payment date as the expiry date. The positions would be long positions if the bank is paying fixed and receiving floating, and short positions if the bank is receiving fixed and paying floating.
  - (3) No offsetting will be allowed if the other leg of a commodity swap is a different commodity.

(B) Simplified approach

- 1. The capital charge will equal 15% of the net position in each commodity.
- In order to circumvent basis risk, interest rate risk and forward gap risk, the capital charge for each commodity will be subject to an additional capital charge equivalent to 3% of the bank's gross positions (i.e. long plus short).
- (C) Options

Capital charge for commodity options is calculated according to options related rules.

(D) Examples

# 1. Maturity ladder approach

# Example: Commodity Risk Maturity Ladder Approach

Time-band	Position	Spread rate	Capital charge	Required
				capital
0-1 month		1.5%		
1-3 months		1.5%		
3-6 months	Long	1.5%	Capital charge for matched position:	
	800 USD		$(800 \log + 800 \text{ short}) \times 1.5\% =$	24
	Short			
	1000 USD		Capital charge for residual net position	
			before carrying forward:	2.4
			200 short carried forward to 1-2 years	2.4
			$200 \text{ short } \times 2 \times 0.6\% \equiv$	
			(Carried forward position is multiplied	
			by 0.6% in respect of each time-band	
			that it is carried forward.)	
6-12 months		1.5%		
1-2 years	Long	1.5%	Capital charge for matched position:	
	600 USD		$(200 \log +200 \text{ short}) \times 1.5\% =$	6
			Capital charge for residual net position	
			before carrying forward:	
			400 long carried forwards to over 3	4.8
			years	
			$400 \log \times 2 \times 0.6\% =$	
			(Carried forward position is multiplied	
			by 0.6% in respect of each time-band	
			that it is carried forward.)	
2-3 years		1.5%		
Over 3 years	Short	1.5%	Capital charge for matched position:	
	600 USD		$(400 \log + 400 \text{ short}) \times 1.5\% =$	12
			Residual net position: 200 short	
			$200 \times 15\% =$	30
	<u> </u>	То	tal	79.2

2. Simplified approach

If a bank holds net long position of USD800 and net short position of USD1000, the

capital charge is calculated as follows:			
Long position		USD	800
Short position			1000
Net open position		200 (s	hort)
Gross position		1800	
Capital charge (200×15% +1,800×3 % )	USD	84	

# E. Treatment of options

# (A) Introduction

- 1. Banks with limited options trading (including call and put warrants)<sup>18</sup> have the alternative to use simplified approach, delta-plus approach or scenario approach for measuring general market risk.
- 2. With respect to the credit risk of options (counterparty credit risk), only buyers are subject to credit risk capital charge. Refer to the section on the rules for calculating derivatives counterparty credit risk for calculation method.

	5	
	Credit risk	Market risk <sup>19</sup>
		(Including specific risk and market risk)
Buyer	$\checkmark$	
Seller	×	$\square$

Table 16Risk charges for buyer and seller of an option trade

Note:  $\blacksquare$  means capital charge is not required.  $\boxdot$  means capital charge is required.

- 3. Banks may use the simplified approach only if they have limited options trading and the time to maturity of the option is less than six months; the restriction of six months to maturity does not apply if a bank handles only limited range of purchased options. Conversely if the bank also holds the seller position in options and the time to maturity exceeds six months, or the trading of options is significant, the bank should not use the simplified approach, but rather delta-plus approach or scenario approach, or more detailed risk management model (e.g. internal model).
- 4. The use of delta-plus or scenario approach is subject to the approval of the FSC. Banks that handle significant options trading and exotic options should use more detailed risk management model (i.e. internal model).
- (B) Simplified approach

Under the simplified approach, positions are first classified into hedged position and naked position. The capital charge rules are detailed in Table 17.

A hedged position is a position where an opposing position in the physical underlying of an option or an option is established for the purpose of hedging. If an opposing position

<sup>&</sup>lt;sup>18</sup> Banks with significant options trading preferably use their internal model for measuring market risk. Delta-plus approach and scenario approach are transitional approaches prior to the adoption of internal model.

<sup>&</sup>lt;sup>19</sup> Market risk of options (including specific risk and general market risk) should be charged according to the rules herein.

in the physical underlying is created for offset, the capital charge for the hedged position is as provided in Table 17, including long in underlying matched with a long put or a short call, and short in underlying matched with a long call or a short put (the unit of the spot must match that of the options; excess spot positions are charged for the relevant categories i.e. interest rate related instruments, equities, foreign exchange and commodities; excess options positions are categorized under "naked position" for capital charge purpose. If an opposing position in options is established, it must be a back-to-back position with completely identical trading terms but in opposite direction<sup>20</sup>. For such hedged position, no capital charge for market risk is required, but counterparty risk must be measured according to rules.

A naked position is an open options position held not for the purpose of hedging.

In the simplified approach, the spot of naked and hedged positions and the hedged options should be carved-out and subject to separately calculated capital charges instead of categorizing the spot under interest rate related instruments, equities, foreign exchange or commodities for capital charge.

	Option	position	In-the-money	Out-of-the-money
	Lon	g call	А	A
Naked position	Lon	ig put	А	А
	Sho	rt call	В	С
	Sho	rt put	В	С
	Long in	Long put	D	Е
Hedged	underlying	Short put	D	E
position	Short in	Long call	D	Е
	underlying	Short put	D	Е

Table 17 Capital charge by simplified approach

The terms defined in Table 17 concerning capital charge by simplified approach mean the following:

#### **In-the-money:**

For a call option (including call warrants), it is in-the-money when the market value of

<sup>&</sup>lt;sup>20</sup> "Back-to-back position" means simultaneously holding positions with completely identical terms (including strike price, quantity, expiration date, underlying and other conditions) but in opposite direction.

the underlying is greater than the exercise price of the option; for a put option (including put warrants), it is in-the-money when the market value of the underlying is smaller than the exercise price of the option.

#### **Out-of-the-money:**

For a call option (including call warrants), it is out-of-the-money when the market value of the underlying is smaller than the exercise price of the option; for a put option (including put warrants), it is out-of-the-money when the market value of the underlying is greater than the exercise price of the option.

#### Naked position:

Naked position a long or a short option, which may be long call, long put, short call and short put. The capital charge for naked position differs for in-the-money and out-of-the-money options (A, B, or C). For example, if a short call is in-the-money, its capital charge method is B; if it is out-of-the-money, its capital charge method is C.

#### **Hedged position:**

If an underlying position is matched with an option, which could be "long in underlying matched with long put", "long in underlying matched with short call", "short in underlying matched with long call", and "short in underlying matched with short put." The capital charge for hedged position differs for in-the-money and out-of-the-money options (D or E). For example, if long in underlying matched with short call is in-the-money, its capital charge method is D; if it is out-of-the-money, its capital charge method is E.

- **P**%: Sum of capital charge rate for the specific risk and general market risk of the underlying (there is no specific risk for foreign exchange and commodity positions).
- S: Market value of the underlying

A: If the bank is only an option buyer, the capital charge should be the less of (1. and 2.):

 1. Market value of the underlying multiplied by the Sum of capital charge rate for the specific risk and general market risk of the underlying (P%); or

2. Market value of the option.

(Currency option or commodity option outside the trading book may use book value for capital charge).

- **B**: Market value of underlying (S) x P%
- **C**: (Market value of underlying x P%)  $-0.5\times$  (out-of-the-money value of option)
- **D**: (Market value of underlying x P%) in-the-money value
- **E**: Market value of underlying x P%.

(C) Delta-plus approach

When a bank chooses delta-plus approach for market risk capital charge, the bank must measure capital charge for at least three types of risks (known risks associated with the price of options as derived by Taylor series expansion include delta, gamma, vega, rho and theta (see footnotes), that is, capital charge is the total charge for at least delta risk, gamma risk, and vega risk.

When using delta-plus approach to measure the specific market risk of options, the delta-weighted positions of options<sup>21</sup> are incorporated into the specific risk for the relevant category, e.g. interest rate, equities, etc. and multiplied by the specific risk charge rate for the underlying; to measure the general market risk of options, the delta-weighted positions of options are incorporated into the general market risk for the relevant category, e.g. interest rate, equities, foreign exchange and commodity, and added with the capital charge for gamma risk and vega risk.

• Delta risk (price risk)

21

Delta-weighted position of the options is multiplied by the capital charge rate for specific risk and general market risk set out for the underlying risk, i.e. interest rate risk, equity risk, foreign exchange risk, and commodity risk (only interest rate risk and equity position risk are subject to specific risk charge).

The calculation method is as follows:

- Delta = the change of option value corresponding to every dollar change in the value of the underlying.
- Option's delta-weighted position = market value of the underlying x delta.
- Capital requirement for delta risk = option's delta-weighted position  $\times$  capital charge rate of the risk category<sup>22</sup> (including specific risk charge and general market risk charge).

The calculation methods for different risk categories are illustrated below:

(1) Options with interest rate or debt security as underlying:

- Specific risk = delta-weighted position  $\times$  specific risk charge rate (measure specific risk charge with other interest rate positions).
- General market risk: delta-weighted positions are slotted into the time-bands of interest rate risk (into different time-bands depending on whether maturity method or duration method is used) and incorporated into the

<sup>&</sup>lt;sup>21</sup> Delta-weighted position is treated as an equivalent position in the measure of options and used for measuring the delta risk of options.

<sup>&</sup>lt;sup>2</sup> The risk categories include interest rate risk, equity risk, foreign exchange risk, and commodity risk.

measurement of general market risk.

A two-legged approach should be used as for other derivatives (e.g. interest rate futures option), requiring one entry at the time the underlying contract takes effect and a second at the time the underlying contract matures. For example, a call option on a June three-month interest-rate futures bought in April will be split into two delta-weighted positions, one is a long position with a maturity of five months and the other a short position with a maturity of two months.

(2) Options with equity as underlying:

Specific risk=delta-weighted position  $\times$  specific risk charge rate (measure specific risk charge with other equity positions).

General market risk: delta-weighted position of option is incorporated into the measurement of equity risk, which is calculated on a market-by-market basis (measure general market risk with other equity positions).

- (3) Options with foreign exchange and gold as underlying: Net delta-weighted position (long and short offset) is incorporated into the measurement of the exposure for the respective currency (or gold) position.
- (4) Options with commodity as underlying:

Delta-weighted position of the option is incorporated into the simplified or the maturity ladder approach set out for commodity position.

Gamma risk

First measure the gamma impact for "each option position." Only net gamma impact that is negative will be included in the capital calculation.

Gamma impact =  $0.5 \times \text{gamma} \times \text{UV}^2$ 

UV means variation of the underlying of the option as expressed by the market value of the underlying multiplied by its capital charge rate. The gamma risks of different risk categories (interest rate, equity, foreign exchange and commodity) are determined as follows:

a. Interest rate options:

- (a) When the underlying is a debt security, the market value of the underlying multiplied by the capital charge rate for the general market risk of interest rate exposures.
- (b) When the underlying is interest rate, the notional principal of the contract<sup>23</sup> multiplied by the capital charge rate for the general market risk of interest

<sup>&</sup>lt;sup>23</sup> Market value may be used instead if it is measurable.

rate exposures.

b. Equity and equity index options<sup>24</sup>:

Market value of the underlying multiplied by 8%.

c. Foreign exchange and gold options:

Market value of the underlying multiplied by 8%.

d. Options

Market value of the underlying multiplied by 15%.

- For the purpose of calculation, the following positions should be treated as the same underlying in the calculation of "net negative gamma impact":
  - (i) Interest rates: Options with the same currency and in the same time-band.
  - (ii)Equities (including stock indexes): Options in the same national (or district) market.
  - (iii) Foreign currencies<sup>25</sup>: Options in the same currency.
  - (iv) Commodities:
    - a) Maturity ladder approach: Options in the same contract series and having the same maturity.
    - b) Simplified approach: Options in the same contract series.
  - Capital charge for "net negative gamma impact": Each option on the same underlying will have a gamma impact that is either positive or negative. These individual gamma impacts will be summed, resulting in a net gamma impact for each underlying that is either positive or negative. Only those net gamma impacts that are negative will be included in the capital calculation.
- Vega risk (volatility risk)
  - Vega = Change of value of an option corresponding to 1% volatility of the value of underlying.

Take the example of interest rate option, its vega risk is not incorporated into the measurement of the general market risk charge for matched and unmatched positions. Instead, capital for gamma risk should be calculated directly.

Capital charge for vega risk = Vega multiplied by a proportional shift in volatility of 25%; take the absolute value.

<sup>&</sup>lt;sup>24</sup> The gamma value will not be incorporated in highly liquid portfolio. Instead, capital for gamma risk is calculated directly, which is the market value of the underlying multiplied by 8%.

Any gold option is also treated as the same underlying.

#### (D) Scenario approach

The application of scenario approach requires the consent of the FSC. Banks with comprehensive risk measurement methods will also have the right to base the market risk capital charge for options portfolios on scenario matrix analysis. But such banks need to specify a fixed range of changes in the option portfolio's risk factors and calculate capital charge by scenario approach. Both specific risk capital charge and general market risk capital charge need to be measured under the scenario approach as described below:

#### • Specific risk

- Only debt instruments and equity positions require specific risk charge as described below:
- Specific risk charge for options with debt instrument as underlying:
   Specific risk = (Market value of the underlying × option's delta) × capital charge rate for specific interest rate risk.
- Specific risk for equity options
  - Specific risk = (Market value of the underlying  $\times$  option's delta)  $\times$  capital charge rate for specific equity risk.
- General market risk

For each option portfolio (including options and hedged positions), construct a matrix composed of two dimensions for scenarios analysis to measure the capital charge for the largest loss.

■ In the first dimension of the matrix, the options and related hedging positions are evaluated over a specified range above and below the current value of the underlying; for interest rate options, the assumed changes in yield corresponding to the interest rate risk time-bands under the maturity approach for general market risk represents the range of price change. Banks which are significant traders in interest rate options will be permitted to base the calculation on a minimum of six sets of time-bands. When using this method, not more than three of the time-bands should be combined into any one set. When several time-bands are combined into one set, the highest of the assumed changes in yield applicable to the set to which the time-bands belong should be used<sup>26</sup>. The ranges of price changes for other risk categories are as follows: ±8% for

<sup>&</sup>lt;sup>26</sup> Assume time-bands are divided into six sets, the assumed changes in yield is as follows:

	Maturity time-band	Assumed change in yield (basis point)
(1)	< 3 months	1 0 0
(2)	3 – 6 months	1 0 0
(3)	6 – 12 months	1 0 0
(4)	1 – 4 years	9 0
(5)	4 – 10 years	75

equities,  $\pm 8\%$  for foreign exchange and fold, and  $\pm 15\%$  for commodities.

For all options portfolios, at least seven observations (including the current observation) should be used to divide the range of price change as the first dimension of the matrix.

- The second dimension of the matrix is expressed by a change in the volatility of the underlying rate or price equal to a shift in volatility of  $\pm 25\%$ .
- After simulation analysis along the grid in the matrix, the capital charge for each underlying will then be calculated as the largest loss contained in the matrix.

#### (E) Annex – Delta-Plus Analysis

$$v(s,k,r,t,\sigma) = v_0(s_0,k,r,t,\sigma) + \frac{\partial V}{\partial S}\Big|_{V_0}(S-S_0) + \frac{1}{2}\frac{\partial^2 V}{\partial S^2}\Big|_{V_0}(S-S_0)^2$$
$$+ \frac{\partial V}{\partial \sigma}\Big|_{V_0}(\sigma-\sigma_0) + \frac{\partial V}{\partial r}\Big|_{V_0}(r-r_0) + \frac{\partial V}{\partial t}\Big|_{V_0}(t-t_0)$$
$$dv \approx \frac{\partial V}{\partial S}\Big|_{V_0}ds + \frac{1}{2}\frac{\partial^2 V}{\partial S^2}\Big|_{V_0}(ds)^2 + \frac{\partial V}{\partial \sigma}\Big|_{V_0}d\sigma + \frac{\partial V}{\partial r}\Big|_{V_0}dr + \frac{\partial V}{\partial t}\Big|_{V_0}dt$$
$$dv \approx \delta \times ds + \frac{1}{2}\Gamma \times (ds)^2 + \Lambda \times d\sigma + rho \times dr + \theta \times dt$$

 $dv \approx Delta \times ds + \frac{1}{2}Gamma \times (ds)^2 + Vega \times d\sigma + rho \times dr + Theta \times dt$ 

The symbols above are defined as follows:

s : Market price of the underlying.

- k : Strike price of the option.
- r : Risk-free interest rate.
- t : Time to maturity (years).
- $\sigma$ : Volatility of return on the underlying.

dv: Change of the value of option, depicting the market risk of option.

- $\delta \times ds$ : Delta risk of option at the value of deltax (price change of the underlying), depicting the effect of price change of the underlying on the value of option.
- Vega  $\times d\sigma$ : Volatility risk, depicting the effect of the volatility of underlying's price on the value of option.

Rho: Interest rate risk, depicting the effect of interest rate change on the option's value.

Theta: Time risk, depicting the effect of time change on the value of the option.

# As deduced above, option's risk includes delta, gamma, vega, rho and theta. When delta plus approach is used, at least delta, gamma and vega need to be incorporated in the calculation of capital charge.

## (F) Examples

## 1. Simplified approach

The bank holds 100 shares of stock valued at \$10 per share, and at the same time, buys 100 share put option at the strike price of \$11 per share. The capital charge for the exposure is calculated as follows:

(100x\$10) × (8% +8%) = \$160 (market value of underlying multiplied by the capital charge rates for specific risk and general market risk) less in-the-money value of option: (11-10)× 100 = \$100

The required capital charge is: 160-100 = \$60

### 2. Delta-plus approach

The bank holds a short European-style call option at 490 with 12 months to maturity, the market price of the underlying is 500, the annual risk-free rate is 8%, and volatility is 20%. According to the Black—Scholes pricing formula, the delta of the short call position is -0.721, gamma is -0.0034, and vega is -1.68 (meaning the value of option increases 1.68 for every 1% increase in volatility, thus the value of the option position would decrease 1.68). The current value of the option is 65.48.

#### Delta risk capital charge = 54.075

Delta-weighted position = 500×0.721=360.5 Delta risk=360.5×0.15=54.075

# Gamma risk capital charge = 9.5625

 $0.5 \times 0.0034 \times (500 \times 0.15)^2 = 9.5625$ 

## Vega risk capital charge = 8.4

For a short option, increase in the volatility of the underlying would lead to loss. The capital charge for volatility change is calculated based on a proportional shift in volatility of 25%. The current volatility is 20%, and the capital charge for an increase of 5% ( $20\% \times 25\% = 5\%$ ) is:

|-1.68×5|=8.4

Total capital charge: 72.0375 (=54.075+9.5625+8.4)

#### 3. Scenario approach

A bank buys and sells options based on the domestic interest rate, and buys and sells foreign exchange rate options denominated in USD. The bank has the alternative to adopt scenario approach for calculating the general market risk capital charge of the options portfolio.

yield	-100	-66	-33	current	+33	+66	+100
	basis	basis	basis	yield	basis	basis	basis
	points	points	points		points	points	points
volatility							
+25%	G/L	G/L	G/L	G/L	G/L	G/L	G/L
current%	G/L	G/L	G/L	G/L	G/L	G/L	G/L
-25%	G/L	G/L	G/L	G/L	G/L	G/L	G/L

# • Interest rate options with three months to maturity (repricing)

Note: "G" means gain; "L" means loss.

# • CAD/USD exchange rate options

yield	-8%	-5%	-2.5%	current exchange	+2.5%	+5%	+8%
				rate			
volatility							
+25%	G/L	G/L	G/L	G/L	G/L	G/L	G/L
current%	G/L	G/L	G/L	G/L	G/L	G/L	G/L
-25%	G/L	G/L	G/L	G/L	G/L	G/L	G/L

Note: "G" means gain; "L" means loss.

The required capital charge is the sum of the largest loss in each (scenario analysis) table for different exposures.

# **III. Internal Models Approach**

## A. Introduction

The use of internal models approach for assessing general market risk would be more precise than the standardized measurement approach. But the accuracy of the measurements using internal models is conditional upon whether there is a whole set of risk management policies and processes in place, and whether the policies and processes are effectively implemented and controlled in addition to the performance of the internal models. To ensure that the accuracy of the internal models is rigorously observed and that their effective operation is maintained, banks that plan to adopt internal models approach for measuring the market risk capital charge must meet the following criteria (including quantitative standards, qualitative standards, risk management process and model verification).

### B. General criteria

- (A) The use of internal models for measuring the market risk capital charge must meet the following criteria and receive the approval of the supervisory authority:
  - 1. A comprehensive set of risk management policies and operating procedures are in place and effectively implemented;
  - Risk management and internal models are implemented by personnel with professional capability, including risk management personnel, trading personnel and supervisors, and personnel in charge of operating process, report, control and audit;
  - 3. The bank's models have a proven track record of reasonable accuracy in measuring risk;
  - 4. The bank regularly conducts regular stress tests according to the "qualitative standards" for the internal models for risk measurement.
- (B) If so requested by the FSC, the bank must complete a period of initial monitoring and live testing of its internal model and report the results to the FSC before using the model for capital charge purposes.
- (C) The market risk capital requirement shall be the higher of:
  - 1. previous day's value-at-risk; and
  - 2. an average of the daily value-at-risk measures on each of the preceding sixty business days, multiplied by a multiplication factor.
    - ♦ (The multiplication factor is 3 at minimum. The multiplication factor will be added with other plus factors on the basis of the assessment of the bank's risk management system (see backtesting for details).
- (D) Banks shall comply with all the provisions specified in sections C through F below in

addition to the rules described above.

(E) Scope of application for internal models approach:

Banks which start to use internal models for certain market risks will, over time, be expected to extend the models to all market risks. A bank which has developed one or more models will no longer be able to revert to measuring the risk measured by those models according to the standardized methodology. Banks will be free to use a combination of the standardized measurement method and the internal models approach to measure their capital requirements during the transitional period, subject to the prior approval of the supervisory authority. Banks may not change the scope of application of the methodology at their own discretion unless with the prior approval of the supervisory authority.

#### C. Qualitative standards

Only those banks whose models are in full compliance with the qualitative criteria will be eligible for application of the minimum multiplication factor (which is 3). The qualitative criteria include:

- (A) The bank should have an independent risk control unit (independent from risk generating units) that is responsible for the design and implementation of the bank's risk management system. The risk control unit should produce and analyze daily reports on the output of the bank's risk measurement model, including an evaluation of the relationship between measures of risk exposure and trading limits, and report to the senior management.
- (B) The risk control unit should conduct a regular back-testing, i.e. an ex-post comparison of the risk measure generated by the model against actual daily changes in portfolio value over longer periods of time, as well as hypothetical changes based on static positions.
- (C) The risk control unit should also conduct the initial and on-going validation of the internal models.
- (D)Board of directors and senior management should be actively involved in the risk control process and render necessary support. The daily reports prepared by the risk control unit must be reviewed by a level of management with sufficient seniority and authority that, where necessary, may enforce both reductions of positions taken by individual traders and reductions in the bank's overall risk exposure.
- (E) The bank's internal risk measurement model must be closely integrated into the day to-day risk management process of the bank. Its output should accordingly be incorporated into the planning, monitoring and control operations of risk management.
- (F) The risk measurement system of the internal model should be used in conjunction with
internal trading and exposure limits. Traders and senior management should be familiar with the trading limits.

- (G) Day-to-day output of the internal model should be subject to regular stress testing. The results of stress testing should be used in the internal assessment of capital adequacy, and reported to senior management periodically, and consistent with the policies and limits set by management and the board of directors. Where stress tests reveal particular vulnerability, prompt actions should be taken to manage those risks appropriately (e.g. carrying out hedging, reducing the size of the bank's exposures, or increasing capital).
- (H) Banks should have documented specifications to ensure that the risk measurement system complies with internal policies, controls and operating procedures. The risk management system and risk measurement methodologies should be well-documented.
- (I) An internal unit should conduct independent review of the risk measurement system regularly. This review should include both the activities of the business trading units and of the risk control unit. A review of the overall risk management process should take place at least once a year and should specifically address, at a minimum, the following:
  - 1. The adequacy of the documentation of the risk management system and process;
  - 2. The organization of the risk control unit;
  - 3. The integration of market risk measures into daily risk management;
  - 4. The approval process for risk pricing models and valuation systems used by front, middle and back-office personnel;
  - 5. The validation of any significant change in the risk measurement process;
  - 6. The scope of market risks captured by the risk measurement model;
  - 7. The integrity of the management information system;
  - 8. The accuracy and completeness of position data;
  - 9. The verification of the consistency, timeliness, reliability, and independence of data sources used to run internal models;
  - 10. The accuracy and appropriateness of volatility of risk factors, correlation assumptions, and parameters used in the risk measurement model;
  - 11. The accuracy of valuation and risk transfer calculation (transfer of risks to others through trading), i.e. the effective measurement of the hedging effect; and
  - 12. The accuracy of frequent back-testing and model validation performed by the risk control unit.
- (J) Banks must meet the following standards in the validation of internal models:Banks must ensure that their internal models have been independently validated to

ensure that they adequately capture all material risks. This validation should be conducted on a periodic basis, especially when the model is initially developed, when any significant changes are made to the model, and when there have been any significant structural changes in the market or changes to the composition of the portfolio. Model validation should not be limited to backtesting, but should, at a minimum, also include the following:

- 1. Tests to demonstrate that any assumptions made within the internal model are appropriate and do not underestimate risk. This may include the assumption of the normal distribution, the use of the square root of time to scale from a one day holding period to a 10 day holding period or where extrapolation or interpolation techniques are used, or pricing models.
- 2. Aside from the regulatory backtesting, testing for model validation should be carried out using additional tests, which may include, for instance:
  - (1) Testing carried out using hypothetical changes in portfolio value that would occur were end-of-day positions to remain unchanged, which therefore excludes trading fees, commissions, bid-ask spreads, net interest income and intra-day trading.
  - (2)Testing carried out for longer periods than required for the regular backtesting (e.g. 3 years). The longer time period generally improves the power of the backtesting. A longer time period may not be desirable if the VaR model or market conditions have changed to the extent that historical data is no longer relevant.
  - (3) Testing carried out using confidence intervals higher than 99%.
  - (4) Testing of portfolios below the overall bank level.
- 3. The use of hypothetical portfolios to ensure that the model is able to apply to particular structural features, for example:
  - (1) Where data histories for a particular instrument do not meet the quantitative standards and where the bank has to map these positions to proxies, then the bank must ensure that the proxies produce conservative results under relevant market scenarios.
  - (2) Ensuring that material basis risks are adequately captured. This may include mismatches between long and short positions by maturity or by issuer.
  - (3) Ensuring that the model captures concentration risk that may arise in an undiversified portfolio.

D. Specification of market risk factors (parameters)

Market risk factors are market rates and prices that affect the value of the bank's trading positions. The market risk factors should be properly regulated, which is an important part in

a market risk measurement system. Market risk factors contained in the market risk measurement system should be sufficient to capture market risks inherent in the bank's portfolio of on- and off-balance sheet trading positions, including interest rate, exchange rate, equities and commodities risk as well as the volatilities of related options.

The risk factors for an internal model should meet the following principles:

#### (A) Interest rates

- 1. There must be a set of risk factors corresponding to interest rates in each currency in which the bank has interest-rate-sensitive on- or off-balance sheet positions.
- 2. The risk measurement system should model the yield curve using a generally accepted approach, for example, by estimating forward rates of zero coupon yields. The yield curve should be divided into various maturity segments in order to capture variation in the volatility of rates along the yield curve; there will typically be one risk factor corresponding to each maturity segment. When measuring exposures to interest rate movements in the major currencies and markets, banks must model the yield curve using a minimum of six risk factors. However, the number of risk factors used should ultimately be driven by the nature of the bank's trading strategies. For instance, a bank with a portfolio of various types of securities across many points of the yield curve and that engages in complex arbitrage strategies would require a greater number of risk factors to capture interest rate risk accurately.
- 3. The risk measurement system must incorporate separate risk factors to capture spread risk. A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other fixed income interest rates, such as specifying a completely separate yield curve for non-government fixed-income instruments or estimating the spread over government rates at various points along the yield curve.
- (B) Exchange rates (including gold)

The risk measurement system should incorporate risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated. Since the value-at-risk figure calculated by the risk measurement system will be expressed in the bank's domestic currency, any net position denominated in a foreign currency will incur a foreign exchange risk. Thus, there must be risk factors corresponding to the exchange rate between the domestic currency and each foreign currency in which the bank has a significant exposure.

(C) Equity prices

- 1. There should be risk factors corresponding to each of the equity markets in which the bank holds significant positions:
- 2. At a minimum, there should be a risk factor that is designed to capture market-wide movements in equity prices, e.g. a market index. Positions in individual securities or in sector indices could be expressed in beta-equivalents. A beta-equivalent position would be calculated from an equity model (such as the CAPM model) by regressing the return on the individual stock or sector index on the risk-free rate of return and the return on the market index.
- 3. A further approach would be to have risk factors corresponding to various sector indices. As above, positions in individual equity are expressed by beta-equivalent in respect to the sector index.
- 4. The most extensive approach would be to have risk factors corresponding to the volatility of individual equity position.
- 5. Banks should determine the nature and sophistication of the modeling technique for a given market according to the bank's exposure to the overall market as well as its concentration in individual equity in that market.
- (D) Commodity prices
  - 1. There should be risk factors corresponding to each of the commodity markets in which the bank holds significant positions.
  - 2. For banks with relatively limited positions in commodity-based instruments, a straightforward specification of risk factors would be acceptable, for example, using one risk factor for each commodity price to which the bank is exposed. In cases where the aggregate positions are small, it might be acceptable to use a single risk factor for a sub-category of commodities.
  - 3. For more active trading, the model must also take account of variation in the convenience yield between derivatives positions and cash positions in the commodity.

# E. Quantitative standards

Banks will have flexibility in devising the precise nature of their models, but the following minimum standards will apply for the purpose of calculating their capital charge. The FSC has the discretion to demand stricter standards:

(A) Value-at-risk<sup>27</sup> must be computed on a daily basis.

(B) In calculating the value-at-risk, a 99th percentile, one-tailed confidence interval is to be

<sup>&</sup>lt;sup>27</sup> Value-at-risk (VaR) measures the maximum loss in the market value of a portfolio over a given time interval at a given confidence level.

used.

- (C) In calculating value-at-risk, an instantaneous price shock equivalent to a 10 day movement in prices is to be used, i.e. the minimum "holding period" will be ten trading days. Banks may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days by the square root of time.
- (D) Banks should choose the historical observation period (sampling period) for calculating value-at-risk with a rigorous approach. For banks that use a weighting scheme or other methods for the historical observation period, observation period must be at least one year (that is, the weighted average time lag of the individual observations cannot be less than 6 months).
- (E) Banks should update their data sets no less frequently than once every three months and should also reassess them whenever market prices are subject to material changes. Where necessary, a bank should shorten the observation period or follow the FSC instruction in adjusting the observation period for the calculation of value-at-risk.
- (F) Banks will be free to use models based, for example, on variance-covariance matrices, historical simulations, or Monte Carlo simulations in accordance with the risk factor specification and qualitative standards described above for the measurement of market risk.
- (G)Banks will have discretion to recognize empirical correlations within risk categories (e.g. interest rates, exchange rates, equity prices and commodity prices) according to empirical results. A bank may also recognize empirical correlations across broad risk factor categories, provided that the bank has demonstrated the appropriateness of its measuring methods and procedures to the satisfaction of the FSC.
- (H) A bank's internal models must accurately capture the unique risks associated with options within each of the broad risk categories. The following criteria apply to the measurement of options risk:
  - 1. Banks' models must capture the non-linear price characteristics of options positions;
  - 2. The basic objective is to apply a full 10 day price shock to options positions or positions that display option-like characteristics. If a bank fails to perform measurement accordingly, it may adjust its capital measure for options risk through other methods, e.g. periodic simulations or stress testing, subject to the consent of the FSC;

- 3. Each bank's risk measurement system must have a set of risk factors that captures the volatilities of the rates and prices underlying option positions, i.e. vega risk. Banks with relatively large and complex options portfolios should have detailed specifications of the relevant volatilities to measure the volatilities of options positions broken down by different maturities.
- (I) Each bank must meet, on a daily basis, a capital requirement expressed as the higher of
  - 1. its previous day's value-at-risk measured by a qualified internal model; and
  - 2. an average of the daily value-at-risk measures on each of the preceding sixty business days, multiplied by a multiplication factor.
- (J) The multiplication factor will be set on the basis of the bank's backtesting results. The FSC has the discretion to require banks to perform backtesting on either hypothetical conditions, or actual trading to evaluate whether the applied multiplication factor is appropriate. The basic principles for banks to determine multiplication factor based on the backtesting results are as follows:
  - 1. Take the past 250 business days as the comparison period and obtain the number of exceptions (i.e. the number of cases where actual loss falls out of the confidence level of loss estimated by the model) by comparing:
    - (1) actual daily portfolio loss; and
    - (2) daily value-at-risk of the portfolio as estimated by the model.
  - 2. The relationship between the number of exceptions and multiplication factor is as shown in Table 18: green zone means there is no question about the accuracy of the model used by the bank; yellow zone means the model quality and accuracy are in doubt, but there is no decisive conclusion; red zone means the model is seriously inaccurate. In the case of red zone, the FSC may restrict the use of such model.
- (K) Banks shall submit the backtesting results in the previous year to the FSC before the end of January every year for approval of the applicable multiplication factors for the current year, which the FSC has the discretion to make adjustment at any time based on the actual situation.

## Table 18 Determining multiplication factors based on the number of

	No. of exception	Multiplication factor
Green zone	< 4	3.00
Yellow zone	5	3.40
	6	3.50
	7	3.65
	8	3.75
	9	3.85
Red zone	> 10	4.00

### exceptions generated in 250-days backtesting

- (L) Banks using models will also be subject to a capital charge to cover specific risk of interest rate related instruments and equity securities as described below:
  - 1. Where a bank has a VaR model that incorporates specific risk and that meets all the qualitative and quantitative requirements for general risk models, as well as the additional requirements set out below, it may base its charge on modeled estimates. Otherwise, the bank is required to calculate its specific risk capital charge under the standardized method.
  - 2. The criteria for banks' modeling of specific risk require that a bank's model must capture all material components of price risk and be responsive to changes in market conditions and compositions of portfolios. When the measuring techniques and the best practice of the model are updated, the bank should make adjustment as soon as possible and meet the following requirements:
    - (1) able to explain the historical price variation in the portfolio;
    - (2) able to capture the change in composition and concentration risk of the portfolio;
    - (3) able to capture the rising trends of risk in an adverse environment;
    - (4) able to capture the idiosyncratic differences between different positions (ex.: debt positions with different levels of subordination, maturity mismatches, or credit derivatives with different default events);
    - (5) able to capture event risk that might affect price change; and
    - (6) be validated through backtesting to see if it is fit to measure general market risk and specific risk.
  - 3. Where a bank's VaR model is unable to capture event risk, because it is beyond the 10-day holding period and 99 percent confidence interval (i.e. low probability and high severity events), the bank must ensure that the impact of such events has been factored in to its internal capital assessment, for example through its stress testing.

- 4. The bank's model must conservatively assess the risk arising from less liquid positions and/or positions with limited price transparency. In addition, the model must meet minimum data standards. Proxies may be used only where available data is insufficient or is not reflective of the true volatility of a position or portfolio, and only where they are handled conservatively.
- 5. Further, as techniques and best practices evolve, banks should avail themselves of these advances.
- 6. A bank must have an appropriate approach to capture the specific risk of its trading book positions. Such approach may be a part of the bank's overall market risk model, or a surcharge from a separate calculation as described below:
  - (1) To avoid double counting a bank may, when measuring specific risks and capital charges, take into account the default risk that has already been incorporated in the calculation of the internal model, especially for risk positions that could and would be closed within 10 days in the event of adverse market conditions or other indications of credit deterioration without double counting their default risk.
  - (2) If a bank uses internal model to measure specific market risk, the bank still must perform backtesting to evaluate whether the model accurately grasps the default risk. When performing specific risk backtesting, daily data on the debt instrument and equity positions shall be tested respectively. If the bank classifies its trading positions in greater detail, backtesting should be carried out according to the more detailed classification. Position classification for specific risk backtesting purpose shall be applied on a consistent basis and may not be altered at own discretion unless the bank has demonstrated to the FSC that the altered classification approach is more reasonable. The bank should analyze the reasons for the exceptions found in the backtesting results, and based on which, modify the model calculation. If the backtesting results fall in the "red zone" (more than 10 exceptions in 250 days), it means the method used by the model for specific risk calculation is "unacceptable" and the bank should take prompt remedial measures, and increase capital charge for specific risks not fully grasped by the model.
  - (3) Where a bank captures its risk through a surcharge, the surcharge will not be subject to a multiplication factor or regulatory backtesting, although the bank should be able to demonstrate that the surcharge calculation method meets its aim.
  - (4) Whichever approach is used, the bank must demonstrate that it meets a soundness standard comparable to that of the internal-ratings based approach to credit risk,

under the assumption of a constant level of risk, and adjusted where appropriate to reflect the impact of liquidity, concentrations, hedging, and optionality of the trading book positions. If a bank use surcharge calculation instead of the internal model, the approach used should be consistent with that of the internal-ratings based approach to credit risk.

(5) Whichever approach is used, securitized exposures shall still be subject to a capital deduction treatment under the securitization framework, that is, equity tranches that absorb first losses should be deducted 50% each from Tier 1 capital and Tier 2 capital; securitization exposures that are unrated liquidity lines or credit enhancement lines, would be subject to a capital charge that is no less than that set forth in the securitization framework. An exception to this treatment could be afforded to banks that are dealers in the above exposures where they can demonstrate that the securitization positions are held with trading intent<sup>28</sup>, that a highly liquid market exists for the position<sup>29</sup> and the bank has sufficient market data and proper internal model to fully grasp the increased default risk arising from the concentration of securitization positions. In such event, the bank is not subjected to capital deduction and treats the securitization positions according to the measure of default risk of regular trading book positions by internal models approach.

#### F. Stress testing

- (A) Banks that use the internal models approach for meeting market risk capital requirements must have in place a rigorous and comprehensive stress testing program. The purpose if stress testing is to identify events or influences that could greatly impact banks and furthermore assess whether the bank's capital level is adequate.
- (B) Banks' stress scenarios need to cover a range of factors that can create extraordinary losses or gains in trading portfolios, or make the control of risk in those portfolios very difficult. These factors include low-probability events in all major types of risks, including the various components of market, credit, and operational risks. Stress scenarios need to shed light on the impact of such events on positions that display both linear and nonlinear price characteristics (i.e. options and instruments that have options-like characteristics).

(C) Banks' stress tests should incorporate negative impact testing covering both market risk and

Including traditional securitization exposures and synthetic securitization exposures through the use of credit derivatives.

<sup>&</sup>lt;sup>9</sup> It means a market in which the bank is able to determine a reasonable transaction price in one day through honest and fair competition, and based on which, settle the trade in a short period of time.

liquidity, and meet the quantitative and qualitative criteria. Quantitative criteria should identify plausible stress scenarios to which banks could be exposed. Qualitative criteria should emphasize that two major goals of stress testing are to evaluate the capacity of the bank's capital to absorb potential large losses and to identify steps the bank can take to reduce its risk and conserve capital. This assessment is integral to setting and evaluating the bank's management strategy and the results of stress testing should be routinely communicated to senior management and, periodically, submitted to the bank's board of directors.

- (D) Banks should use stress scenarios developed by banks themselves to reflect their specific risk characteristics and prepare documentation to describe the appropriateness of the stress scenarios. The supervisory authority may ask banks to stress test specific scenarios at any time. Banks shall preserve the following stress test related data:
  - 1. Banks should have information on the largest losses experienced during the reporting period for comparison with the level of capital that results from a bank's internal measurement system. For example, such data can be used to examine whether the largest losses in each period fall in the value at risk estimated by the system.
  - 2. Banks should subject their portfolios to a series of simulated stress scenarios and preserve the test results for supervisory review. These scenarios could include (1) testing the current portfolio against past periods of significant disturbance of large price movements or the sharp reduction in liquidity; (2) testing the assumptions about volatilities and correlations of exposures. Banks should evaluate the historical range of variation for volatilities and correlations and test the current positions against the extreme values of the historical range. Due consideration should be given to the sharp variation that at times has occurred in a matter of days in periods of significant market disturbance. For example, in market crash events that happened in the past, all involved correlations within risk factors approaching the extreme values of 1 or -1.
  - 3. In addition to the scenarios prescribed above, a bank should also develop its own stress tests which it identifies as most adverse based on the characteristics of its portfolio and preserve detailed documentation describing the methodology used in the simulation test and the test results.
- (E) The results of stress tests should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. If the testing reveals particular vulnerability to certain circumstances or impacts, the bank to take

appropriate steps to manage those risks (e.g. carrying out hedging or reducing the size of its exposures).