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Part II

Department of the Treasury
12 CFR Part 3

Federal Reserve System
12 CFR Part 208 et al.

Federal Deposit Insurance Corporation
12 CFR Part 325

Market Risk-Based Capital Standards and Capital Requirements for Market Risk; Proposed Rules

DEPARTMENT OF THE TREASURY

Office of the Comptroller of the Currency

12 CFR Part 3

[Docket No. 95–19]

RIN 1557–AB14

FEDERAL RESERVE SYSTEM

12 CFR Parts 208 and 225

[Regulations H and Y; Docket No. R–0884]

FEDERAL DEPOSIT INSURANCE CORPORATION

12 CFR Part 325

RIN 3064–AB64

Risk-Based Capital Standards: Market Risk

AGENCIES: Office of the Comptroller of the Currency (OCC), Department of the Treasury; Board of Governors of the Federal Reserve System (Board), and the Federal Deposit Insurance Corporation (FDIC).

ACTION: Joint notice of proposed rulemaking.

SUMMARY: The Office of the Comptroller of the Currency (OCC), the Board of Governors of the Federal Reserve System (Board), and the Federal Deposit Insurance Corporation (FDIC) (the Agencies) are proposing to amend their risk-based capital requirements to incorporate a measure for market risk in foreign exchange and commodity activities and in the trading of debt and equity instruments. Under the proposal, banks and bank holding companies (institutions) regulated by the OCC, the Board, and the FDIC with relatively large trading activities would calculate their capital charges for market risk using either their own internal value-at-risk model(s) or, alternatively, risk measurement techniques that were developed by supervisors. The effect of the proposed market risk measure would be that, in addition to existing capital requirements for credit risk, certain institutions would be required to hold capital based on the measure of their market risk exposure.

DATES: Comments must be received on or before September 18, 1995.

ADDRESSES: Comments should be directed to:

OCC: Comments may be submitted to Docket Number 95–19, Communications Division, Third Floor, Office of the Comptroller of the Currency, 250 E Street, S.W., Washington, DC 20219. Comments will be available for inspection and photocopying at that address.

Board: Comments directed to the Board should refer to Docket No.R–0884 and may be mailed to William W. Wiles, Secretary, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue, N.W., Washington, D.C. 20551. Comments may also be delivered to Room B–2222 of the Eccles Building between 8:45 and 5:15 p.m. weekdays, or to the guard station in the Eccles Building courtyard on 20th Street, N.W. (between Constitution Avenue and C Street) at any time. Comments may be inspected in Room MP–500 of the Martin Building between 9 a.m. and 5 p.m. weekdays, except as provided in 12 CFR 261.8 of the Board's rules regarding availability of information.

FDIC: Written comments should be sent to Jerry L. Langley, Executive Secretary, Attention: Room F–402, Federal Deposit Insurance Corporation, 550 17th Street N.W., Washington, D.C. 20429. Comments may be hand-delivered to Room, F–402, 1776 F Street N.W., Washington, D.C. 20429, on business days between 8:30 a.m. and 5 p.m. (Fax number (202)898–3838; Internet address: comments@fdic.gov). Comments will be available for inspection and photocopying in Room 7118, 550 17th Street, N.W., Washington, D.C. 20429, between 9 a.m. and 4:30 p.m. on business days.

FOR FURTHER INFORMATION CONTACT:

OCC: Roger Tufts, Senior Economic Advisor (202/874–5070), or Christina Benson, Capital Markets Specialist, (202/874–5070) Office of the Chief National Bank Examiner. For legal issues, Ronald Shimabukuro, Senior Attorney, Legislative and Regulatory Activities Division (202/874–5090), Office of the Comptroller of the Currency, 250 E Street S.W., Washington, D.C. 20219.

Board: Roger Cole, Deputy Associate Director (202/452–2618), James Houpt, Assistant Director (202/452–3358), Barbara Bouchard, Supervisory Financial Analyst (202/452–3072), Division of Banking Supervision and Regulation; or Stephanie Martin, Senior Attorney (202/452–3198), Legal Division. For the hearing impaired *only*, Telecommunication Device for the Deaf, Dorothea Thompson (202/452–3544).

FDIC: William A. Stark, Assistant Director, (202/898–6972), Kenton Fox, Senior Capital Markets Specialist, (202/898–7119), Division of Supervision; Jamey Basham, Counsel, (202/898–7265), Legal Division, FDIC, 550 17th Street, N.W., Washington, D.C. 20429.

SUPPLEMENTARY INFORMATION: The Agencies are proposing amendments to their risk-based capital requirements to incorporate a measure for market risk. The proposed amendments would generally apply only to institutions that have (1) total assets exceeding $5 billion and either on-balance-sheet trading activities representing at least 3.0 percent of total assets or a volume of off-balance-sheet trading activities with notional amounts exceeding $5 billion, or (2) total assets of $5 billion or less and a volume of trading activities representing at least 10.0 percent of total assets.

I. Background

The Agencies' risk-based capital standards are based upon the principles contained in the agreement on International Convergence of Capital Measurement and Capital Standards of July, 1988 (the Accord) that was agreed to by the Basle Committee on Banking Supervision (the Committee) and endorsed by the central bank governors of the Group of Ten (G–10) countries.[1] That Accord sets forth a framework for measuring capital adequacy under which weighted risk assets are calculated by weighting an institution's assets and off-balance-sheet items on the basis of their perceived credit risk using a relatively small number of risk categories.

By focusing on credit risk, the risk that a loss will be incurred due to an obligor or counterparty default on a transaction, the Accord generally excludes coverage of risks arising from adverse movements in market interest rates, foreign exchange rates, or commodity or equity prices. The potential for loss from such movements is referred to as market risk. In April 1993, the Committee, recognizing the need to incorporate market risk into the risk-based capital standard, requested comments on an initial measurement framework. The Agencies' current proposal reflects substantial revisions to that 1993 paper and is based upon revisions to the Accord that were proposed by the Committee on April 12, 1995.[2]

The 1993 paper proposed standardized measurement procedures for assessing risks in traded debt, equity,

[1] The Basle Supervisors' Committee is comprised of representatives of the central banks and supervisory authorities from the G–10 countries (Belgium, Canada, France, Germany, Italy, Japan, The Netherlands, Sweden, Switzerland, the United Kingdom, and the United States) plus Luxembourg.

[2] The Committee's document is entitled ''Proposal to Issue a Supplement to the Basle Capital Accord to Cover Market Risks'' and is available through the Board's and the OCC's Freedom of Information Office and the FDIC's Reading Room.

and foreign exchange activities and provided only a limited role for a bank's internal model(s) in measuring market risk exposure for regulatory capital purposes. These procedures were strongly criticized by commenters to the consultative document, especially by institutions in the United States. These institutions generally believed that the measurement framework was unduly cumbersome and potentially inaccurate, especially for institutions with significant and diversified trading activities.

In lieu of the standardized framework, these institutions urged the Committee to allow greater use of an institution's internal market risk models. They noted that large trading banks have materially expanded the sophistication and coverage of their market risk trading models. These models are typically described as ''value-at-risk'' (VAR) models, which estimate the maximum amount by which an institution's portfolio could decline in market value, given a certain level of statistical confidence and an assumed holding period. The commenters believed that these models would provide a more accurate risk measure and would be better able to incorporate new products and activities than would the standardized framework. They also believed that imposing a rigid supervisory measurement system on institutions would result in unnecessary costs and could encourage improper risk management practices if institutions sought to minimize the capital requirements resulting from the proposed risk measure. Many large European banks also urged the use of internal models for measuring market risks for regulatory capital purposes, but were generally less critical, in part because the European Union had adopted into European law a regime similar to the one outlined in the 1993 paper.[3]

In response to these and other comments and concerns, the Committee issued a new proposal on April 12, 1995. In addition to expanding the earlier proposal by providing measures for risks in commodities and options, this latest proposal would allow institutions to use their internal market risk models to measure the level of their market risk exposure against which they would be required to hold capital. This approach is referred to as the ''internal models approach.'' An institution's use of this approach would be subject to the approval of its appropriate supervisor and would be contingent upon conformance with certain qualitative and quantitative standards regarding the measurement and management of market risks. An institution whose internal model failed to meet those standards or otherwise failed to gain regulatory approval would be required to use standardized risk measurement techniques as set forth in the Committee's April 1995 proposal. This latter approach is referred to as the ''standardized risk measure'' approach, as it applies standardized assumptions and risk factors to an institution's activities.

The Agencies are now proposing amendments to their risk-based capital standards that are similar to the proposal recently issued by the Committee.[4] The Agencies would encourage institutions that are affected by this proposal, and especially those with large trading accounts, to comply with the proposed requirements by using the proprietary internal models that they use to manage market risk.

The Agencies believe that such models should provide a more accurate measure of market risk than the standardized risk measure and would impose fewer costs and burdens on institutions. By using internal models not only for operating purposes, but also as a basis for determining capital requirements, institutions should be further encouraged to continue their efforts to refine the accuracy of their proprietary models, especially with regard to options risk. Given their preference for the use of internal models for measuring market risk, the Agencies request comments regarding whether institutions should be permitted a choice between the two measurement procedures, or only be permitted to use internal models.

II. Scope: Activities and Institutions Covered by the Proposal

This proposal would establish new capital requirements for general market risk and specific risk as they pertain to the trading activities of a banking organization and to the organization's other foreign exchange and commodities activities. As such, the proposed standard, by creating a risk-based capital ratio adjusted for market risk through the addition of a market risk-equivalent assets measure, is an integrated supplement to existing standards that address credit risk through the current weighted-risk assets measure.

For purposes of this proposal, general market risk refers to changes in the market value of the covered transactions that arise from broad market movements, such as changing levels of market interest rates, broad equity indices, or currency exchange rates. Specific risk includes the credit risk of an issuer of a traded security, as well as other factors that affect the market value of specific instruments, but that do not materially alter broad market conditions. Consequently, instruments other than over-the-counter (OTC) derivatives that are covered by this proposal would, in effect, be removed from and no longer subject to the credit risk standard previously established. OTC derivatives would remain subject to the counterparty credit risk requirements set forth in the existing risk-based capital standard.

This proposal defines trading activities as the sum of all trading assets and liabilities as reported in the quarterly Consolidated Reports of Condition and Income (call report) and would apply on a fully consolidated basis to all national banks, state member banks, and bank holding companies that meet the following criteria:

(1) The institution has total assets exceeding $5 billion, and (a) the gross sum of trading assets and liabilities on a daily average basis for the quarter account for 3.0 percent or more of total assets, or (b) the sum of the notional amount of interest rate, foreign exchange, equity and commodity off-balance-sheet derivative contracts relating to trading activities exceeds $5 billion, or

(2) The institution has total assets of $5 billion or less and trading assets and liabilities exceed 10 percent of total assets.

The Agencies may also apply the standard to other institutions for safety and soundness purposes in limited circumstances and on a case-by-case basis.

III. Definition of Capital and the Capital Requirement

The Agencies are also proposing to expand the definition and types of qualifying capital that an institution could use to meet its market risk capital requirements. This modification and others require that the procedures for calculating an institution's overall risk-based capital ratio be changed.

Definition of capital. The Accord permits institutions to meet regulatory capital requirements with a combination of ''core'' (Tier 1) and ''supplementary''

[3] The European Union's Second Directive sets forth a capital regime for market risk that applies to banking and securities firms that operate in EU member countries. These capital requirements become effective at the beginning of 1996.

[4] As set forth in the regulatory text, the Agencies propose to adopt the market risk requirements as new appendices to their capital adequacy standards. The OCC may be required to make additional conforming amendments to its risk-based capital guidelines.

(Tier 2) capital. Tier 1 includes equity, noncumulative perpetual preferred stock, and minority interest in consolidated subsidiaries, less goodwill, while Tier 2 includes the allowance for loan and lease losses, other preferred stock, and subordinated debt that has an original weighted average maturity of at least five years.[5]

This proposal would permit institutions to use a third tier of capital (Tier 3), consisting of short-term subordinated debt. However, this capital could be used only to meet capital requirements pertaining to *market risk* and only if that debt meets certain qualifying conditions: It must have an original maturity of at least two years, be unsecured and fully paid up, and subject to a lock-in provision that prevents the issuer from repaying the debt even at maturity if the issuer's capital ratios are, or with repayment would become, less than the minimum 8.0 percent risk-based capital requirement.

The agencies are proposing to allow the use of Tier 3 capital in recognition that such short-term subordinated debt can help to protect depositors and the Bank Insurance Fund against loss. Indeed, because the underwriting activities of securities firms often create volatile capital requirements, securities regulators in many countries permit their institutions to treat such debt as capital, with similar qualifications. The Agencies, however, believe that Tier 1 instruments should remain a substantial proportion of an institution's total capital and, therefore, propose the following constraints:

(1) Tier 3 capital may not exceed 250 percent of the amount of Tier 1 capital allocated for market risk, and

(2) Tier 1 capital must represent at least 50 percent of an institution's total eligible capital—the sum of Tier 1, qualifying Tier 2, and Tier 3 to the extent it is permitted in item (1), above.

Note that any element of Tier 2 capital must continue to conform with the requirements of the original Accord; that is, Tier 2 may not exceed total Tier 1 capital, and long-term subordinated debt may not exceed 50 percent of Tier 1.

Calculation of the capital ratio. An institution subject to this proposal would remain subject to the Agencies' risk-based capital standards based on credit risk, but would also be required to supplement its risk-based capital ratio to adjust it for market risk. Under the proposal, an institution would accomplish this by multiplying its capital requirement for market risk (as calculated by the internal model or standardized approach) by 12.5 (the reciprocal of the minimum capital ratio of 8.0 percent) and adding the resulting market risk equivalent figure to its weighted risk assets, as calculated by the credit risk standard. The institution's Tier 1 and total risk-based capital ratios would be calculated as the sum of the eligible capital as a percent of the sum of market risk-equivalent assets and weighted risk assets. This approach avoids the distortions that could result from allocating the necessary capital to either market or credit risk and then calculating an institution's capital ratio on the basis of the remaining capital. It also incorporates the risk-based capital ratio adjusted for market risk into the capital category definitions under the Agencies' prompt corrective action regulations.

Due to the 250 percent constraint on Tier 3 capital, an institution that wishes to use Tier 3 capital must first calculate its minimum credit risk requirement to determine the amount of Tier 1 capital that is available to support market risk. This amount sets an upper limit on the amount of Tier 3 capital that the institution may have. In calculating its aggregate capital ratio, however, only that portion of Tier 3 that is actually needed to meet its market risk requirement may be included as eligible capital. Tier 3 capital in excess of this amount will not be considered as eligible capital as it is not permitted to meet credit risk. Eligible capital would be the sum of the whole of the institution's Tier 1 capital, plus all of its Tier 2 capital under the limits imposed in the credit risk Accord, and Tier 3 capital subject to the above restrictions. The quoted ratio will thus represent capital that is available to meet both credit risk and market risk.[6]

IV. Partial Models

With supervisory approval, institutions whose internal models do not cover all elements of their trading activities may use components of the alternative standardized approach to measure market risks for risk-based capital purposes. Such combinations, however, should be limited to situations in which the institution is in the process of developing and implementing the internal models approach for all of its trading activities and would be permitted only on a temporary basis. In addition, the combination of approaches used should be consistent with the method the institution uses in managing its risks. For example, if an institution has a comprehensive value-at-risk model for its interest rate exposures in its trading portfolio but not for its equities exposures, the agencies would expect the institution to use the standardized measure for equities and the internal model for interest rate exposures. These conditions are designed to prevent institutions from selecting the lower of alternative risk measures and are also intended to encourage institutions to develop and improve their risk measurement and management practices.

When combinations of the two risk measurement techniques are used, the institution should measure a complete risk category using a single approach and not mix techniques within a given category of risk. For this purpose, the risk categories are defined as interest rates, foreign exchange, equity prices, and commodity prices. Moreover, once an institution adopts a comprehensive value-at-risk model that is acceptable, it may not revert to the standardized risk measure, except in unusual circumstances and only with supervisory consent. The proposal provides some flexibility for *de minimis* positions, activities in remote locations, in minor currencies, or in activities that present negligible risk to the institution.

V. Internal Models Approach

The Agencies believe that an institution's market risk can be most accurately measured using detailed information available only to the institution and processed by its own proprietary risk measurement model(s). Accordingly, the Agencies would encourage all institutions—especially those with significant trading activities—to pursue this approach. To be most reliable, however, the modelling process must be fully integrated into the institution's broader procedures for managing risk and must be actively supported by senior management. It must also conform with other specific qualitative and quantitative standards that the Agencies believe are necessary in order to achieve an adequate level of rigor and consistency in a capital standard. Under this proposal, institutions that plan to use internal models in calculating their capital requirements for market risk

[5] Bank holding companies may include cumulative perpetual preferred stock in Tier 1 capital, subject to the conditions that are specified in the Board's capital guidelines.

[6] For example, if an institution had $120 of Tier 1 capital, of which $100 was needed to meet its minimum 8.0 percent risk-based capital standard for credit risk, only $20 would be available for market risk. That $20, in turn, would ''support'' as much as $50 of Tier 3 capital ($20 X 250%) for purposes of meeting the capital requirement for market risk. If the market risk capital requirement were $50, the institution could count only $30 of Tier 3 capital as eligible capital in calculating its regulatory capital requirements.

would need to contact their appropriate supervisor and make arrangements for having their models validated for regulatory capital purposes.

Modelling Market Risk

In order to measure exposures when evaluating trading risks, many institutions calculate the ''value-at-risk'' (VAR), representing the maximum amount by which the market value of their trading portfolios could decline during a specific period of time and with a certain degree of statistical confidence. For example, at the close of business on day one a bank might calculate its VAR to be $10 million, indicating that it has only some small chance of losing more than that amount on its existing holdings, if they were held through the end of day two. Most institutions use this measure as a management tool for evaluating their trading positions, limits, and strategies. By measuring the risk daily, management can quickly revise its positions, limits and strategies as market conditions change.

A value-at-risk model requires a variety of inputs: (1) Accurate and timely information about the institution's trading positions, (2) information about past movements of relevant market prices and rates, and (3) several key measurement parameters, such as the length of the historical period for which market changes are observed (observation period), management's required level of confidence, and the assumed holding period for which the value of current trading positions may change. When evaluating their current positions and estimating future market volatility, institutions typically use a series of ''market risk factors'' that they have determined affect the value of their positions and the risks to which they are exposed. These factors, in turn, can be grouped into four categories, depending on the nature of the underlying risk: interest rates, exchange rates, and equity and commodity prices, with related options volatilities included in each risk factor category.

Having determined which risk factors to use, an institution estimates the potential future volatility of the factors. Most often this calculation is based on the past movements of these factors over some specified time horizon, with some institutions using long historical time periods and others focusing on more recent market behavior. However derived, the estimates of potential market movements are combined with current position data to calculate an estimate of the potential loss that may arise from those positions for a specified holding period. Just as institutions use different historical time periods when computing possible changes in market risk factors, they also use different confidence levels to estimate potential losses. Some institutions use a 90 or 95 percent confidence level (one-tail), while others use a higher level of statistical confidence.

Institutions also use different modelling procedures in calculating their market risk exposures. The most common models are based upon variance/covariance methodologies, historical simulations, or Monte Carlo simulation techniques. In the case of the variance/covariance approach, the change in value of the portfolio is calculated by combining the risk factor sensitivities of the individual positions—derived from valuation models—with a variance/covariance matrix based on risk factor volatilities and correlations. An institution would calculate the volatilities and correlations of the risk factors on the basis of the holding period and the observation period. Value-at-risk is determined according to the desired level of statistical confidence.

Using historical simulations, an institution would calculate the hypothetical change in value of the current portfolio in the light of actual historical movements in risk factors. This calculation is done for each of the defined holding periods over a given historical measurement horizon to arrive at a range of simulated profits and losses, and the confidence level, again, determines the value-at-risk.

Monte Carlo techniques also consider historical movements, but only to determine the probability of particular price and rate changes. Using these probabilities, the institution would then construct a large number of theoretical movements to evaluate the range of its portfolio's potential market values and identify the maximum loss consistent with the necessary confidence level.

Proposed Modelling Constraints

The Agencies recognize that institutions have adopted different assumptions and measurement techniques in their internal market risk models and that such differences often reflect distinct business strategies and approaches to risk management. In developing a framework for the use of internal models for regulatory capital purposes, the Agencies believe that some constraints should be placed on model parameters and assumptions. Such restrictions would help to ensure that prudential capital levels are maintained and that institutions with similar risk exposures have similar capital requirements.

Since institutions use VAR to guide them in setting trading limits, rather than for evaluating capital adequacy, they set their model parameters to address normal conditions. Indeed, the models are designed to ensure that actual trading results often exceed the projected levels so that management is better able to evaluate the model's predictive accuracy and to respond to events that generate unexpectedly large gains or losses. During a given year, for example, a model based on a 90 percent confidence level (one tail) could be expected to underestimate actual trading losses more than 20 times.

Moreover, knowing that a day's trading results could be expected to exceed the VAR ten percent, five percent, or even only one percent of the time, says nothing about the *magnitude* by which the VAR might be exceeded. The probabilities of VAR models cannot be extended to estimate the size of a highly unlikely event because most models assume that market movements are distributed normally. While that assumption may be adequate for a model's intended purpose, it permits the model to greatly understate the likelihood of a large loss. For example, assuming a normal distribution, the likelihood of experiencing a four standard deviation event is approximately 3 in 100,000—in trading terms, about once in 130 years. In practice, however, such unusual market movements are seen in most major markets on average almost every year.[7]

These conditions require that regulators impose some constraints or other adjustments to the VAR figure that each institution derives in order to provide the rigor and consistency that a capital requirement demands. At the same time, the Agencies want to minimize the costs and dislocations to an internal modelling system that external constraints could create and have sought to balance these conflicting objectives through a combination of qualitative and quantitative constraints.

Qualitative Standards

The qualitative standards are designed to ensure that institutions using internal models have market risk management systems that are conceptually sound and implemented

[7] Daily rate or price movements of a half-dozen major currencies and U.S. Treasury maturities and of several U.S. equity indices each moved by at least four standard deviations on average about once a year during the period 1977–1994. The drop in the value of the S&P 500 index on October 19, 1987 represented a 20 standard deviation event in terms of daily price movements.

with integrity.[8] The internal risk measurement model should be closely integrated in the daily risk management process and serve as a basis for reporting of risk exposures to senior officers. Institutions should have, for example, highly trained personnel who can evaluate the adequacy of the risk models and who are organizationally independent of personnel responsible for executing trades. These individuals should compare actual daily trading gains and losses with VAR figures generated by the model as part of their on-going evaluations of the modelling process. At least annually, internal auditors should assess the institution's overall process for managing and measuring trading risks.

Notwithstanding the use of VAR as a basis for a regulatory capital charge, institutions should also routinely evaluate their exposures to highly stressful events, selected to identify the circumstances to which their particular trading portfolios are most vulnerable. Such a program of stress testing supplements the capital standard and illustrates management's commitment to evaluating trading risks fully.

The stress testing process, along with other relevant internal policies, controls, and procedures, should be well documented and available for examiners to review. Examiners will need this information, as well as comparisons of VAR measures with actual daily trading results, to judge the acceptability of the institution's model on an initial and periodic basis. Under the proposal, if key management procedures are missing or weak, or if the integrity of a model is questionable, the appropriate supervisor may either disallow the model for regulatory capital purposes or require capital above the minimum specified in the proposal. The latter may be done by increasing the size of the multiplier that would be applied to an institution's VAR (discussed below under ''Capital Requirement''). Typically, the Agencies would expect to see any management or modelling shortcomings addressed and the risk measure improved, rather than seek to resolve the matter by applying a larger multiplier to a marginally satisfactory or questionable modelling or management approach.

Quantitative Standards

Whereas the qualitative standards focus on the integrity of the modelling process and incorporate standards of sound practice, the quantitative standards are designed to develop a prudential capital requirement by addressing the level of rigor in an institution's models and the consistency of model parameters among institutions. The Agencies have sought to minimize the quantitative constraints and to make those that were deemed necessary as compatible as practicable with existing procedures of institutions. The Agencies recognize, however, that some of these standards may require an institution to make certain modifications to its internal model when using it for computing regulatory capital requirements. The Agencies propose that an institution that elects to use the internal model approach be subject to the following standards for its internal model:

(1) *Value-at-risk* should be computed each business day and should be based on a 99 percent (one-tailed) *confidence level* of estimated maximum loss.

(2) The assumed *holding period* used for the VAR measure must be 10 business days, although for positions that display linear price characteristics (not options, which display nonlinear characteristics) the institution may use results based on one-day periods, increased to ten days by multiplying by the square root of time.[9]

(3) The model must measure *all material risks* incurred by the institution, although no specific type of model is prescribed.

(4) The model may utilize historical *correlations* within broad categories of risk factors (interest rates, exchange rates, and equity and commodity prices), but not among these categories. That is, the consolidated value-at-risk is the sum of the individual VARs measured for each broad category.

(5) The *non-linear price characteristics* of options must be adequately addressed, both by ensuring that the model incorporates potential non-linear price behavior and by evaluating actual minimum 10 day holding periods, rather than multiplying the results based on one-day periods by the square root of time. The volatility of the rates and prices (vega) underlying the options must also be included among the risk factors.

(6) The *historical observation period* used to estimate future price and rate changes must have a minimum length of one year. The Agencies request specific comment on whether they should also require institutions to calculate their exposures using a shorter observation period (e.g. less than 6 months), with the capital requirement based on the higher result.

(7) Data must be *updated* no less frequently than once every three months and more frequently if market conditions warrant.

(8) Each yield curve in a major currency must be modeled using at *least six risk factors,* selected to reflect the characteristics of the interest rate sensitive instruments that the institution trades. The model must also take account of spread risk.

Several of these constraints warrant a discussion of their underlying rationale:

Minimum holding period (and issues regarding options). Typically, longer holding periods lead to larger expected price changes and, consequently, to larger measures of risk. When estimating risk in trading activities for management purposes, most institutions assume only a one-day holding period, since trading decisions are made constantly, and some instruments are held for only minutes or hours. This approach may be fully satisfactory for day-to-day management purposes but seems less appropriate when designing a prudent capital standard.

In periods of market turmoil, when an institution's capital is most needed, many financial instruments could become unexpectedly illiquid, as market participants become less willing to accept market risk. One method of increasing the rigor of the risk measure and addressing an unexpectedly large price change that could result from a decline in market liquidity would be to assume a longer holding period. The proposed requirement that institutions use a 10-day holding period does not imply that the Agencies would expect them to plan for that eventuality. Indeed, some positions, such as those involving spot foreign exchange contracts, will mature and settle within that time frame and could not be held for 10 days, in any event. Therefore, in this context, the 10-day period should be viewed simply as a way of producing a more stressful market shock by assuming an *instantaneous* price movement of a size that one would normally expect to witness only over the longer period of time.

However, in order to minimize modelling costs and recognize the linear nature of price movements of many financial instruments, the Agencies would permit institutions to estimate a 10-day price or rate movement—for instruments other than options—using the risk factor changes calculated on the basis of one-day holding periods. This adjustment could be accomplished using the ''square root of time'' method

[8] With respect to the qualitative standards, the OCC is planning to provide additional guidance through supplementary banking issuances.

[9] For example, one can estimate the ten day price volatility of an instrument by multiplying the volatility calculated on one-day changes by the square root of ten.

by multiplying the one-day results by 3.16 (the square root of ten trading days).

The prices of options, however, do not change proportionately with the price of the underlying instrument, and their potential price volatility cannot be so easily estimated. Therefore, institutions would be required to take steps to identify the non-linear behavior of option prices with respect to changes in underlying rates or prices. In addition, institutions would not, for example, be allowed to scale the price volatility of an option that was based on one-day sensitivities using the square root of ten. However, since the price or rate volatility of the instrument on which the option is based is considered to increase proportionately with the square root of time, institutions would be permitted to use the square root of time technique to expand the one-day volatility of the option's underlying instrument when calculating the price volatility of the option itself. Alternatively, institutions could estimate the changes in the value of options on the basis of actual movements in underlying factors measured during a full 10-day period.

Institutions should also evaluate the effect of changes in the volatility of rate or price movements of instruments underlying their option positions (*vega*) on option values. This can be done by modelling volatilities as additional risk factors and including them in the overall set of risk factors affecting the value of the institution's trading positions. Institutions with relatively large or complex options portfolios should also measure volatilities across different points along the maturity yield curve.

Aggregating Exposures

When evaluating the potential change in a portfolio's market value, one must consider the likelihood that prices of certain instruments in the portfolio may move together (or in opposite directions). However, observed correlations among the prices of some instruments are themselves volatile and may be especially likely to change during periods of market stress. Therefore, which assumptions are prudent and which ones are not cannot be determined in advance. Moreover, one correlation assumption is not always more conservative than another, since the outcome depends on whether an institution's position in a given instrument is long or short. In practice, most models calculate the correlations within risk factor categories, but differ in their recognition of historical correlations across broad categories of risk factors (interest rates, foreign exchange, etc.).

The Agencies do not want to specify correlations or to set standards for what levels of correlations could be recognized by a model. Given the importance—but also the uncertainty—of historical correlations, the Agencies propose to permit institutions to use correlations within categories of risk factors, but not among categories, where the interrelationships of market factors may be more tenuous, especially during periods of market stress.[10] Thus, total VAR would be the simple sum of the calculated VAR for individual categories. The Agencies recognize that this approach is conservative and believe that it is appropriate for a capital charge against market price moves during periods of stress, when historic correlations have been observed to breakdown. The Agencies also note that it is consistent with the risk measurement practices of many large trading banks.

Minimum Observation Period

In managing market risk, institutions draw from a broad range of historical periods to calculate historical volatilities and correlations for the purpose of estimating future price and rate movements. Some institutions use periods as short as 30–60 days, while others use periods extending as long as several years. Although the choice of historical periods may have little effect on a trading portfolio's level of expected VAR over an extended period of time, it can have a significant effect on the measure of exposure at any specific time. VARs based on short historical periods will be more volatile and responsive to changing market conditions than measures based on longer periods, producing relatively large VARs during periods of high market volatility and low VARs when the markets are calm. Conversely, VARs based on longer periods will exhibit more stability, reflecting a wider range of market conditions and the smaller effect of recent observations.

Since VARs based on short periods may, at times, produce small estimates of risk and could also produce a wide range of risk measures among institutions having similar portfolios, the Agencies are proposing a minimum historical observation period of one year. That constraint should reduce the dispersion and help ensure that institutions have adequate capital requirements at all times. While the Agencies believe such a one-year constraint may be sufficient, they are also requesting comment on whether institutions should be required to calculate their exposures using two observation periods—one as constrained above and the other representing a shorter period, such as six months or less. Under this dual observation approach, the capital requirement would be based on the period that indicated the greater risk.

Minimum Number of Risk Factors

The risk factors contained in an institution's market risk measurement system should be sufficiently comprehensive to capture all of the material risks inherent in the portfolio of its on- and off-balance sheet trading positions, including interest and exchange rates, equity and commodity prices, and the volatilities related to option positions. Although institutions will have substantial flexibility in specifying the risk factors that are most relevant to their portfolios, the Agencies expect the number and composition of factors to be commensurate with the nature and scope of each institution's risks.

In order to adequately measure exposures to interest rates and to bring about greater conformity of results among institutions, the Agencies are proposing a minimum of six maturity bands (each representing a separate risk factor) to be used for material positions in the major currencies and markets. All institutions would be expected to measure spread risk (e.g., the difference between rates on corporate and U.S. government instruments) adequately, with the required level of sophistication being a function of the nature and scope of the institution's activities and exposures.

Capital Requirement

Experience has shown that financial markets can have brief periods of high volatility preceded or followed by extended periods of calm. Under some modelling procedures, the large number of small daily market changes can substantially offset the infrequent periods of high volatility. Even when constrained and calculated as proposed, there are several reasons why an institution's need for capital might sometimes exceed this figure:

(1) The past is not always a good guide to the future;

(2) The assumptions about statistical ''normality'' built into some models may not be justified because of the relatively high frequency of large market movements;

[10] Use of correlations is permitted provided the supervisor is satisfied that the calculation of correlations within a category is performed with integrity.

(3) The correlations assumed in the model may prove to be incorrect;

(4) Market liquidity may become inadequate to close out positions; and

(5) The institution may face multiple stressful events over short periods of time.

Consequently, the Agencies believe that in order for an institution's VAR figure to serve as an adequate basis for a capital requirement, it should be multiplied by an appropriate prudential factor. The Agencies are proposing a minimum multiple of three, which could be increased if the results of ''back-testing'' are not sufficiently satisfactory.[11]

The Agencies also recognize that institutions may change their trading positions rapidly and may substantially increase their exposures for brief periods in order to respond to perceived opportunities or market conditions. At such times, an institution's exposure to market risk may be larger than its average VAR times three. In order to address such circumstances, the Agencies are proposing that institutions maintain capital on a daily basis to support the larger of either (1) the average VAR figure for the last 60 business days, calculated under the proposed criteria and increased by the assigned multiple, or (2) the previous day's VAR, similarly calculated but without the multiple. By considering not only an average VAR but also a single day's measure, the Agencies expect institutions to hold capital sufficient to cover peak levels of market volatility and to manage their activities accordingly.

Many VAR models focus principally on measuring general market risks and incorporate only partial elements of specific risk. Therefore, institutions would remain subject to separate capital requirements to cover specific risk on equities and traded debt, to the extent it is not addressed by their VAR models. This separate charge would be added after the VAR figure is increased by the multiplier and would, in no case, be less than one-half the specific risk charge calculated using the standardized approach. The Agencies specifically request comments on which features to consider when reviewing models in order to evaluate their coverage of specific risk.

[11] Back-testing refers to the process of comparing calculated daily VARs with actual daily trading results to determine how effectively the risk measure identified the boundaries of gains or losses consistent with the predetermined level of statistical confidence.

VI. Standardized Risk Measure

The standardized risk measure calculates separate capital requirements for specific and general market risks and uses different techniques to measure an institution's risk exposure, depending upon its source: debt instruments, equities, foreign currencies, and commodities, including their respective options.[12]

Debt instruments held in trading portfolios

The market risk capital requirement for debt instruments in a trading account consists of separate charges for general market and specific risks.

a. *General market risk.* The general market risk capital requirement for debt instruments (including off-balance-sheet derivatives) that are part of trading activities is designed to capture the potential loss that may arise from movements in market interest rates. An institution may determine this component of its capital requirement either by using standardized risk weights that approximate the price sensitivity of various instruments or by calculating, itself, the precise duration of each instrument, weighted by a specified change in interest rates.

Both methods use a maturity-ladder approach that employs a series of time bands and zones, designed to take into account differences in price sensitivities and interest rate volatilities across various maturities. Under either method, the institution's capital charge for general market risk would be the sum of a base charge that results from fully netting various risk-weighted positions (i.e., longs versus shorts) and a series of additional charges (add-ons) that effectively disallow part of the previous full netting in order to address basis and yield curve risk. The capital charges would be separately computed for each currency in which an institution has significant positions. No netting of positions or charges would be allowed across different currencies.

When using the first approach, referred to as the ''maturity'' method, an institution would first distribute its on- and off-balance-sheet positions in each currency among a range of time-bands based on the maturity or nearest interest rate reset date of the instrument. Long positions would be treated as positive amounts and short positions would be treated as negative amounts. The institution would then calculate its net long or short position for each time-band and would multiply that net position by the risk weight provided by the supervisor for that time-band. The resulting risk-weighted position represents the amount by which the market value of that debt position is expected to change for a specified movement in interest rates. The risk weights and associated interest rate changes are shown in each Agency's proposed regulatory language (OCC—Table 2, Board—Table I, and FDIC—Table 1).[13] Adding the sum of all risk-weighted positions (long or short) across all time-bands results in a final net risk-weighted position. This amount would be the base capital charge for general market risk.[14]

The base charge is calculated differently under the second, or alternative ''duration'' method. In this case, an institution would calculate the estimated price movement for a specific instrument by multiplying the instrument's modified duration by a specified interest rate shock that is based on the instrument's duration as shown in the proposed regulatory language.[15] That product, representing the amount of expected price change of the instrument, is then distributed into the array of time-bands on the basis of the instrument's duration (see proposed Table 4—OCC, Table III—Board, Table 3—FDIC). For example, an instrument with a maturity of 4 years and 3 months might have a modified duration of 3.5 years. Based on its duration, it would be ''shocked'' by 75 basis points, resulting in an expected price change of 2.625 percent (3.5×0.75 percent). That estimated 2.625 percent change, multiplied by the current value of the instrument, would be placed into the 3.3 to 4.0 year time-band for

[12] Several techniques are offered for measuring the price risk in options (see ''Options'', discussed below or in the proposed regulatory language for each agency). Under one approach, called the ''delta-plus'' approach, an institution would include the delta-equivalent value of the underlying instrument when evaluating the market risk of each category of instruments (debt, equity, etc.). Under the two other approaches, the underlying instrument of an option may be ''carved-out'', not subject to the prescribed risk measure for the underlying, and evaluated together with its option according to the procedures described for options.

[13] In the case of securities backed by fixed rate mortgages, an institution would slot the instruments into time bands on the basis of their current expected weighted average lives (reflecting the effect of expected prepayments at current market interest rates), rather than by their contractual maturities.

[14] Since the price sensitivity of zero coupon and low coupon instruments can be materially greater than that of instruments with higher coupons, institutions would be required to assign higher risk weights to low coupon instruments as shown in the proposed Tables.

[15] The duration of an instrument indicates its approximate percentage change in price for a small parallel shift in the yield curve assuming that its cash flow does not change when the yield curve shifts.

determining the charge for general market risk.

As in the maturity method, the base capital charge for general market risk is the sum of the estimated price changes across all time bands. If that sum is negative, the base charge would be its absolute value. Different time-bands are used for the two methods because an instrument's duration can be substantially different from its maturity.

In addition to the base capital charge for general market risk, as reflected by the institution's net risk-weighted position, an institution would be subject to a series of capital ''add-ons'' that are designed to take into account imperfect and uncertain correlations among instrument types and maturities. These add-ons recognize that long and short positions might not, in practice, offset each other by the full amount that their risk-weightings would suggest, and therefore, some portion of the hedged or offsetting position should be disallowed.

The first disallowance (referred to as the vertical disallowance) is intended to address the basis risk that exists between instruments with the same or similar maturities and also the possibly different price movements that may be experienced by different instruments within the same time-band due to the range of maturities (or repricing periods) that may exist within a time-band. To capture this risk, a vertical disallowance is applied to the smaller of the offsetting (long or short) positions within a time-band.[16] This disallowance is 10 percent under the maturity method, and 5 percent under the duration method. For example, under the maturity method, if the sum of weighted long positions within a time-band equals $100 million and the sum of weighted short positions equals $90 million, the vertical disallowance for the time-band would be 10 percent of $90 million, or $9 million. This amount would be added to the institution's base capital charge. The use of two different vertical disallowances recognizes that because the duration method takes into account an instrument's specific characteristics (maturity and coupon), there is less opportunity for measurement error.[17]

The second disallowance (or horizontal disallowance) addresses the risk that interest rates along the yield curve are not perfectly correlated and that risk-weighted positions that might have been expected to offset will not fully offset, in practice. The horizontal disallowance applies to the smaller of the offsetting positions across different time-bands. The amount of this disallowance varies in size by zone (that is, a grouping of contiguous time bands), with greater netting allowed for positions in different time bands but within the same zone than is allowed for positions that are in different zones (Table 3—OCC, Table II—Board, Table 2—FDIC in the proposed regulatory language). The horizontal disallowances range from 30 percent to 100 percent of the smaller figure in a pair of offsetting transactions.[18]

In calculating these disallowances, an institution would first determine its offsetting positions within a zone and the associated ''within zone'' disallowance amounts. Once the institution has netted its positions within a zone, it would determine the amount of offsetting and associated disallowances across zones. An institution's general market risk requirement for debt instruments within a given currency would be the sum of (1) the value of its net risk-weighted position (base charge) and (2) all of its vertical and horizontal disallowances.

b. *Specific risk.* Under the proposal, generally every traded security, whether long or short, would be assessed a capital charge for specific market risk. In the debt portfolio this charge is based on the identity of the obligor and, in the case of corporate securities, on the credit rating and maturity of the instrument. Consistent with the original Accord, debt instruments of national governments of OECD countries are assigned zero specific risk. Other securities are assigned risk weights ranging from 0.25 percent to 1.6 percent if they are issued by *qualifying* borrowers. Securities of nonqualifying issuers are charged a specific risk of 8.0 percent. To be considered as qualifying, the security must be rated as investment grade by at least two nationally recognized credit rating firms or, if the issuer has securities listed on a recognized stock exchange, it must be deemed to be of comparable investment quality by the reporting institution.

This latter condition is provided to accommodate the fact that in some countries credit ratings and the coverage of credit rating firms are not as extensive as in the United States. Consequently, the securities of many large and well-established foreign companies may not be rated. In such cases, a company's listing on an organized exchange may be an acceptable substitute for credit ratings if such listings are limited to financially strong and well-established firms. In these cases, and in the absence of independent credit ratings, the securities of a listed company may qualify for a lower capital charge if the trading institution and its appropriate supervisor believe the securities are equivalent to investment grade. However, the Agencies are proposing that, given the presence and wide coverage in the United States of credit rating firms, institutions would not be allowed to qualify the securities of a U.S. firm on the basis of a listing on an organized exchange.

During the examination process, the Agencies would also consider the extent to which an institution trades non-investment grade instruments (sometimes called high yield debt) that do not qualify for risk weights less than 8.0 percent because of the lack of investment grade ratings. If these holdings are not well diversified or if they otherwise represent material exposures to the institution, the Agencies may prevent an institution from netting the exposures arising from these instruments with otherwise offsetting exposures resulting from positions in qualifying instruments.

Equities Held in Trading Portfolios

The standardized measure of market risk in traded equities also consists of separate charges for specific and general market risk. These charges would apply not only to direct holdings of equity securities, but also to equity derivatives and off-balance-sheet positions whose market values are directly affected by equity prices.

a. *General market risk.* An institution's general market risk capital charge would be 8.0 percent of its net

[16] If the offsetting amounts (long and short) are equal, the disallowance can be applied to either figure.

[17] In the case of cash positions and transactions conducted on an exchange (e.g. futures) an institution has the opportunity to adjust its market risk either by acquiring a new position or selling an existing one. However, that is not typically the case with interest rate swaps, for which an institution almost always adjusts its position by entering into a new or offsetting swap, rather than by selling or unwinding one that it already holds. This procedure, required partly because of the lack of standardization in the terms and credit risk characteristics of swaps, can produce large swap portfolios and potentially large disallowances under the standardized approach.

Consequently, the Agencies' proposal would allow institutions with large swap books to use alternative procedures for calculating the amounts that would be distributed into the maturity or duration time bands. One approach would be to convert the payments required by a swap into their present values using zero coupon yields and then to place those amounts into their appropriate time bands using the procedures that apply to zero (or low) coupon bonds. The net amounts for each time band would then be weighted and subject to the disallowances of the general market risk framework as if they were bonds. The Agencies would also consider other procedures.

[18] Since the disallowance is applied to only one side of an offsetting transaction, a 100 percent disallowance effectively treats the hedge as being 50 percent effective.

equity position—the difference between the sum of its long and the sum of its short positions. The net long or short position against which a general market risk charge would be assessed must be calculated on a market-by-market basis, i.e., a separate calculation must be computed for each national market in which the institution holds equities. Institutions would not, for example, be able to net a long position in U.S. companies traded on the New York Stock Exchange against a short position in Japanese companies traded on the Tokyo Stock Exchange.

b. *Specific risk.* The capital charge for specific risk is based on the reporting institution's gross equity positions (i.e., the absolute sum of all long equity positions and of all short equity positions, with netting allowed only when the institution has long and short positions in exactly the same instrument). This charge would also be 8.0 percent, unless the portfolio is both liquid and well-diversified or the position relates to an index comprising a diversified portfolio of equities.

Examiners will verify that any portfolio designated as ''liquid and well-diversified'' by an institution is characterized by a limited sensitivity to price changes of any single equity issue or closely related group of equity issues held in the portfolio. In particular, the volatility of the value of the portfolio should not be dominated by the volatility of any individual equity issue or by equity issues from any single industry or economic sector. In general, such portfolios should be characterized by a large number of individual equity positions, with no single position representing a large portion of the portfolio's total market value. In addition, it would generally be the case that a sizeable proportion of the portfolio would be comprised of issues traded on organized exchanges.

For such liquid and well-diversified portfolios, the specific risk charge would be 4.0 percent. A specific risk charge of 2.0 percent would apply to the net long or short position in a broad-based, diversified equity index and is viewed as necessary to provide for the risk that the performance of the index will differ from those of other market measures and also for potential difficulties that could arise in executing transactions at expected prices.

Foreign Exchange

This capital requirement covers the risk of holding or taking positions in foreign currencies, including gold, and is based on an institution's net positions in individual currencies, whether or not those positions are booked in the trading account. Net positions, in turn, include an institution's net spot and forward positions; any guarantees that are certain to be called and likely to be irrecoverable; net future income and expenses that are not yet accrued, but that are already fully hedged; and any other items representing a profit or loss in foreign currencies. Forward and future positions would be converted into the reporting currency at spot market rates.

Institutions may, subject to supervisory approval, exclude from this calculation any structural positions in foreign currencies. For this purpose, such structural positions are limited to transactions designed to hedge an institution's capital ratios against the effect of adverse exchange rate movements on (1) subordinated debt, equity, or minority interests in consolidated subsidiaries and dotation capital assigned to foreign branches that are denominated in foreign currencies, and (2) any positions related to unconsolidated subsidiaries and to other items that are deducted from an institution's capital when calculating its capital base. In any event, such structural foreign currency positions should reflect long-term policies of the institution and not relate to trading positions.

The standardized approach assumes the same volatility for all currencies and requires an institution to hold capital equal to 8.0 percent of the sum of (a) its net position in gold and (b) the sum of the net short positions or the sum of the net long positions in each foreign currency, whichever is greater. With supervisory approval, an institution may be exempt from this capital requirement if the sum of its gross long and short positions does not exceed 100 percent of its eligible capital and its overall net foreign exchange position does not exceed 2.0 percent of this capital, as defined above in Section II.

Commodities

The capital requirement for commodities risk applies to holdings or positions taken in commodities, including precious metals, but excluding gold (which is treated as a foreign currency because of its market liquidity). As with foreign currencies, the coverage extends to all commodities positions of the institution, not only to those booked in trading accounts. For this purpose, a commodity is defined as a physical product which is or can be traded on a secondary market, e.g., agricultural products, minerals, and precious metals. The standardized approach for measuring general market risk in commodities provides only a rough indication of the risk exposure and is appropriate only for institutions with relatively small amounts of commodities activity.

Within the standardized approach, two alternative measures are available, referred to as the ''simple'' and the ''maturity'' methods. Both measures address directional risk, which is the risk that a commodity's spot price will increase or decrease, as well as basis risk, interest rate risk, and forward gap risk, which are also important risks, especially for institutions that engage in forward or derivative contracts. These institutions can face significant losses in their positions as a result of adverse changes in the relationship between prices of similar commodities, increases in the cost of financing forward positions, or changes in forward prices produced by any number of economic or market conditions.

Both the simple and maturity approaches require an institution to calculate its net position in each commodity on the basis of spot rates. Long and short positions in the same commodity may be netted, but positions in different commodities would generally not be allowed to offset, except where different sub-categories of commodities are deliverable against each other.

Under the simple approach, an institution's capital charge for directional risk would equal 15 percent of its net position, long or short, in each commodity. A supplemental charge of 3.0 percent of the gross position in each commodity would be added to cover basis, interest rate and forward gap risk.

The capital charge using the maturity method reflects not only the net and gross positions in each commodity, but also the maturity of each commodity contract. For each commodity, positions would first be distributed among seven time bands. Physical holdings of commodities would be allocated to the first band. The matched long position plus the matched short position within each time-band would then be multiplied by a ''spread rate,'' (proposed at a uniform 1.5 percent rate) to capture forward gap and interest rate risk. Net positions from one time-band must be used to offset opposite positions in another time-band and would incur a ''surcharge'' equal to 0.6 percent of the net position for every time-band it is carried forward in recognition that such offsetting may not be perfect. This process ultimately produces an overall net position for each commodity. A 15 percent capital charge would be applied to that net position. The total capital charge for any given commodity would be the sum of (a) the initial 1.5 percent

charge for the matched positions in each time band, (b) any surcharge, and (c) the charge on the overall net position.

Options

The Agencies recognize the diversity of activities in options and the difficulties in measuring an option's price risk. Accordingly, the proposal provides three alternative risk measures for institutions that do not adopt the internal models approach. These alternatives are: (a) a ''simplified'' method, which is available to institutions that only purchase traded options, (b) a ''scenario analysis'' method that evaluates option values under a range of market scenarios, and (c) a ''delta-plus'' method that provides specific measures of individual components of an option's risk. The method used should be commensurate with and appropriate for the nature and scope of the institution's options activities. Institutions that have extensive dealings in options must have appropriately accurate measures of risk.

Several variables determine an option's price:

(1) The current price of the underlying asset;

(2) The strike price of the option, which is the price of the underlying security at which the option has value;

(3) The volatility of the price of the underlying security;

(4) The time remaining before the option expires; and

(5) The prevailing ''risk free'' interest rate.

The effect of these variables on an option's value are represented by a series of Greek letters: *delta* (the price sensitivity of an option relative to price changes in the underlying security, rate, or index—the ''underlying''), *gamma* (the change in delta for a given change in the underlying), *vega* (the effect of changes in the volatility of the underlying), *theta* (the effect given the passage of time), and *rho* (how the option price changes for a given change in risk free interest rates). Delta is a frequently used indicator of an option's risk, but others—particularly gamma—should be specifically addressed by institutions that trade options to any material extent. Such institutions should not rely merely on linear approximations of price movements, but should undertake to capture the non-linear relation between changes in the option's price and changes in the underlying rate or price.

Simplified Approach

The simplified approach for options may only be used by institutions whose options activities are confined to a small volume of purchased options. This approach permits an institution either to ''carve out'' both the option and a corresponding underlying position from other elements of the standardized approach or to view the option as ''naked''—that is, without a matching cash position. In order to avoid potentially penalizing an institution for purchasing an option, institutions could avoid linking (and subsequently carving-out) a purchased option and a corresponding cash position if doing so would create an exposure within the underlying position and produce a capital requirement that exceeded the value of the purchased option. Consequently, there are two possibilities:

(1) If a carve-out is made, the capital charge is equal to the specific and general market risk charge on the underlying position, less the amount the option is in the money, bounded at zero.

(2) If the purchased option is viewed by itself, the charge for the option is the smaller of (a) its market value or (b) the sum of the specific and general market risk charge that would apply to its underlying instrument. Any existing related (but not linked) cash position would continue to receive the full specific and general market risk charge produced by other elements of the standardized approach.

In both cases, the method is relatively conservative, creating an incentive for institutions to use a more accurate measure of risk. Institutions that want a more accurate measure of option risk or whose trading activities include the writing (selling) of options must use either the scenario or the delta-plus methods offered under the standardized approach, or the previously described internal models approach.

Scenario Analysis

Using scenario analysis, institutions would evaluate the market values of their options and related hedging positions by changing the underlying rate or price over a specified range and by also assuming different levels of volatility for that rate or price. Each combination of assumed volatilities and rate or price changes would represent a scenario.

The range of rate or price movements would be based on the nature of the option. For options based on debt instruments or interest rates, the range would be consistent with the maximum rate movement indicated in the proposal dealing with traded debt: 100 basis points for underlying instruments in zone 1, 90 basis points for those in zone 2, and 75 basis points for those in zone 3. Similarly, the ranges used for other options would be consistent with the assumed price or rate change applied to their underlying cash positions: 8 percent for foreign exchange, 12 percent for individual equities, 8 percent for equity indices, and 15 percent for commodities. In all cases, the range would cover both an increase and decrease from current values of the underlying security (or rate) by these percentages and would be divided into at least 10 equally spaced intervals centered by the current rate or price.

Given the near-linear relationship between volatility and option values for many options, the Agencies believe it would be sufficient in most cases to evaluate the option portfolio assuming a 25 percent increase and decrease in the level of volatility from that implied by current market prices. If warranted, however, the Agencies may require a different change in volatility and the consideration of intermediate points.

An institution would determine the market value of each option and any related hedging position or group of options and related hedging positions for each scenario.[19] Such options and positions based on debt instruments in the same zone, or on the same equity, equity index, exchange rate, or commodity may be grouped together and evaluated on a portfolio basis when evaluating the effect of a given scenario. The market risk capital charge for a portfolio would be the largest loss estimated for that portfolio from among the evaluated scenarios. The charge for all option portfolios would be the sum of the charges on the individual portfolios. The Agencies recognize that this approach is conservative, since it assumes that the largest loss will occur within each segment of the option portfolio simultaneously.

The delta-plus method

Institutions that write options would be allowed to include delta-weighted options positions within the standardized methodology. Such options should be reported as a position equal to the market value of the underlying instrument multiplied by the delta. However, since an option's delta does not sufficiently address other risks associated with the option's market value, institutions would also be required to measure the option's gamma and vega in order to calculate the total capital charge for the option. These sensitivities would be calculated by an approved exchange model or by the

[19] For this purpose, a single option and any related hedging position and a group of options and any related hedging positions are all referred to as an ''options portfolio.''

institution's proprietary options pricing model, subject to oversight by the appropriate supervisor.

Delta-weighted positions of options based on debt securities or interest rates would be slotted into the debt securities time-bands, as set out above for debt instruments, under the following procedure. A two-legged approach would be used as for other derivatives, requiring one entry at the time the underlying contract takes effect and a second at the time the underlying contract matures. For instance, a bought call option on a June three-month interest-rate future will in April be considered, on the basis of its ''delta'' equivalent value, to be a long position with a maturity of five months and a short position with a maturity of two months. The written option would be similarly slotted as a long position with a maturity of two months and a short position with a maturity of five months. Floating rate instruments with caps or floors would be treated as a combination of floating rate securities and a series of European-style options. For example, the holder of a three-year floating rate bond indexed to six month LIBOR with a cap of 15 percent would treat the instrument as: (1) A debt security that reprices in six months; and (2) a series of five written call options on a floating rate asset (FRA) with a basis of 15 percent, each with a negative sign at the time the underlying FRA takes effect and a positive sign at the time the underlying FRA matures.

In addition to the above capital charges arising from delta risk, the proposal requires capital for gamma and vega risks. Institutions using this method would be required to calculate the gamma and vega for each option position. The results would be slotted into separate maturity ladders by currency. For options such as caps and floors whose underlying instrument is an interest rate, the delta and gamma would be expressed in terms of a hypothetical underlying security. Subsequently:

(1) For gamma risk, for each time-band, net gammas which are negative would be multiplied by the risk weights set out in the proposed regulatory language (OCC—Table 5, Board—Table IV, FDIC—Table 4) and by the square of the market value of the underlyings (net gammas which are positive would be disregarded);

(2) For volatility risk, institutions would be required to calculate the capital charges for vegas in each time-band assuming a proportional shift in volatility of 25 percent;

(3) The capital charge would be the absolute value of the sum of the individual capital charges for net negative gammas plus the absolute value of the sum of the individual capital charges for vega risk for each time-band.

The capital charge for options on equities would also be based on the delta weighted positions of the options by incorporating those weighted positions into the market risk measure for equities described above. For purposes of this calculation individual equity issues and indices are to be treated as separate underlyings. In addition to the capital charge for delta risk, institutions would apply a further capital charge for gamma and vega risk:

(1) For gamma risk, the net negative gammas for each underlying instrument would be multiplied by 0.72 percent when that instrument is an individual equity and by 0.32 percent when it is an index.[20] That product would then be multiplied by the square of the market value of the underlying;

(2) For volatility risk, institutions would be required to calculate the capital charges for vegas for each underlying instrument assuming a proportional shift in volatility of plus or minus 25 percent;

(3) The capital charge would be the absolute value of the sum of the individual capital charges for net negative gammas plus the absolute value of the sum of the individual capital charges for vega risk.

The capital charge for options on foreign exchange and gold positions would be based on the shorthand method set out earlier. For delta risk, the net delta (or delta-based) equivalent of the total book of foreign currency and gold options would be incorporated into the measurement of the exposure in a single currency position. The gamma and vega risks would be measured as follows:

(1) For gamma risk, for each underlying exchange rate net gammas which are negative would be multiplied by 0.32 percent and by the square of the market value of the position;[21]

(2) For volatility risk, institutions would be required to calculate the capital charges for vegas for each currency pair and gold assuming a proportional shift in volatility of plus or minus 25 percent;

(3) The capital charge would be the absolute value of the sum of the individual capital charges for net negative gammas plus the absolute value of the sum of the individual capital charges for vega risk.

The capital charge for options on commodities would be based on the same approach set out above for commodities. The delta weighted positions would be incorporated into one of the two measures described in that section. In addition to the capital charge for delta risk, institutions would incur a further capital charge for gamma and vega risk:

(1) For gamma risk, net negative gammas for each underlying would be multiplied by 1.125 percent and by the square of the market value of the commodity;[22]

(2) For volatility risk, institutions would be required to calculate the capital charges for vegas for each commodity as defined above in the section dealing with commodities, assuming a proportional shift in volatility of plus or minus 25 percent;

(3) The capital charge would be the absolute value of the sum of the individual capital charges for net negative gammas plus the absolute value of the sum of the individual capital charges for vega risk.

A worked example of the delta-plus method for commodities is set out in Attachment IV of the Board's and the FDIC's proposed regulatory language. In the case of options based on debt securities or interest rates and with the approval of the appropriate supervisor, institutions that are significant traders in options could be allowed to net positive and negative gammas and vegas across time-bands to a limited extent. However, such netting would be permitted only if it is based on prudent and conservative assumptions and the institution materially satisfies the qualitative standards outlined under the internal models approach.

In addition, instead of applying a uniform relative change in volatility to measure vega risk, institutions may base the calculation on a volatility ladder in which the implied change in volatility varies with the maturity of the option. When using such a volatility ladder the assumed proportional shift in volatility should be at least 25 percent at the short end of the maturity spectrum. The proportional shift in volatility for longer maturities should be at least as stringent in statistical terms as the 25 percent shift at the short end. Use of this alternative would be subject to validation by the supervisor, and to the qualitative standards listed in the internal models section that are relevant to this aspect of the institution's

[20] Using the Taylor expansion, the risk weights are calculated as follows: Risk weight for gamma =0.5× (assumed price change of underlying)^2 For an individual equity, $0.5 \times 0.12^2 = 0.72\%$. In the case of an index as the underlying, the assumed price change of the underlying equals 8.0 percent.

[21] The assumed price change is 8.0 percent.

[22] The assumed price change is 15 percent.

business. In the long term, institutions using this alternative would be expected to move to fully articulated value-at-risk models, subject to the full qualitative and quantitative standards for models.

Besides the options risks mentioned above, the Agencies recognize that there are other risks associated with options, e.g., rho and theta. While they are not proposing a measurement system for those risks at present, institutions undertaking significant options business would still be expected to monitor such risks closely.

VII. Questions on Which the Agencies Specifically Request Comment

General Topics

1. The Agencies propose to apply these standards to a relatively small number of institutions that have material trading activities. As the criteria are proposed, about 25 ''large'' institutions and a few other smaller institutions with relatively more significant trading activities would meet the requirements and be subject to the new capital standards. Is the exemption of smaller institutions appropriate, given their risk profile and the implied regulatory burden, or does it provide them with an undue competitive advantage? On the other hand, would the amendment affect too many institutions, given the nature of their trading activities and market risk profiles?

2. Consistent with their procedures for existing capital standards, the Agencies would apply the proposed standard to any national bank, state member bank and bank holding company that meets the criteria on a consolidated basis. What are the burden implications of applying the standard to both banks and bank holding companies?

3. The Board currently evaluates the capital adequacy of bank holding companies that have Section 20 subsidiaries on a fully consolidated basis and also without the assets and capital of the Section 20 subsidiaries. Should it continue this practice regarding market risk, or should it focus on only the consolidated holding company?

4. Should the Agencies permit institutions the choice of the standardized or internal model approaches, or should it permit only the internal model approach on the basis that the institution's trading activities are sufficient to warrant the more accurate measure of risk?

5. The Agencies are interested in comments on whether the internal model quantitative standards, together with the scaling factor, could result in capital requirements that on average are significantly different (for example, higher) than those required under the standardized approach.

6. The Agencies propose to allow institutions to use the standardized method for measuring some categories of risk (e.g., debt, equities, etc.), and internal models for other categories. Should institutions be given this flexibility, or should they be required to use one approach throughout?

7. The Agencies propose a reduced capital charge for specific risk in equities if an institution's equities portfolio is ''liquid and well-diversified,'' a concept that is defined in qualitative terms in the proposal. Should this concept be described more specifically and, if so, what criteria should be applied?

Questions on the Standardized Method

1. Under the proposal, institutions would be allowed to net offsetting positions in different commodities only if the commodities were deliverable against each other. To what extent, if any, should the Agencies allow netting on the basis of the historical correlations of price movements of different commodities within the standardized approach? If netting is allowed on the basis of past correlations, what specific criteria should be required?

2. One of the alternative ways of measuring the market risk of options in the standardized approach is to calculate separate charges for an option's delta, gamma, and vega risk (see the delta-plus method). This approach permits an institution to measure the risk of its options positions while measuring the risk of its other positions and, thereby, to evaluate them more fully on a portfolio basis. It also permits an institution to avoid incurring the worst-case charge for the option under the scenario method. The delta-plus calculations, however, are complex and potentially inaccurate since they do not permit full use of a revaluation model. Is the method sufficiently useful to warrant its complexity, and does it provide a sufficiently conservative measure of risk for institutions that write options but do not have options pricing models integrated into their risk measurement systems?

Questions on the Internal Model Method

1. The Agencies are considering whether to require institutions to calculate their VARs using two observation periods (one long, one short) and basing the capital requirement on the larger figure. What are the costs and burden implications of requiring such a dual calculation?

2. All institutions affected by the proposal would be required to have capital covering both general market and specific risks. Institutions using the internal model approach would be required to apply the specific risk charge (or a portion thereof) calculated using the standardized approach, if their models do not adequately capture specific risk. What modelling techniques should the Agencies consider when evaluating an institution's model and determining the extent to which the model includes specific risk in its VAR measure?

3. As part of an on-going process of evaluating the accuracy of an institution's internal model, actual daily trading profits and losses would be compared with the measured VAR (so-called ''back-testing''). The Agencies would expect this back-testing normally to rely upon the VARs actually used by the institution for nonregulatory purposes, which in most cases would reflect a confidence level less than the 99 percent level on which the capital requirement would be based. Would this approach be less burdensome to the institution than requiring a separate calculation for the 99 percent confidence level, and would it provide a more statistically reliable basis for evaluating the results? Please comment on these procedures and any other considerations the Federal Reserve should take into account in reviewing back-tests.

4. The Agencies recognize that daily VAR is used by institutions for setting daily trading limits, rather than for evaluating capital adequacy. The regulatory use of VAR as a basis for a capital requirement is predicated on the specification of several constraints on modelling parameters, as well as the use of a multiplication factor. Do these constraints provide sufficient capital for the underlying activities?

5. To qualify for the use of the internal models approach, an institution must have a rigorous stress testing program which would be subject to supervisory review. What stress tests for market risk should institutions be expected to perform as part of their internal management process?

VIII. Regulatory Flexibility Act Analysis

OCC Regulatory Flexibility Act Analysis

Pursuant to section 605(b) of the Regulatory Flexibility Act, the Comptroller of the Currency certifies that this proposal would not have a significant impact on a substantial

number of small business entities in accord with the spirit and purposes of the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). Accordingly, a regulatory flexibility analysis is not required. The impact of this proposed rule on banks regardless of size is expected to be minimal. Further, this proposed rule generally would apply to larger banks with significant trading account activities and would cover only trading activities and foreign exchange and commodity positions throughout the bank.

Board Regulatory Flexibility Act Analysis

Pursuant to section 605(b) of the Regulatory Flexibility Act, the Board does not believe this proposal would have a significant impact on a substantial number of small business entities in accord with the spirit and purposes of the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). Accordingly, a regulatory flexibility analysis is not required. In addition, because the risk-based capital standards generally do not apply to bank holding companies with consolidated assets of less than $150 million, this proposal would not affect such companies.

FDIC Regulatory Flexibility Act Analysis

Pursuant to section 605(b) of the Regulatory Flexibility Act (Pub. L. 96–354, 5 U.S.C. 601 *et seq.*), it is certified that the proposed rule would not have a significant impact on a substantial number of small entities.

IX. Paperwork Reduction Act and Regulatory Burden

OCC Regulatory Burden

Section 302 of the Riegle Community Development and Regulatory Improvement Act of 1994, Pub. L. 103–325, 108 Stat. 2160 (September 23, 1994), provides that the federal banking agencies must consider the administrative burdens and benefits of any new regulations that impose additional requirements on insured depository institutions. As discussed, this proposed rule would affect only a small number of banks and generally would cover only trading account activities and foreign exchange and commodity positions throughout the bank. Additionally, any burden imposed would be lessened to the extent that a bank may use its own qualifying internal market risk model. The OCC believes that any additional burden placed on a bank is outweighed by the advantages of greater accuracy in risk management and capital allocation, which contribute to increased safety and soundness in the banking system.

Board Paperwork Reduction Act and Regulatory Burden

The Board has determined that this proposal would not increase the regulatory paperwork burden of banking organizations pursuant to the provisions of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*). Section 302 of the Riegle Community Development and Regulatory Improvement Act of 1994 (Pub. L. 103–325, 108 Stat 2160) provides that the federal banking agencies must consider the administrative burdens and benefits of any new regulations that impose additional requirements on insured depository institutions. As noted above, the proposed market risk measure would affect only a small number of institutions. The Board believes that any additional burden placed on these institutions is outweighed by the advantages of greater accuracy in risk measurement and capital allocation, which contribute to increased safety and soundness in the banking system.

FDIC Paperwork Reduction Act

The FDIC has determined that his proposed rulemaking does not contain any collections of information as defined by the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*).

X. OCC Executive Order 12866 Determination

The Comptroller of the Currency has determined that this notice of proposed rulemaking is not a significant regulatory action under Executive Order 12866.

XI. OCC Unfunded Mandates Reform Act of 1995 Determination

Section 202 of the Unfunded Mandates Reform Act of 1995 (Unfunded Mandates Act), Pub. L. 104–4, 109 Stat. 48 (March 22, 1995) requires that an agency prepare a budgetary impact statement before promulgating a rule that includes a Federal mandate that may result in the expenditure by state, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any one year. If a budgetary impact statement is required, section 205 of the Unfunded Mandates Act also requires an agency to identify and consider a reasonable number of regulatory alternatives before promulgating a rule. Because the OCC has determined that this notice of proposed rulemaking will not result in expenditures by state, local and tribal governments, or by the private sector, of more than $100 million in any one year, the OCC has not prepared a budgetary impact statement or specifically addressed the regulatory alternatives considered. As discussed in the preamble, this proposed rule may require additional capital for market risks. However, the application of this proposed rule would be generally limited to banks with significant trading account activities and would cover only foreign exchange and commodity positions throughout the bank. Currently, the OCC estimates that less than 25 national banks will be subject to the requirements of this proposed rule. In addition, any burden imposed on this small group of national banks would be lessened to the extent that a bank may use its own qualifying internal market risk model.

List of Subjects

12 CFR Part 3

Administrative practice and procedure, Capital, National banks, Reporting and recordkeeping requirements, Risk.

12 CFR Part 208

Accounting, Agriculture, Banks, banking, Confidential business information, Crime, Currency, Federal Reserve System, Mortgages, Reporting and recordkeeping requirements, Securities.

12 CFR Part 225

Administrative practice and procedure, Banks, banking, Federal Reserve System, Holding companies, Reporting and recordkeeping requirements, Securities.

12 CFR Part 325

Administrative practice and procedure, Banks, banking, Capital adequacy, Reporting and recordkeeping requirements, Savings associations, State non-member banks.

Authority and Issuance

OFFICE OF THE COMPTROLLER OF THE CURRENCY

12 CFR Chapter I

For the reasons set out in the preamble, part 3 of title 12, chapter I of the Code of Federal Regulations is proposed to be amended as set forth below.

PART 3—MINIMUM CAPITAL RATIOS; ISSUANCE OF DIRECTIVES

1. The authority citation for part 3 continues to read as follows:

Authority: 12 U.S.C. 93a, 161, 1818, 1828(n), 1828 note, 1831n note, 1835, 3907, and 3909.

2. New appendix B is added to part 3 to read as follows:

Appendix B to Part 3—Market Risk

Section 1. Purpose, Applicability, Effective Date, and Definitions

(a) *Purpose.* The purpose of this appendix B is to ensure that banks maintain adequate capital for market risk. Market risk is generally the risk of loss arising from movements in market prices. The market risk requirements of this appendix B are limited to the market risk associated with the trading account of the bank and to the overall foreign exchange risk and the commodities risk throughout the bank, including related options and other derivative contracts. Under this appendix B a bank may measure its market risk exposure with either its own qualifying internal market risk model or the alternative standardized market risk model provided. However, the OCC generally expects that banks with significant trading activities will calculate their market risk using a qualifying internal market risk model.

(b) *Applicability.* The market risk requirement of this appendix B applies to the following banks:

(1) Any bank with total assets in excess of $5 billion and either total on-balance sheet trading account activities of 3 percent or more of the total assets of the bank, or total notional off-balance sheet trading account activities in excess of $5 billion; and

(2) Any bank with total assets of $5 billion or less and total trading account activities in excess of 10 percent of the total assets of the bank; and

(3) Any bank with a significant exposure to market risk and the OCC deems necessary to protect the safety and soundness of the bank.

(c) *Effective date.* The market risk requirements of this appendix B are effective December 31, 1997.

(d) *Definitions.* For the purposes of this appendix B, the following definitions apply:

(1) *Covered market risk assets* means all trading account assets plus all other on- and off-balance sheet assets which have foreign exchange risk, equity price risk, and commodity risk throughout the bank including related options and other derivative contracts.

(2) *Derivative contract* means generally a financial contract whose value is derived from the values of one or more underlying asset, reference rate or index of asset values. Derivative contracts include both standardized contracts that are traded on exchanges and customized, privately negotiated contracts known as over-the-counter (OTC) derivative contracts.

(3) *Lock-in clause* means a provision in a subordinated debt agreement that precludes payment by the bank of either interest or principal (even upon maturity) of the subordinated debt if such payment would cause the issuing bank to fall or remain below the minimum risk-based capital requirement as provided in appendix A of this part 3 as adjusted for market risk.

(4) *Market risk* means the risk of loss resulting from movements in market prices. Market risks consist of both general and specific market risks. General market risk is the change in market value of a particular asset that results from broad market movements such as a change in market interest rates, foreign exchange rates, equity prices, and commodity prices. Specific market risks are those risks that affect the market value of a specific instrument, such as the credit risk of the issuer of that particular instrument, but do not materially alter broad market conditions.

(5) *Tier 3 capital* means capital that may be used by a bank to satisfy the market risk capital requirements under this appendix B as determined in accordance with section 3 of this appendix B.

(6) *Total assets* means the quarter-end total assets figure required to be computed for and stated in a bank's most recent quarterly Consolidated Report of Condition and Income (Call Report).

(7) *Trading account activities* means the sum of trading account assets and trading account liabilities.

(8) *Trading account assets* means all positions in financial instruments acquired with the intent to resell in order to profit from short-term price movements. Trading account assets include, but are not limited to:

(i) Assets acquired with the intent to resell to customers;

(ii) Positions in financial instruments arising from matched principal brokering or market making; or

(iii) Positions in financial instruments taken in order to hedge positions in other financial instruments of the trading account.[1]

(9) *Value-at-risk* means the statistical estimate representing the maximum amount by which the market value of covered market risk assets could decline during a specific period for a stated level of statistical confidence.

Section 2. Market Risk Capital Requirement

(a) *Capital requirement.* All banks subject to this appendix B shall maintain a minimum market risk capital ratio of 8 percent. The market risk capital ratio is the ratio of eligible market risk capital to adjusted market risk assets. Eligible market risk capital consists of Tier 1, Tier 2, and Tier 3 capital as determined in accordance with section 3 of this appendix B. Adjusted market risk assets is the sum of the risk weighted assets as determined in accordance with appendix A of this part 3 (risk-based capital guidelines) plus the market risk equivalent assets. The market rate equivalent assets equal 12.5 times the market risk exposure as determined in accordance with section 4 of this appendix B.

(b) *Relationship to risk-based capital requirement.* The amount of capital required for market risk is in addition to the amount of capital required for counterparty credit risk under the risk-based capital guidelines as determined in accordance with appendix A of this part 3.

[1] When non-trading account instruments are hedged with trading account instruments, whether on- or off-balance-sheet, the bank may include the non-trading account instruments in the measure for general market risk. However, such non-trading account instruments remain subject to the credit risk capital charges of appendix A of this part.

Section 3. Eligible Market Risk Capital

(a) *Types of eligible market risk capital.* A bank may use Tier 1 and Tier 2 capital, as determined in accordance with § 3.2 of this part 3, to satisfy the market risk requirement. A bank also may use Tier 3 capital to satisfy its market risk requirement as determined in accordance with section 3(b) and subject to the limitations of section 3(c) of this appendix B.

(b) *Tier 3 capital.* For the purposes of this appendix B, Tier 3 capital consists of short-term subordinated debt subject to a lock-in clause. In addition, the subordinated debt must have an original maturity of at least two years, be unsecured and subordinated to the claims of depositors must be fully paid-in, and may not be subject to any covenants, terms, or restrictions inconsistent with safe and sound banking practices.

(c) *Limitations.* Tier 3 capital only may be used to satisfy the market risk capital requirements under this appendix B and may not be used to satisfy the capital risk-based capital requirements for counterparty risk under appendix A of this part 3, including counterpart credit risk associated with derivative transactions in either the trading or nontrading accounts. In addition, the use of Tier 3 capital is subject to the following quantitative limitations:

(1) Tier 3 capital may not exceed 250 percent of a bank's Tier 1 capital allocated for market risk.

(2) The total of Tier 2 capital and Tier 3 capital is limited to 100 percent of Tier 1 capital.

(3) Tier 2 capital may be substituted for Tier 3 capital up subject to the same 250 percent limitation on Tier 3 capital and all other limitations on Tier 2 capital under the risk-based capital guidelines, as determined by appendix A of this part 3.

Section 4. Market Risk Exposure

Market risk exposure represents the total dollar amount at risk arising from movements in market prices. A bank may determine its market risk exposure either through a qualifying internal market risk model as provided in accordance with section 5 of this appendix B, or through the standardized market risk model as provided in accordance with section 6 of this appendix B.

(a) *Qualifying internal market risk model.* For a bank permitted or required by the OCC to use a qualifying internal market risk model, the market risk exposure of covered market risk assets is equal to the greater of:

(1) The aggregate value-at-risk amount for the previous day; or

(2) The average of the daily value-at-risk amounts for each of the preceding 60 business days times a multiplication factor of three.

(b) *Standardized market risk model.* For banks using the standardized market risk model, the market risk exposure equals the measured value-at-risk amount for covered market risk assets as determined in section 6 of this appendix B.

Section 5. Qualifying Internal Market Risk Model

As provided in this section, a bank may use a qualifying internal market risk model

to determine its market risk exposure. The qualifying internal market risk model may use any generally accepted measurement technique including, but not limited to, variance-covariance models, historical simulations, or monte carlo simulations; however, the qualifying internal market risk model must capture all material market risk.

(a) *Value-at-risk measurement.* A qualifying internal market risk model must incorporate a value-at-risk measurement that adequately evaluates the market risk associated with all covered market risk assets.

(b) *Risk factor categories.* The value-at-risk measurement must include risk factors sufficient to capture the market risk inherent in all covered market risk assets. In addition, the risk factors must cover the risk categories of interest rates, exchange rates, equity prices, commodity prices, and the volatility of related market factors.

(c) *Prior approval.* Prior OCC approval is required before a bank may use an internal market risk model for the purposes of the market risk requirement of this appendix B. A qualifying internal market risk model must satisfy the following criteria:

(1) *Qualitative factors.* (i) The level of sophistication and accuracy of the internal market risk model must be commensurate with the nature and volume of bank's trading account activities.

(ii) The market risk management systems must adequately monitor compliance with internal procedures and controls which generally would include independent risk management, annual internal audits, back testing, and stress testing.

(2) *Quantitative factors.* (i) The value-at-risk measurement must be calculated with sufficient frequency to allow the bank enough time to react to changing market conditions.

(ii) The value-at-risk measurement must be based on a 99th percentile, one-tailed confidence interval[2] with an assumed holding period of ten trading days.

(iii) For positions that display linear price relationships, a bank may use value-at-risk measurement using shorter holding periods which are scaled up to ten days by the square root of time.[3]

(iv) The value-at-risk measurement must be calculated using an observation period of at least one year to measure historical changes in rates and prices.

(v) A bank must update its historical rates and prices at least once every three months and must reassess them whenever market conditions change materially.

(vi) A bank may incorporate into its value-at-risk measurement empirical correlations within each risk category. However, empirical correlations across risk categories may not be incorporated. The value-at-risk measurement for each risk category must be added together on a simple sum basis to determine the aggregate value-at-risk exposure.

(vii) The value-at-risk measurement must capture the unique risks associated with options within each of the risk categories subject to the following criteria:

(A) The value-at-risk measurement must capture the non-linear price characteristics of option positions using an options pricing technique.

(B) The bank must apply a minimum ten-day holding period to option positions or positions that display option-like characteristics. Options may not be scale-up the daily value-at-risk exposure by the square root of time.

(C) The value-at-risk measurement must capture the volatilities of the rates and prices underlying option positions.

(viii) The accuracy of a bank's qualifying internal market risk model must be validated by auditors.

Section 6. Standardized Market Risk Model

As provided in this section, a bank may use the standardized market risk model to determine its market risk exposure.

(a) *Debt Instruments.* (1) *Specific Risk.* (i) The market risk requirement for specific risk is based on the identity of the obligor and, in the case of corporate securities, on the credit rating and maturity of the instrument. The specific risk is calculated by weighting the current market value of each individual position, whether long or short, by the appropriate specific risk factor and summing the weighted values. In measuring specific risk, the bank may offset and exclude from its calculations any matched positions in the identical issue (including positions in derivative contracts). Even if the issuer is the same, offsetting is not permitted between different issues. The specific risk factors are set forth in Table 1—Specific Risk Factors for Debt Instruments, as follows:

TABLE 1.—SPECIFIC RISK FACTORS FOR DEBT INSTRUMENTS

Category	Remaining contractual maturity	Factor (In percent)
Government ..	N/A	0.00
Qualifying	6 months or less.	0.25
	Over 6 to 12 months.	1.00
	Over 12 months.	1.60
Other	N/A	8.00

(ii) The government category includes all forms of debt instruments of central governments of the OECD-based group of countries including bonds, Treasury bills and other short-term instruments, as well as local currency instruments of non-OECD central governments to the extent that the bank has liabilities booked in that currency.

(iii) The qualifying category includes securities of U.S. government-sponsored agencies, general obligation securities issued by states and other political subdivisions of the OECD-based group of countries, multilateral development banks, and debt instruments issued by U.S. depository institutions or OECD-banks that do not qualify as capital of the issuing institution. It also includes other securities, including revenue securities issued by states and other political subdivisions of the OECD-based group of countries, that are rated investment-grade by at least two nationally recognized credit rating services, or rated investment-grade by one nationally recognized credit rating agency and not less than investment-grade by any other credit rating agency, or, with the exception of securities issued by U.S. firms and subject to review by the OCC, unrated but deemed to be of comparable investment quality by the reporting bank *and* the issuer has securities listed on a recognized stock exchange.

(iv) The other category includes debt securities not qualifying as government or qualifying securities. This would include non-OECD central government securities that do not meet the criteria for the government or qualifying categories. This category also includes instruments that qualify as capital issued by other banking organizations.

(v) The OCC will consider the extent of a bank's position in non-investment grade instruments (sometimes referred to as ''high yield debt'') that do not have investment-grade ratings. If those holdings are not well-diversified or otherwise represent a material position to the institution, the OCC may prohibit a bank from offsetting positions in these instruments with other positions in qualifying instruments that may be offset when calculating its general market risk requirement. In addition, the OCC may impose a specific risk capital requirement as high as 16.0 percent.

(2) *General Market Risk.* (i) A bank may measure its exposure to general market risk using, on a continuous basis, either the maturity method (which uses standardized risk weights that approximate the price sensitivity of various instruments) or the duration method (where the institution calculates the precise duration of each instrument, weighted by a specified change in interest rates).

(ii) Both methods use a maturity-ladder that incorporates a series of ''time bands'' and ''zones'' to group together securities of similar maturities and that are designed to take into account differences in price sensitivities and interest rate volatilities across different maturities. Under either method, the capital requirement for general market risk is the sum of a base charge that results from fully netting various risk-weighted positions and a series of additional charges (add-ons), which effectively ''disallow'' part of the previous full netting to address basis and yield curve risk.

(iii) For each currency in which a bank has significant positions, a separate capital requirement must be calculated. No netting of positions is permitted across different currencies. Offsetting positions of the same amount in the same issues, whether actual or

[2] A one-tailed confidence interval of 99 percent means that there is a 1 percent probability based on historical experience that the combination of positions in a bank's portfolio would result in a loss higher than the measured value-at-risk.

[3] This transformation entails multiplying a bank's value-at-risk by the square root of the ratio of the required holding period (ten days) to the holding period embodied in the value-at-risk exposure. For example, the value-at-risk calculated according to a one-day holding period would be scaled-up by the ''square root of time'' by multiplying the value-at-risk by 3.16 (the square root of the ratio of a ten-day holding period to a one-day holding period).

notional, may be excluded from the calculation, as well as closely matched swaps, forwards, futures, and forward rate agreements (FRAs) that meet the conditions set out in section 6(a)(3) of this appendix B.

(iv) In the maturity method, the bank distributes each long or short position (at current market value) of a debt instrument into the time bands of the maturity ladder. Fixed-rate instruments are allocated according to the remaining term to maturity and floating-rate instruments according to the next repricing date. A callable bond trading above par is slotted according to its first call date, while a callable bond priced below par is slotted according to remaining maturity. Fixed-rate mortgage-backed securities, including collateralized mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs), are slotted according to their expected weighted average lives.

(v) Once all long and short positions are slotted into the appropriate time band, the long positions in each time-band are summed and the short positions in each time-band are summed. The summed long and/or short positions are multiplied by the appropriate risk-weight factor (reflecting the price sensitivity of the positions to changes in interest rates) to determine the risk-weighted long and/or short position for each time-band. The risk weights for each time-band are set out in Table 2—Maturity Method: Time-Band and Weights, as follows:

TABLE 2.—MATURITY METHOD: TIME-BANDS AND WEIGHTS

Zone	Coupon 3% or more	Coupon less than 3% and zero coupon bonds	Risk weights
1	Up to 1 month	Up to 1 month	0.00
	1 up to 3 months	1 up to 3 months	0.20
	3 up to 6 months	3 up to 6 months	0.40
	6 up to 12 months	6 up to 12 months	0.70
2	1 up to 2 years	1 up to 1.9 years	1.25
	2 up to 3 years	1.9 up to 2.8 years	1.75
	3 up to 4 years	2.8 up to 3.6 years	2.25
3	4 up to 5 years	3.6 up to 4.3 years	2.75
	5 up to 7 years	4.3 up to 5.7 years	3.25
	7 up to 10 years	5.7 up to 7.3 years	3.75
	10 up to 15 years	7.3 up to 9.3 years	4.50
	15 up to 20 years	9.3 up to 10.6 years	5.25
	Over 20 years	10.6 up to 12 years	6.00
		12 up to 20 years	8.00
		Over 20 years	12.50

(vi) Within each time-band for which there are risk-weighted long and short positions, the risk-weighted long and short positions are then netted, resulting in a single net risk-weighted long or short position for each time-band. Because different instruments and different maturities may be included and netted within each time-band, a capital requirement, referred to as the vertical disallowance, is assessed for basis risk. The vertical disallowance capital requirement is 10.0 percent of the position eliminated by the intra-time-band netting, that is, 10.0 percent of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, 10.0 percent of either position.[4] The vertical disallowances for each time-band are absolute values, that is, neither long nor short. The vertical disallowances for all time-bands in the maturity ladder are summed and included as an element of the general market risk capital requirement.

(vii) Within each zone for which there are risk-weighted long and short positions in different time-bands, the weighted long and short positions in all of the time-bands within the zone are then netted, resulting in a single net long or short position for each zone. Because different instruments and different maturities may be included and netted within each zone, a capital requirement, referred to as the horizontal disallowance, is assessed to allow for the imperfect correlation of interest rates along the yield curve. The horizontal disallowance capital requirement is calculated as a percentage of the position eliminated by the intra-zone netting, that is, a percentage of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, a percentage of either position.[5] The percent disallowance factors for intra-zone netting are set out in Table 3—Horizontal Disallowances in section 6(a)(2)(H). The horizontal disallowances, like the vertical disallowances, are absolute values that are summed and included as an element of the general market risk capital requirement.

(viii) Risk-weighted long and short positions in different zones are then netted between the zones. Zone 1 and zone 2 are netted if possible, reducing or eliminating the net long or short position in zone 1 or zone 2 as appropriate. Zone 2 and zone 3 are then netted if possible, reducing or eliminating the net long or short position in zone 2 or zone 3 as appropriate. Zone 3 and zone 1 are then netted if possible, reducing or eliminating the long or short position in zone 3 and zone 1 as appropriate. A horizontal disallowance capital requirement is then assessed, calculated as a percentage of the position eliminated by the inter-zone netting. The horizontal disallowance capital requirements for each zone are then summed as absolute values and included in the general market risk capital charge. The percent disallowance factors for inter-zone netting are set out in Table 3—Horizontal Disallowances, as follows:

TABLE 3.—HORIZONTAL DISALLOWANCES

Zone	Time-band	Within the zone (percent)	Between adjacent zones (percent)	Between zones 1 and 3 (percent)
1	0 up to 1 month 1 up to 3 months. 3 up to 6 months.	40	40	100

[4] For example, if the sum of the weighted longs in a time-band is $100 million and the sum of the weighted shorts is $90 million, the vertical disallowance for the time-band is 10.0 percent of $90 million, or $9 million.

[5] For example, if the sum of the weighted longs in the 1- to 3-month time-band in Zone 1 is $8 million and the sum of the weighted shorts in the 3- to 6-month time-band is $10 million, the horizontal disallowance for the zone is 40 percent of $8 million, or $3.2 million.

TABLE 3.—HORIZONTAL DISALLOWANCES—Continued

Zone	Time-band	Within the zone (percent)	Between adjacent zones (percent)	Between zones 1 and 3 (percent)
	6 up to 12 months.			
2	1 up to 2 years	30	40	100
	2 up to 3 years			
	3 up to 4 years			
3	1 up to 5 years	30	40	100
	5 up to 7 years			
	7 up to 10 years			
	10 up to 15 years			
	15 up to 20 years			
	Over 20 years			

(ix) Finally, the net risk-weighted long or net risk-weighted short positions remaining in the zones are summed to reach a single net risk-weighted long or net risk-weighted short position for the bank's portfolio. The sum of the absolute value of this position and the vertical and horizontal disallowances is the capital requirement for general market risk.

(x) In the duration method, the bank, after calculating each instrument's modified duration,[6] multiplies that modified duration by the interest rate shock specified for an instrument of that duration in Table 4—Duration Method: Time-Band and Assumed Changes in Yield in section 6(a)(2)(K). The resulting product (representing the expected percentage change in the price of the instrument for the given interest rate shock) is then multiplied by the current market value of the instrument. The resulting amount is then slotted as a long or short position into a time-band in the maturity ladder in Table 4—Duration Method: Time-Band and Assumed Changes in Yield on the basis of the instrument's modified duration.[7]

(xi) Once all of the bank's traded debt instruments have been slotted into the maturity ladder, the bank conducts the same rounds of netting and disallowances described in sections 6(a)(2)(F) through (H) of the maturity method in this appendix B, with the exception that the vertical disallowance requirement for the duration method is 5.0 percent (horizontal disallowances continue to be those set out in Table 3—Horizontal Disallowances). As with the maturity method, the sum of the absolute value of the final net position and the vertical and horizontal disallowances is the general market risk capital requirement.

[6] The duration of an instrument is its approximate percentage change in price for a 100 basis point parallel shift in the yield curve assuming that its cash flows do not change when the yield curve shifts. Modified duration is duration divided by a factor of 1 plus the interest rate.

[7] Example, an instrument held by a bank with a maturity of 4 years and 3 months and a current market value of $1,000 might have a modified duration of 3.5 years. Based on its modified duration, it would be subjected to the 75-basis point interest rate shock, resulting in an expected price change of 2.625 percent (3.5 × 0.75). The corresponding expected change in price of $26.25, calculated as 2.625 percent of $1,000, would be slotted as a long position in the 3.3 to 4.0 year time-band of the maturity ladder.

(xii) The duration method maturity ladder is set out in Table 4—Duration Method: Time Bands and Assumed Changes in Yield, as follows:

TABLE 4.—DURATION METHOD: TIME-BANDS AND ASSUMED CHANGES IN YIELD

Zone	Time-band	Assumed change in yield
1	Up to 1 month	1.00
	1 up to 3 months	1.00
	3 up to 6 months	1.00
	6 up to 12 months	1.00
2	1.0 up to 1.8 years	0.90
	1.8 up to 2.6 years	0.80
	2.6 up to 3.3 years	0.75
3	3.3 up to 4.0 years	0.75
	4.0 up to 5.2 years	0.70
	5.2 up to 6.8 years	0.65
	6.8 up to 8.6 years	0.60
	8.6 up to 9.9 years	0.60
	9.9 up to 11.3 years ..	0.60
	11.3 up to 16.6 years	0.60
	Over 16.6 years	0.60

(3) *Interest rate derivative contracts.* (i) Derivative contracts and other off-balance sheet positions that are affected by changes in interest rates are included in the measurement system under section 6(a) of this appendix B (except for options and the associated underlyings, which are included in the measurement system under the treatment discussed in section 6(e) of this appendix B).

(ii) Derivatives are converted into positions in the relevant underlying instrument and are included in the calculation of specific and general market risk capital charges as described above. The amount to be included is the market value of the principal amount of the underlying or of the notional underlying.

(iii) Futures and forward contracts (including FRAs) are broken down into a combination of a long position and short position in the notional security. The maturity of a future or a FRA is the period until delivery or exercise of the contract, plus the life of the underlying instrument.[8] Where a range of instruments may be delivered to fulfill the contract, the bank may chose which deliverable instrument goes into the maturity or duration ladder as the notional underlying. In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

(iv) Swaps are treated as two notional positions in the relevant instruments with appropriate maturities. The receiving side is treated as the long position and the paying side is treated as the short position.[9] The separate sides of cross-currency swaps or forward foreign exchange transactions are slotted in the relevant maturity ladders for the currencies concerned. For swaps that pay or receive a fixed or floating interest rate against some other reference price, for example, an equity index, the interest rate component is slotted into the appropriate repricing maturity category, with the long or short position attributable to the equity component being included in the equity framework set out in section 6(b) of this appendix B.[10]

[8] For example, a long position in a June three-month interest rate future (taken in April) is reported as a long position in a government security with a maturity of five months and a short position in a government security with a maturity of two months.

[9] For example, an interest rate swap in which a bank is receiving floating-rate interest and paying fixed is treated as a long position in a floating rate instrument with a maturity equivalent to the period until the next interest rate reset date and a short position in a fixed-rate instrument with a maturity equivalent to the remaining life of the swap.

[10] A bank with a large swap book may, with prior approval of the OCC, use alternative formulae to calculate the positions to be included in the maturity or duration ladder. For example, a bank could first convert the payments required by the swap into present values. For that purpose, each payment would be discounted using zero coupon yields, and the payment's present value entered into the appropriate time-band using procedures that apply to zero (or low) coupon bonds. The net amounts would then be treated as bonds, and slotted into the general market risk framework. Such alternative treatments will, however, only be allowed if: (i) the OCC is satisfied with the accuracy of the system being used, (ii) the calculated positions fully reflect the sensitivity of the cash flows to interest rate changes; and (iii) the positions are denominated in the same currency.

(v) A bank may offset long and short positions (both actual and notional) in identical derivative instruments with exactly the same issuer, coupon, currency, and maturity before slotting these positions into time-bands. A matched position in a future and its corresponding underlying may also be fully offset and, thus, excluded from the calculation, except when the future comprises a range of deliverable instruments. However, in cases where, among the range of deliverable instruments, there is a readily identifiable underlying instrument that is most profitable for the trader with a short position to deliver, positions in the futures contract and the instrument may be offset. No offsetting is allowed between positions in different currencies.

(vi) Offsetting positions in the same category of instruments can in certain circumstances be regarded as matched and treated by the bank as a single net position which should be entered into the appropriate time-band. To qualify for this treatment the positions must be based on the same underlying instrument, be of the same nominal value, and be denominated in the same currency. The separate sides of different swaps may also be ''matched'' subject to the same conditions. In addition:

(A) For futures, offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical instruments and the instruments must mature within seven days of each other;

(B) For swaps and FRAs, the reference rate (for floating rate positions) must be identical and the coupon closely matched; and

(C) For swaps, FRAs and forwards, the next interest reset date, or for fixed coupon positions or forwards the remaining maturity, must correspond within the following limits: If the reset (remaining maturity) dates occur within one month, then the reset (remaining maturity) dates must be on the same day; if the reset (remaining maturity) dates occur between one month and one year later, then the reset (remaining maturity) dates must occur within seven days of each other, or if the reset (remaining maturity) dates occur over one year later, then the reset (remaining maturity) dates must occur within thirty days of each other.

(vii) Interest rate and currency swaps, FRAs, forward foreign exchange contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on a short-term (e.g., LIBOR) interest rate index. However, in the case of futures contracts where the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge will apply according to the category of the issuer as set out in section 6(a)(2) of this appendix B.

(b) *Equities.* (1) *Specific risk.* The measure of specific risk is calculated on the basis of the bank's gross equity positions, that is, the absolute sum of the current market value of all long equity positions and of all short equity positions.[11] The specific risk capital requirement is 8.0 percent of that sum, unless the portfolio is both liquid and well-diversified, in which case the specific risk capital requirement is 4.0 percent of the gross equity position. A specific risk charge of 2.0 percent applies to the net long or short position in a broad, diversified equity index.

(2) *General market risk.* The measure of general market risk is based on the difference between the sum of the long positions and the sum of the short positions (i.e., the overall net position in an equity market) at current market value. An overall net position must be separately calculated for each national market in which the bank holds equities. The capital requirement for general market risk is 8.0 percent of the net position in each equity market.

(3) *Equity derivatives.* (i) Equity derivatives and other off-balance-sheet positions that are affected by changes in equity prices are included in the measurement system under section 6(b) of this appendix B (except for equity options, equity index options, and the associated underlying, which are included in the measurement system under the treatment discussed in section 6(e) of this appendix B).[12] This includes futures and swaps on both individual equities and on equity indices. Equity derivatives should be converted into notional equity positions in the relevant underlying.

(ii) Futures and forward contracts relating to individual equities should be reported as current market prices of the underlying. Futures relating to equity indices should be reported as the marked-to-market value of the notional underlying equity portfolio. Equity swaps are treated as two notional positions, with the receiving side as the long position and the paying side as the short position.[13] If one of the legs involves receiving/paying a fixed or floating interest rate, the exposure should be slotted into the appropriate repricing maturity band for debt securities. The stock index is covered by the equity treatment.

(iii) In the case of futures-related arbitrage strategies, the 2.0 percent specific risk charge applicable to broad diversified equity indices may be applied to only one index. The opposite position is exempt from a specific risk charge. The strategies qualifying for this treatment are:

(A) When the bank takes an opposite position in exactly the same index at different dates; and

(B) When the bank has an opposite position in different but similar indices at the same date, subject to supervisory oversight.

(iv) If a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broad diversified equity index matches a basket of securities, it may exclude both positions from the standardized approach on the condition that the trade has been deliberately entered into and separately controlled and the composition of the basket of stocks represents at least 90 percent of the market value of the index. In such a case, the minimum capital requirement is 4.0 percent (that is, 2.0 percent of the gross value of the positions on each side). This applies even if all of the securities comprising the index are held in identical proportions. Any excess value of the securities comprising the basket over the value of the futures contract or excess value of the futures contract over the value of the basket is treated as an open long or short position.

(v) If a bank takes a position in depository receipts[14] against an opposite position in the underlying equity, it may offset the position.

(c) *Foreign Exchange Risk.* (1) The capital requirement for foreign exchange risk covers the risk of holding or taking positions in foreign currencies, including gold, and is based on a bank's net open long positions or net open short positions in each currency, whether or not those positions are in the trading portfolio, plus the net open position in gold, regardless of sign.[15]

(2) A bank's net open position in each currency (and gold) is calculated by summing:

(i) The net spot position (i.e., all asset items less all liability items, including accrued interest earned but not yet received and accrued expenses, denominated in the currency in question);

(ii) All foreign exchange derivative instruments and other off-balance-sheet positions that are affected by changes in exchange rates are included in the measurement system under section 6(c) of this appendix B (except for options and their associated underlyings, which are included in the measurement system under the treatment discussed in section 6(e) of this appendix B). Forward currency positions should be valued at current spot market exchange rates. For a bank in which the basis of its normal management accounting is to use net present values, forward positions may be discounted to net present values as an acceptable way of measuring currency positions for regulatory capital purposes;

(iii) Guarantees (and similar instruments) that are certain to be called and are likely to be irrevocable;

(iv) Net future income/expenses not yet accrued but already fully hedged (at the discretion of the bank). A bank that includes future income and expenses must do so on a consistent basis without selecting expected future flows in order to reduce the bank's position; and

(v) Any other item representing a profit or loss in foreign currencies.

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[11] Matched positions in each identical equity in each national market may be treated as offsetting and excluded from the capital calculation, with any remaining position included in the calculations for specific and general market risk. For example, a future in a given equity may be offset against an opposite cash position in the same equity.

[12] Where equities are part of a forward contract (both equities to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be appropriately included in sections 6(a) and (c) of this appendix B.

[13] For example, an equity swap in which a bank is receiving an amount based on the change in value of one particular equity or equity index and paying a different index will be treated as a long position in the former and a short position in the latter.

[14] Depository receipts are instruments issued by a trust company or other depository institution evidencing the deposit of foreign securities and facilitating trading in such instruments on U.S. stock exchanges.

[15] Where a bank has future and forward contracts to deliver and receive gold, a maturity ladder should be constructed in accordance with section 6(a) of this appendix B treating gold as a zero coupon instrument.

(3) For measuring a bank's open positions, positions in composite currencies, such as the ECU, may be either treated as a currency in their own right or split into their component parts on a consistent basis. Positions in gold are measured in the same manner as described in section 6(d) of this appendix B.[16]

(4) The capital requirement is determined by converting the nominal amount (or net present value) of the net open position in each foreign currency (and gold) at spot rates into the reporting currency. The capital requirement is 8.0 percent of the sum of:

(i) The greater of the sum of the net short open positions or, the sum of the net long open positions; and

(ii) The net open position in gold, regardless of sign.[17]

(5) A bank doing negligible business in foreign currency and that does not take foreign exchange positions for its own account may be exempted from the capital requirement for foreign exchange risk provided that:

(i) Its foreign currency business, defined as the greater of the sum of its gross long positions and the sum of its gross short positions in all foreign currencies, does not exceed 100 percent of eligible capital as defined in section 3 of this appendix B; and

(ii) Its overall net open foreign exchange position as determined in section 6(c)(2) does not exceed 2.0 percent of its eligible capital.

(6) Where a bank is assessing its foreign exchange risk on a consolidated basis, it may be impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the bank. In such cases, the internal limit in each currency may be used as a proxy for the positions, provided there is adequate ex post monitoring of actual positions complying with such limits. In these circumstances, the limits should be added, regardless of sign, to the net open position in each currency.

(d) *Commodities risk.* (1) *Measurement methods.* This section provides a minimum capital requirement to cover the risk of holding or taking positions in commodities. There are two methods under the standardized approach for measuring commodity market risk—the simplified method and the maturity method. These methods are only appropriate for banks that conduct a limited amount of commodities business. All other banks must adopt an internal measurement system conforming to the criteria in section 5 of this appendix B.

(2) *Base capital requirement.* Under both the simplified and maturity methods, each long and short commodity position (spot and forward) is expressed in terms of the standard unit of measurement (such as barrels, kilos, or grams). The open positions in each category of commodities are then converted at current spot rates into U.S. currency, with long and short positions offset to arrive at the net open position in each commodity. Positions in different categories of commodities may not, generally, be offset.[18] Under either method, the base capital requirement is 15.0 percent of the net open position, long or short, in each commodity.[19]

(3) *Simplified method.* To protect a bank against basis risk, interest rate risk, and forward gap risk, each category of commodity is also subject to a 3.0 percent capital requirement on the bank's gross positions, long plus short, in the particular commodity. In valuing gross positions in commodity derivatives for this purpose, a bank should use the current spot price. The total capital requirement for commodities risk is the sum of the 15.0 percent base charges for each net commodity position and the 3.0 percent requirements on the gross commodity positions.

(4) *Maturity method.* (i) Under this method, a bank must slot each long and short commodity position (converted into U.S. currency at current spot rates) into a maturity ladder. The time-bands for the maturity ladder are; from zero to one month, one up to three months, three up to six months, six up to twelve months, one up to two years, two up to three years, and over three years. A separate maturity ladder is used for each category of commodity. Physical commodities are allocated to the first time-band.

(ii) In order to capture forward gap and interest rate risk within a time-band (together sometimes referred to as curvature/spread risk), offsetting long and short positions in each time-band are subject to an additional capital requirement. Beginning with the shortest-term time-band and continuing with subsequent time-bands, the amount of the matched short positions plus the amount of the matched long position is multiplied by a spread rate of 1.5 percent.

(iii) The unmatched net position from a shorter-term time-band must be carried forward to offset exposures in longer-term time-bands. A capital requirement of 0.6 percent of the net position carried forward is added for each time-band that the net position is carried forward.[20] The total capital requirement for commodities risk is the sum of the 15.0 percent base capital requirement for each net commodity position and the additional requirements for matched positions and for unmatched positions carried forward.

(5) Commodity derivatives and other off-balance-sheet positions that are affected by changes in commodity prices are included in the measurement system under section 6(d) of this appendix B (except for options and the associated underlying, which are included in the measurement system under the treatment discussed in section 6(e) of this appendix B). Commodity derivatives are converted into notional commodity positions. Under the maturity method, the positions are slotted into maturity time-bands as follows:

(i) Futures and forward contracts relating to individual commodities are incorporated in the measurement system as notional amounts (of, for example, barrels or kilos) that are converted to U.S. dollars at current spot rates and are assigned a maturity according to expiration date;

(ii) Commodity swaps where one side of the contract is a fixed price and the other side is the current market price are incorporated as a series of positions equal to the notional amount of the contract at current spot rates, with one position corresponding to each payment on the swap and slotted in the maturity ladder accordingly. The positions are long positions if the bank is paying a fixed price and receiving a floating price, and short positions if the bank is receiving a fixed price and paying a floating price;[21] and

(iii) Commodity swaps where the sides of the transaction are in different commodities are included in the relevant reporting ladder. No offsetting is allowed unless the commodities are in the same sub-category.

(e) *Options.* (1) Several alternatives are available for a bank to use in measuring its market risk for options activities. A bank that only has purchased options may use the simplified method set forth in section 6(e)(2) of this appendix B. A bank that also writes options may use the scenario method described in section 6(e)(3) of this appendix B, or the delta-plus method set forth in section 6(e)(4) of this appendix B.[22] These methods may only be used by banks which, in relative terms, have limited options activities. Banks with more significant options business are expected to adopt an internal measurement system conforming to the criteria in section 5 of this appendix B. Regardless of the method used, specific risk related to the issuer of an instrument still applies to options positions for equities, equity indices and corporate debt securities as set forth in sections 6(a) and (b) of this appendix B. There remains a separate capital

[16] Where gold is part of a forward contract (quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be reported as set out in section 6(a) and (c) of this appendix B.

[17] For example, a bank has the following net currency positions: Yen = +50, DM = +100, GB = +150, FFR = −20, US$= −180, and gold = −35. The bank would sum its long positions (total = +300) and sum its short positions (total = −200). The bank's capital requirement for foreign exchange market risk would be: (300 (the larger of the summed long and short positions) + 35 (gold)) × 8.0% = $26.80.

[18] However, netting is permitted between different sub-categories of the same commodity in cases where the sub-categories are deliverable against each other.

[19] When the funding of a commodity position opens a bank to interest rate or foreign exchange exposure the relevant positions should be included in the measures of interest rate and foreign exchange risk described in sections 6(a) and (c) of this appendix B. When a commodity is part of a forward contract, any interest or foreign currency exposure from the other side of the contract should be appropriately included in sections 6(a) and 6(c) of this appendix B.

[20] For example, if $200 short is carried forward from the 3–6 month time-band to the 1–2 year time-band, the capital charge would be $200 × .006 × 2 = $2.40.

[21] If one of the sides of the transaction involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing maturity band in section 6(a) of this appendix B.

[22] Unless all their written option positions are hedged by perfectly matched long positions in exactly the same options, in which case there is no capital requirement for market risk.

requirement for counterparty credit risk as set forth in appendix A to this part 3.

(2) Under the simplified and scenario methods, the positions for the options and the associated underlying, cash or forward, are not included in the measurement framework for debt securities, equities, foreign exchange or commodities risk as set forth in sections 6(a) through (d) of this appendix B. Rather, they are subject to capital requirements as calculated in this section. The capital requirements calculated under this section should then be added to the capital requirements for debt securities, equities, foreign exchange and commodities risk as appropriate. Under the delta-plus method, the delta equivalent position [23] for each option is included in the measurement frameworks set forth in sections 6(a) through (d) of this appendix B.

(3) A bank that has only a limited amount and range of purchased options may use the following simplified approach to measure its market risk exposure: [24]

(i) For a bank with a long cash position and a long put or with a short cash position and a long call, the capital requirement is the market value of the underlying instrument multiplied by the sum of the specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections 6(a) through (d) of this appendix B), less the amount the option is in the money (if any) bounded at zero.[25]

(ii) For a bank with a long call or a long put, the capital charge is the lesser of:

(A) The market value of the underlying security multiplied by the sum of specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections 6(a) through (d) of this appendix B); or

(B) The market value of the option.

(iii) Under this measure, the capital requirement for currency options is 8.0 percent of the market value of the underlying and for commodity options is 15.0 percent of the market value of the underlying.

(4) Under the scenario approach, a bank revalues its options and related hedging positions by changing the underlying rate or price over a specified range and by assuming different levels of volatility for that rate or price.

(i) For each of its option portfolios, a bank constructs a grid based on a fixed range of changes in the portfolio's risk factors and calculates changes in the value of the option portfolio at each point within the grid. For this purpose, an option portfolio consists of an option and any related hedging positions or multiple options and related hedging positions that are grouped together according to their remaining maturity or the type of underlying.

(ii) Options based on interest rates and debt instruments are grouped into portfolios according to the maturity zones that are set forth in section 6(a) of this appendix B. (Zone 1 instruments have a remaining maturity of up to 1 year, zone 2 instruments have a remaining maturity from 1 year up to 4 years, and zone 3 instruments have a remaining maturity of 4 years or more.)

(iii) These options and the associated hedging positions should be evaluated under the assumption that the relevant interest rates move simultaneously. For options based on equities, separate grids are constructed for each individual equity issue and index. For options based on exchange rates, separate grids are constructed for individual exchange rates. For options based on commodities, separate grids are constructed for each category of commodity (as defined in sections 6(a) and (d) of this appendix B).

(iv) For option portfolios with options based on equities, exchange rates, and commodities, the first dimension of the grid consists of rate or price changes within a specified range above and below the current market value of the underlying; for equities, the range is +/− 12.0 percent (or in the case of an index +/− 8.0 percent), for exchange rates the range is +/− 8.0 percent, and for commodities the range is +/− 15.0 percent. For option portfolios with options based on interest rates, the range for the first dimension of the grid depends on the remaining maturity zone. The range for zone 1 is +/− 100 basis points, the range for zone 2 is +/− 90 basis points, and the range for zone 3 is +/− 75 basis points. For all option portfolios, the range is divided into at least ten equally spaced intervals. The second dimension of each grid is a shift in the volatility of the underlying rate or price equal to +/− 25.0 percent of the current volatility.[26]

(v) For each assumed volatility and rate or price change (a scenario), the bank revalues each option portfolio. The market risk capital requirement for the portfolio is the largest loss in value from among the scenario revaluations. The total market risk capital requirement for all option portfolios is the sum of the individual option portfolio capital requirements.

(vi) The OCC will review the application of the scenario approach, particularly regarding the precise way the analysis is constructed. A bank using the scenario approach should meet the appropriate qualitative criteria set forth in section 5 of this appendix B.

(5) Under the delta-plus method, a bank that writes options may include delta-weighted options positions within each measurement framework as set forth in sections 6(a) through 6(d) of this appendix B.

(i) Options positions should be measured as a position equal to the market value of the underlying instrument multiplied by the delta. In addition, a bank must measure the sensitivities of the option's gamma (the change of the delta for a given change in the price of the underlying) and vega (the sensitivity of the option price with respect to a change in volatility) to calculate the total capital requirement. These sensitivities may be calculated according to an exchange model approved by the OCC or to the bank's own options pricing model, subject to oversight by the OCC.

(ii) For options with debt instruments or interest rates as the underlying instrument, delta-weighted options positions should be slotted into the debt instrument time-bands in section 6(a) of this appendix B using a two-legged approach (as is used for other derivatives), requiring one entry at the time the underlying contract takes effect and one at the time the underlying contract matures.[27] Floating rate instruments with caps or floors should be treated as a combination of floating rate securities and a series of European-style options.[28] A bank must also calculate the gamma and vega for each such option position (including hedge positions). The results should be slotted into separate maturity ladders by currency. For options such as caps and floors whose underlying instrument is an interest rate, the delta and gamma should be expressed in terms of a hypothetical underlying security. Subsequently:

(A) For gamma risk, for each time-band, net gammas that are negative are multiplied by the risk weights set out in Table 5 and by the square of the market value of the underlying instrument (net positive gammas may be disregarded);

(B) For volatility risk, a bank calculates the capital requirements for vega in each time-band assuming a proportional shift in volatility of ±25.0 percent;

(C) The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the

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[23] The delta equivalent of an option is the option's delta value multiplied by its principal or notional value. The delta value of an option represents the expected change in the option's price as a proportion of a small change in the price of the underlying instrument. For example, an option whose price changes $1 for every $2 dollar change in the price of the underlying instrument has a delta of 0.50.

[24] For example, if a holder of 100 shares currently valued at $10 each has an equivalent put option with a strike price of $11, the capital charge would be: $1,000 × 16.0 percent (e.g., 8.0 percent specific plus 8.0 percent general market risk) = $160, less the amount the option is in the money ($11 − $10) × 100 = $100, i.e., the capital charge would be $60. A similar methodology applies for options whose underlying is a foreign currency, a debt security or a commodity.

[25] Some options (e.g., where the underlying is an interest rate, a currency, or a commodity) bear no specific risk but specific risk will be present in the case of options on corporate debt securities and for options on equities and equity indices.

[26] For example, if the underlying in an equity instrument with a current market value of $100 and a volatility of 20 percent, the first dimension of the grid would range from $88 to $112, divided into ten intervals of $2.40 and the second dimension would assume volatilities of 15 percent, 20 percent, and 25 percent.

[27] For example, in April a purchased call option on a June three-month interest-rate future would be considered on the basis of its delta-equivalent value to be a long position with a maturity of five months and a short position with a maturity of two months. The written option would be slotted as a long position with a maturity of two months and a short position with a maturity of five months.

[28] For example, the holder of a three-year floating rate bond indexed to six-month LIBOR with a cap of 15 percent would treat the bond as a debt security that reprices in six months, and a series of five written call options on a FRA with a strike rate of 15 percent, each slotted as a short position at the expiration date of the option and as a long position at the time the FRA matures.

individual capital requirements for vega risk for each time-band; and

(D) The delta plus method risk weights are:

TABLE 5.—DELTA PLUS METHOD RISK WEIGHTS

Time-band	Modified duration (average assumed for time-band)	Assumed interest rate change (%)	Risk-weight for gamma[1]
Under 1 month	0.00	1.00	0.00000
1 up to 3 months	0.20	1.00	0.00020
3 up to 6 months	0.40	1.00	0.00080
6 up to 12 months	0.70	1.00	0.00245
1 up to 2 years	1.40	0.90	0.00794
2 up to 3 years	2.20	0.80	0.01549
3 up to 4 years	3.00	0.75	0.02531
4 up to 5 years	3.65	0.75	0.03747
5 up to 7 years	4.65	0.70	0.05298
7 up to 10 years	5.80	0.65	0.07106
10 up to 15 years	7.50	0.60	0.10125
15 up to 20 years	8.75	0.60	0.13781
Over 20 years	10.00	0.60	0.18000

[1] According to the Taylor expansion, the risk weights are calculated as ½ (modified duration x assumed interest rate change) [2]/100.

(iii) For options with equities as the underlying, delta-weighted option positions should be incorporated in the measure of market risk set forth in section 6(b) of this appendix B. Individual equity issues and indices should be treated as separate underlyings. In addition to the capital requirement for delta risk, a bank should apply a further capital charge for gamma and vega risk:

(A) For gamma risk, the net gammas that are negative for each underlying are multiplied by 0.72 percent (in the case of an individual equity) or 0.32 percent (in the case of an index as the underlying) and by the square of the market value of the underlying;

(B) For volatility risk, a bank calculates the capital requirement for vega for each underlying, assuming a proportional shift in volatility of ±25.0 percent; and

(C) The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the individual capital requirements for vega risk.

(iv) For options on foreign exchange and gold, the net delta (or delta-based) equivalent of the total book of foreign currency and gold options is incorporated into the measurement of the exposure in a single currency position as set forth in section 6(c) of this appendix B. The gamma and vega risks should be measured as follows:

(A) For gamma risk, for each underlying exchange rate, net gammas that are negative are multiplied by 0.32 percent and by the square of the market value of the positions;

(B) For volatility risk, a bank calculates the capital requirements for vega for each currency pair and gold assuming a proportional shift in volatility of ±25.0 percent; and

(C) The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

(v) For options on commodities, the delta-weighted positions are incorporated in one of the measures described in section 6(d) of this appendix B. In addition, a bank must apply a capital requirement for gamma and vega risk:

(A) For gamma risk, net gammas that are negative for each underlying are multiplied by 1.125 percent and by the square of the market value of the commodity;

(B) For volatility risk, a bank calculates the capital requirements for vega for each commodity assuming a proportional shift in volatility of ±25.0 percent; and

(C) The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

(vi) Under certain conditions and to a limited extent, the OCC may permit banks that are significant traders in options with debt securities or interest rates as the underlying to net positive and negative gammas and vegas across time-bands. Such netting must be based on prudent and conservative assumptions and the bank must materially meet the qualitative standards set forth in section 5 of this appendix B.

(vii) A bank may base the calculation of vega risk on a volatility ladder in which the implied change in volatility varies with the maturity of the option. The assumed proportional shift in volatility must be at least ±25.0 percent at the short end of the maturity spectrum. The proportional shift for longer maturities must be at least as stringent in statistical terms as the 25.0 percent shift at the short end.

(viii) A bank should also monitor the risks of rho (the rate of change of the value of the option with respect to the interest rate) and theta (the rate of change of the value of the option with respect to time).

Section 7. Reservation of authority

(a) *Partial models.* The OCC reserves the authority to require a bank subject to the market risk requirements of this appendix B to develop or use an internal market risk model, the supervisory market risk model, or any combination thereof, for the purposes of compliance with the capital requirements of this appendix B.[29]

(b) *De minimis exposures.* The OCC also may permit a bank with negligible exposures to certain types of market risk (activities in remote locations and minor currencies) to adopt alternative measurements for those exposures if the alternative measurements are able to adequately measure the risk.

(c) *Multiplication factor for qualifying internal market risk model.* The OCC may increase or decrease the multiplication factor applicable to the capital requirement under a qualifying internal market risk model based on an assessment of the quality and historic accuracy of the bank's risk management system.

Office of the Comptroller of the Currency.

Dated: July 10, 1995.

Eugene A. Ludwig,

Comptroller of the Currency.

FEDERAL RESERVE BOARD

12 CFR Chapter II

For the reasons set out in the preamble, parts 208 and 225 of title 12 of the Code of Federal Regulations are proposed to be amended as set forth below.

PART 208—MEMBERSHIP OF STATE BANKING INSTITUTIONS IN THE FEDERAL RESERVE SYSTEM (REGULATION H)

1. The authority citation for part 208 is revised to read as follows:

Authority: 12 U.S.C. 36, 248(a), 248(c), 321–338a, 371d, 461, 481–486, 601, 611, 1814, 1823(j), 1828(o), 1831o, 1831p–1, 3105, 3310, 3331–3351, and 3905–3909; 15 U.S.C.

[29] The OCC generally expect banks with significant trading positions to use internal market risk models for the purposes of this appendix B.

78b, 78l(b), 78l(g), 78l(i), 78o–4(c)(5), 78q, 78q–1 and 78w; 31 U.S.C. 5318; 42 U.S.C. 4012a, 4104a, 4104b, 4106, and 4128.

2. In Part 208, § 208.13 is revised to read as follows:

§ 208.13 Capital adequacy.

The standards and guidelines by which the capital adequacy of state member banks will be evaluated by the Board are set forth in appendix A and appendix E to part 208 for risk-based capital purposes, and, with respect to the ratios relating capital to total assets, in appendix B to part 208 and in appendix B to the Board's Regulation Y, 12 CFR part 225.

3. In Part 208, § 208.31 is amended by revising paragraphs (e), (h), and (j) to read as follows:

§ 208.31 Definitions.

* * * * *

(e) *Risk-weighted assets* means total weighted risk assets, as calculated in accordance with the Board's Capital Adequacy Guidelines for State Member Banks: Risk-Based Measure (appendix A to this part 208) and adjusted for market risk in accordance with the Board's Capital Adequacy Guidelines for State Member banks: Market Risk Measure (appendix E to this part 208).

* * * * *

(h) *Tier 1 risk-based capital ratio* means the ratio of Tier 1 capital to weighted risk assets, as calculated in accordance with the Board's Capital Adequacy Guidelines for State Member Banks: Risk-Based Measure (appendix A to this part 208) and adjusted for market risk in accordance with the Board's Capital Adequacy Guidelines for State Member Banks: Market Risk Measure (appendix E to this part 208).

* * * * *

(j) *Total risk-based capital ratio* means the ratio of qualifying total capital to weighted risk assets, as calculated in accordance with the Board's Capital Adequacy Guidelines for State Member Banks: Risk-Based Measure (appendix A to this part 208) and adjusted for market risk in accordance with the Board's Capital Adequacy Guidelines for State Member Banks: Market Risk Measure (appendix E to this part 208).

4. In part 208, Appendix A is amended by revising the first and second paragraphs of section I. to read as follows:

Appendix A to Part 208—Capital Adequacy Guidelines for State Member Banks: Risk-Based Measure

I. Overview

The Board of Governors of the Federal Reserve System has adopted a risk-based capital measure to assist in the assessment of the capital adequacy of state member banks.[1] The principal objectives of this measure are to (i) make regulatory capital requirements more sensitive to differences in risk profiles among banks; (ii) factor off-balance-sheet exposures into the assessment of capital adequacy; (iii) minimize disincentives to holding liquid, low-risk assets; and (iv) achieve greater consistency in the evaluation of the capital adequacy of major banks throughout the world.

The risk-based capital guidelines include both a definition of capital and a framework for calculating weighted risk assets by assigning assets and off-balance-sheet items to broad risk categories.[2] A bank's risk-based capital ratio is calculated by dividing its qualifying capital (the numerator of the ratio) by its weighted risk assets (the denominator).[3] The definition of qualifying capital is outlined below in section II. of this appendix A, and the procedures for calculating weighted risk assets are discussed in section III. of this appendix A. Attachment I to this appendix A illustrates a sample calculation of weighted risk assets and the risk-based capital ratio.

* * * * *

5. In Part 208, a new Appendix E is added to read as follows:

Appendix E to Part 208—Capital Adequacy Guidelines for State Member Banks: Market Risk Measure

I. Introduction

A. Overview

1. The Board of Governors of the Federal Reserve System has adopted a framework for determining capital requirements for the market risk exposure of state member banks.[1] For this purpose, market risk is defined as the risk of losses in a bank's on- and off-balance-sheet positions arising from movements in market prices. The market risks subject to these capital requirements are those associated with debt and equity instruments held in the bank's trading account, as well as foreign exchange risk and commodities risk throughout the bank, including options and other derivative contracts in each risk category.

2. Effective December 31, 1997, the market risk measure will be applied to all state member banks that, on a consolidated basis:

a. Have total assets in excess of $5 billion; and either have a total volume of trading activities (measured as the sum of the bank's trading assets and liabilities[2] on a daily average basis for the quarter) that is 3.0 percent or more of the total assets of the bank, or have interest rate, foreign exchange, equity, and commodity off-balance-sheet derivative contracts relating to trading activities whose total notional amounts exceed $5 billion; or

b. Have total assets of $5 billion or less; *and* have trading activities exceeding 10.0 percent of the total assets of the bank.

3. Such banks are still subject to the risk-based capital measure set forth in appendix A of this part, subject to the exclusion of certain assets specified in this appendix E. However, these banks must calculate their market risk-equivalent assets and determine risk-based capital ratios adjusted for market risk in accordance with this appendix E.[3]

4. The market risk measure provides two ways for a bank to determine its exposure to market risk. A bank may use its internal risk measurement model, subject to the conditions and criteria set forth in section III. of this appendix E (referred to as the internal models approach), or when appropriate, a bank may use all or portions of the alternative measurement system described in section IV. of this appendix E (referred to as the standardized approach).

a. With prior approval from the Federal Reserve, for regulatory capital purposes, a bank may use its internal risk measurement model to measure its value-at-risk[4] for each of the following risk factor categories; interest rates, exchange rates, equity prices, and commodity prices. The value-at-risk amount for each risk factor category should include volatilities of related options. The value-at-risk amount for each risk factor category is

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[1] Some banks are also subject to capital requirements for market risk as set forth in appendix E of this part. Banks that are subject to the market risk measure are required to follow the guidelines set forth in appendix E of this part for determining qualifying and eligible capital, calculating market risk-equivalent assets and adding them into weighted-risk assets, and calculating risk-based capital ratios adjusted for market risk. Supervisory ratios that relate capital to total assets for state member banks are outlined in appendix B of this part and in appendix B to part 225 of the Board's Regulation Y, 12 CFR part 225.

[2] The risk-based capital measure is based upon a framework developed jointly by supervisory authorities from the countries represented on the Basle Committee on Banking Regulations and Supervisory Practices (Basle Supervisors' Committee) and endorsed by the Group of Ten Central Bank Governors. The framework is described in a paper prepared by the Basle Supervisors' Committee entitled ''International Convergence of Capital Measurement,'' July 1988.

[3] Banks generally are expected to utilize period-end amounts in calculating their risk-based capital ratios. When necessary and appropriate, ratios based on average balances may also be calculated on a case-by-case basis. Moreover, to the extent banks have data on average balances that can be used to calculate risk-based ratios, the Federal Reserve will take such data into account.

[1] The market risk measure is based on a framework developed jointly by supervisory authorities from the countries represented on the Basle Committee on Banking Supervision (Basle Supervisors Committee) and endorsed by the Group of Ten Central Bank Governors. The framework is described in a paper prepared by the Basle Supervisors Committee entitled ''[Proposal to issue a] Supplement to the Basle Capital Accord to Cover Market Risks.'' [April] 1995.

[2] As reflected in the bank's quarterly Consolidated Reports of Condition and Income (call report).

[3] The Federal Reserve may apply all or portions of this Appendix E to other banks when deemed necessary for safety and soundness purposes.

[4] A bank evaluates its current positions and estimates future market volatility through a value-at-risk measure, which is an estimate representing, with a certain degree of statistical confidence, the maximum amount by which the market value of trading positions could decline during a specific period of time. The value-at-risk is generated through an internal model that employs a series of market risk factors (for example, market rates and prices that affect the value of trading positions).

summed to determine the aggregate value-at-risk for the bank.

b. The standardized approach uses a set of standardized calculations and assumptions to measure market risk exposure depending on its source; debt instruments, equities, foreign currencies, and commodities, including volatilities of related options.

5. The Board generally expects any bank that is subject to the market risk measure, especially those with large trading accounts, to comply with the measure by using internal risk-measurement models. A bank may not change its measurement approach for the purpose of minimizing capital requirements. In limited instances, on a case-by-case basis, the Federal Reserve may permit a bank that has internal models to incorporate risk measures of negligible exposures, for example, *de minimis* positions, activities in remote locations, minor exposures in a currency, or activities that present negligible risk to the bank, in an alternative manner, so long as it adequately captures the risk.

6. The risk-based capital ratios adjusted for market risk determined in accordance with this appendix E are *minimum* supervisory ratios. Banks generally are expected to operate with capital positions well above the minimum ratios. In all cases, banks should hold capital commensurate with the level and nature of the risks to which they are exposed.

7. The Federal Reserve will monitor the implementation and effect of these guidelines in relation to domestic and international developments in the banking industry. When necessary and appropriate, the Board will consider the need to modify this appendix E in light of any significant changes in the economy, financial markets, banking practices, or other relevant factors.

B. Market Risks Subject to a Capital Requirement

1. *General Market Risk and Specific Risk.* A bank must hold capital against exposure to general market risk and specific risk arising from its trading and other foreign exchange and commodity activities. For this purpose, general market risk refers to changes in the market value of covered transactions resulting from market movements, such as changing levels of market interest rates, broad equity indices, or currency exchange rates. Specific risk refers to credit risk, that is, the risk that the issuer of a debt or equity instrument might default, as well as to other factors that affect the market value of specific instruments but that do not materially alter market conditions.[5]

2. *Trading Activities.* a. The general market risk and specific risk capital requirements for trading activities are based on on- and off-balance-sheet positions in a bank's trading account. For this purpose, trading account means positions in financial instruments acquired with the intent to resell in order to profit from short-term price movements (or other price or interest-rate variations), including, but not limited to:

i. Assets acquired with the intent to resell to customers;

ii. Positions in financial instruments arising from matched principal brokering and market making; or

iii. Positions taken in order to hedge other elements of the trading account (that is, reduce risk by offsetting other positions that have exposure to changes in market rates or prices).[6] Trading activities may include positions in debt instruments, equities, foreign currencies, and commodity instruments, or related derivative[7] or other off-balance-sheet contracts.

b. Debt instruments in the trading account are all fixed-rate and floating-rate debt securities and instruments that behave like debt, including non-convertible preferred stock. Convertible bonds, i.e., preferred stock or debt issues that are convertible, at a stated price, into common shares of the issuer, should be treated as debt instruments if they trade like debt instruments and as equities if they trade like equities. Also included are derivative contracts of debt instruments and other off-balance-sheet instruments in the trading account that react to changes in interest rates. A security that has been sold subject to a repurchase agreement or lent subject to a securities lending agreement is treated as if it were still owned by the lender of the security. Such transactions remain subject to capital requirements for credit risk for the off-balance-sheet portion of the transaction as set forth in section III.D. of appendix A of this part.

c. Equities in the trading account are equity instruments that behave like equities. The instruments covered include common stocks (whether voting or non-voting), convertible securities that behave like equities, and commitments to buy or sell equity securities. Also included are derivative contracts of equity instruments and other off-balance-sheet instruments in the trading account that are affected by changes in equity prices. However, non-convertible preferred stock is included in debt instruments.

3. *Foreign Exchange and Commodities Risk.* Foreign exchange or commodities positions, whether or not included in a bank's trading account, are subject to a capital requirement for the market risk of those positions.

a. The capital requirement for foreign exchange risk applies to a bank's total currency and gold positions. This includes spot positions (that is, asset items and liability items, including accrued interest and expenses, denominated in each currency); forward positions (that is, forward foreign exchange transactions, including currency futures and the principal on currency swaps not included in the spot position); and certain guarantees. It includes future income and expenses from foreign currency transactions not yet accrued but already fully hedged (at the discretion of the reporting bank), foreign exchange derivative and other off-balance-sheet positions that are affected by changes in exchange rates, and any other item representing a profit or loss in foreign currencies.

b. A bank may, subject to approval by the Federal Reserve, exclude from its foreign exchange positions any structural positions in foreign currencies. For this purpose, such structural positions are limited to transactions designed to hedge a bank's capital ratios against the effect of adverse exchange rate movements on subordinated debt, equity, or minority interests in consolidated subsidiaries and dotation capital assigned to foreign branches that are denominated in foreign currencies. Also included are any positions related to unconsolidated subsidiaries and to other items that are deducted from a bank's capital when calculating its capital base. In any event, such structural foreign currency positions must reflect long-term policies of the institution and not relate to trading positions.

c. A bank doing negligible business in foreign currency and that does not take foreign exchange positions for its own account may be exempted from the capital requirement for foreign exchange risk provided that:

i. Its foreign currency business, defined as the greater of the sum of its gross long positions and the sum of its gross short positions in all foreign currencies, does not exceed 100 percent of eligible capital as defined in section II. of this appendix E; and

ii. Its overall net open foreign exchange position as determined in section IV.C.2. of this appendix E does not exceed 2.0 percent of its eligible capital.

d. The capital requirement for commodities risk applies to a bank's total commodities positions, including commodity futures, commodity swaps, and all other commodity derivatives or other off-balance-sheet positions that are affected by changes in commodity prices. A commodity is defined as a physical product that is or can be traded on a secondary market (such as agricultural products, minerals (including oil), and precious metals), but excluding gold (which is treated as foreign exchange).

C. Capital Requirements

1. *Capital Requirements.* The minimum capital requirement for a state member bank subject to the market risk measure is the sum of:

a. The capital requirement for credit risk as determined in accordance with appendix A of this part, *excluding* debt and equity instruments in the trading book and positions in commodities, but *including* the counterparty credit risk requirements on all over-the-counter derivative activities whether in the bank's trading account or not; and

b. The capital requirement for market risk as determined by the internal models approach, the standardized approach, or a

[5] This appendix E does not impose specific risk capital requirements for foreign exchange risk and commodities positions because they do not have the type of issuer-specific risk associated with debt and equity instruments in the trading account.

[6] At a bank's option, when non-trading account instruments are hedged with instruments in the trading account, on- or off-balance-sheet, the non-trading account instruments may be included in the measure for general market risk. Such non-trading account instruments remain subject to the credit risk capital requirements of appendix A of this part.

[7] In general terms, a derivative is a financial contract whose value is derived from the values of one or more underlying assets or reference rates or indexes of asset values (referred to as ''the underlying''). Derivatives include standardized contracts that are traded on exchanges and customized, privately negotiated contracts known as over-the-counter (OTC) derivatives.

combination of the two approaches deemed to be appropriate by the Federal Reserve.

2. *Internal Models.* a. For a bank approved to use the internal models approach, the capital requirement for market risk is the higher of:

i. The bank's previous day's aggregate value-at-risk amount calculated subject to certain supervisory requirements set forth in section III. of this appendix E; or

ii. An average of the daily aggregate value-at-risk amounts, calculated subject to the same restrictions, measured on each of the preceding sixty (60) business days, multiplied by a minimum ''multiplication factor'' of three (3).[8]

b. A bank approved to use the internal models approach may also be subject to a separate capital requirement for specific market risk of traded debt and equity instruments to the extent that the specific market risk associated with these instruments is not captured by the bank's models. However, for all banks using internal models, the total specific risk charge should in no case be less than one-half the specific risk charges calculated according to the standardized approach.

3. *Standardized approach.* A bank whose model has not been approved by the Federal Reserve must use the standardized approach for measuring its market risk. For a bank using this approach, the capital requirement for market risk is the sum of the market risk capital requirement for debt and equity instruments in the trading account, foreign exchange and commodities risk throughout the bank, and options and other derivative positions in each risk category as set forth in sections IV.A. to IV.E. of this appendix E.[9]

4. *Partial models.* a. With approval from the Federal Reserve, a bank whose internal model does not cover all risk factor categories may use the standardized approach to measure market risk exposure arising from the risk factor categories that are not covered. The Federal Reserve will approve combining the two approaches only on a temporary basis in situations where the bank is developing, but has not fully implemented, a comprehensive value-at-risk measurement system. When a bank uses both approaches, each risk factor category (that is, interest rates, exchange rates, equity prices, and commodity prices) must be measured using one or the other approach. The methods may not be combined within a risk factor category. Once a bank adopts an acceptable value-at-risk model for a particular risk factor category, it may not revert to the standardized approach except in unusual circumstances and with prior approval of the Federal Reserve.

b. For a bank using a combination of approaches, the capital requirement for market risk is the sum of (i) the appropriate value-at-risk amount (as determined under section I.C.2.a. of this appendix E), and (ii) the capital requirement for each risk category that is calculated using the standardized approach.

5. *Application.* The capital requirements for market risk apply to state member banks on a worldwide consolidated basis. The Federal Reserve may, however, evaluate market risk on an unconsolidated basis when necessary. For example, when there are obstacles to the repatriation of profits from a foreign subsidiary or where management structure does not allow timely management of risk on a consolidated basis.

6. *Other considerations.* All transactions, including forward sales and purchases, should be included in the calculation of market risk capital requirements from the date on which they were entered into. The Federal Reserve expects a bank to meet its capital requirements for market risk on a continuous basis (that is, at a minimum, at the close of each business day).

II. Qualifying Capital and the Market Risk-Adjusted Capital Ratio

A. Qualifying and Eligible Capital

1. The principal forms of qualifying capital for market risk are Tier 1 capital and Tier 2 capital as defined in section II. of appendix A of this part and subject to the conditions and limitations of appendix A of this part. A bank may use Tier 3 capital for the sole purpose of meeting a portion of the capital requirements for market risk.[10]

2. Tier 3 capital consists of short-term subordinated debt that is subject to a lock-in clause providing that neither interest nor principal payment is due (even at maturity) if such payment would cause the issuing bank to fall or remain below the minimum 8.0 percent risk-based capital requirement as set forth in appendix A and adjusted for market risk.

3. In order to qualify as Tier 3 capital, the short-term debt must be unsecured, subordinated, and fully paid up; it must have an original maturity of at least two years; and it may not be redeemed before maturity without prior approval by the Federal Reserve. In addition, it may not contain or be covered by any covenants, terms, or restrictions that are inconsistent with safe and sound banking practices.

4. Eligible Tier 3 capital may not exceed 250 percent of a bank's Tier 1 capital allocated for market risk and the maximum eligible amount of Tier 2 and Tier 3 capital together is limited to 100 percent of Tier 1 capital. (Examples of how to calculate these limits are set forth in Attachment I to this appendix E.) Tier 2 elements may be substituted for Tier 3 up to the same limit of 250 percent, so long as the overall limits for Tier 2 capital set forth in appendix A of this part are not exceeded, that is, Tier 2 capital may not exceed total Tier 1 capital, and long-term subordinated debt may not exceed 50 percent of Tier 1 capital.

B. Calculation of Eligible Capital and the Capital Ratio

1. In order to calculate eligible capital, a bank must first calculate its minimum capital requirement for credit risk in accordance with appendix A of this part and then its capital requirement for market risk. Eligible capital is the sum of the bank's qualifying Tier 1 capital, its qualifying Tier 2 capital subject to the limits stated above, and its eligible Tier 3 capital subject to the conditions set out under section II. of this appendix E.

2. A bank that is subject to the market risk measure must calculate its risk-based capital ratios as follows:

a. Determine total weighted-risk assets using the procedures and criteria set forth in appendix A of this part, excluding debt and equity instruments in the trading book and positions in commodities, but including all over-the-counter derivative activities whether in the bank's trading account or not.

b. Calculate the measure for market risk using the internal models approach, the standardized approach, or an approved combination of these two approaches.

c. Multiply the measure for market risk by 12.5 (i.e., the reciprocal of the 8.0 percent minimum risk-based capital ratio). The resulting product is referred to as ''market risk-equivalent assets.''

d. Add market risk-equivalent assets to the weighted-risk assets compiled for credit risk purposes (section II.B.2.a. of this appendix E). The sum of these two amounts is the denominator of risk-based capital ratios adjusted for market risk. The numerator of the total risk-based capital ratio is eligible capital and the numerator of the Tier 1 risk-based capital ratio is Tier 1 capital.

III. The Internal Models Approach

A. Use of Models

1. With prior approval of the Federal Reserve, a bank may use its internal risk measurement model(s) for purposes of measuring value-at-risk and determining the associated regulatory capital requirements for market risk exposure.

a. Requests for approval under section III.A.1. of this appendix E should include, at a minimum, a complete description of the bank's internal modeling and risk management systems and how these systems conform to the criteria set forth in this section III., an explanation of the policies and procedures established by the bank to ensure continued compliance with such criteria, a discussion of internal and external validation procedures, and a description of other relevant policies and procedures consistent with sound practices.

b. The Federal Reserve will approve an internal model for regulatory capital

[8] The Federal Reserve may adjust the multiplication factor for a bank to increase its capital requirement based on an assessment of the quality and historic accuracy of the bank's risk management system.

[9] Section IV.E. of this appendix E provides several alternatives for measuring the market risk of options. Under two of the alternatives, the simplified and scenario methods, the underlying position of an option is ''carved-out,'' and is not included in the prescribed risk measure for the underlying. Instead it is evaluated together with the related option according to the procedures described for options to determine the capital requirement. Under the third alternative, the ''delta-plus'' approach, the delta-equivalent value of each position is included in the measurement framework for the appropriate risk category (that is, debt or equity instruments in the trading account, foreign exchange or commodities risk).

[10] A bank may not use Tier 3 capital to satisfy any capital requirements for counterparty credit risk under appendix A of this part, including counterparty credit risk associated with derivative transactions in either trading or non-trading accounts.

purposes only after determining that the bank's internal model and risk management systems meet the criteria in section III. of this appendix E. Such a determination may require on-site examinations of the systems. The Federal Reserve may require modification to an internal model as deemed necessary to ensure compliance, on a continuing basis, with the provisions of this appendix E. A bank's internal model will be subject to continuing review, both on- and off-site, by the Federal Reserve.[11]

2. A bank should ensure that the level of sophistication of its internal model is commensurate with the nature and volume of the bank's trading activity in the risk factor categories covered by this appendix E and measures market risk as accurately as possible. In addition, the model should be adjusted to reflect changing portfolio composition and changing market conditions.

B. Qualitative Criteria

1. A bank using the internal models approach should have market risk management systems that are conceptually sound and implemented with integrity. Internal risk measurement models must be closely integrated into the day-to-day risk management process of the bank. For example, the risk measurement model must be used in conjunction with internal trading and exposure limits.

2. A bank must meet the following minimum qualitative criteria before using its internal model to measure its exposure to market risk.[12]

a. A bank must have a risk control unit that is independent from business trading units and reports directly to senior management of the bank. The unit must be responsible for designing and implementing the bank's risk management system and analyzing daily reports on the output of the bank's risk measurement model in the context of trading limits. The unit must conduct regular back-testing.[13]

b. Senior management must be actively involved in the risk control process. The daily reports produced by the risk management unit must be reviewed by a level of management with sufficient authority to enforce both reductions in positions taken by individual traders, as well as in the bank's overall risk exposure.

c. The bank must have a routine and rigorous program of stress-testing[14] to identify the effect of low-probability events on the bank's trading portfolio. Senior management must routinely review the results of stress-testing in the context of the potential effect of the events on bank capital and the appropriate procedures the bank should take to minimize losses. The policies of the bank set by management and the board of directors should identify appropriate stress-tests and the procedures to follow in response to the test results.

d. The bank must have established procedures for ensuring compliance with a documented set of internal policies and controls, as well as for monitoring the overall operation of the risk measurement system.

e. Not less than once a year, the bank must conduct, as part of its regular internal audit process, an independent review of the risk measurement system. This review must include both the activities of the business trading units and of the independent risk control unit of the bank.

f. Not less than once a year, the bank must conduct a review of its overall risk management process. The review must consider:

i. The adequacy of the documentation of the risk management system and process and the organization of the risk control unit;

ii. The integration of market risk measures into daily risk management and the integrity of the management information system;

iii. The process the bank employs for approving risk pricing models and valuation systems that are used by front- and back-office personnel;

iv. The scope of market risks captured by the risk measurement model and the validation of any significant changes in the risk measurement process;

v. The accuracy and completeness of position data, the accuracy and appropriateness of volatility and correlation assumptions, and the accuracy of valuation and risk sensitivity calculations;

vi. The verification process the bank employs to evaluate the consistency, timeliness, and reliability of data sources used to run internal models, including the independence of such data sources; and

vii. The verification process the bank uses to evaluate back-testing that is conducted to assess the model's accuracy.

C. Market Risk Factors

1. *Overview.* For regulatory capital purposes, a bank's internal risk measurement system(s) must use sufficient risk factors to capture the risks inherent in the bank's portfolio of on- and off-balance-sheet trading positions and must, subject to the following guidelines, cover interest rates, equity prices, exchange rates, commodity prices, and volatilities related to options positions in each risk factor category. The level of sophistication of the bank's risk factors must be commensurate with the nature and scope of the risks taken by the bank.

2. *Interest Rates.* a. A bank must use a set of market risk factors corresponding to interest rates in each currency in which it has material interest rate-sensitive on- or off-balance- sheet positions. The risk measurement system must model the yield curve[15] using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve must 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.

b. For material exposures to interest rate movements in the major currencies and markets, a bank 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.[16] The risk measurement system must incorporate separate risk factors to capture spread risk.[17]

3. *Exchange rates.* A bank must use market risk factors corresponding to the exchange rate between the domestic currency and each foreign currency in which the bank has a significant exposure. The risk measurement system must incorporate market risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated.

4. *Equity prices.* A bank must use market risk factors corresponding to each of the equity markets in which it holds significant positions. The sophistication and nature of the modeling technique for a given market must correspond to the bank's exposure to the overall market as well as to the bank's concentration in individual equity issues in that market. At a minimum, there must be a risk factor designed to capture market-wide movements in equity prices (such as a market index), but additional risk factors could track various sectors or individual issues.

5. *Commodity prices.* A bank must use market risk factors corresponding to each of the commodity markets in which it holds significant positions. The internal model must encompass directional risk, forward gap and interest rate risk, and basis risk.[18] The

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[11] Banks that need to modify their existing modeling procedures to accommodate the requirements of this appendix E should, nonetheless, continue to use the internal models they consider most appropriate in evaluating risks for other purposes.

[12] If the Federal Reserve is not satisfied with the extent to which a bank meets these criteria, the Federal Reserve may adjust the multiplication factor used to calculate market risk capital requirements or otherwise increase capital requirements.

[13] Back-testing includes *ex post* comparisons of the risk measures generated by the model against the actual daily changes in portfolio value.

[14] Bank stress-testing should cover a range of factors that can create extraordinary losses or gains in trading portfolios or make the control of risk in those portfolios difficult. These factors include low-probability events of all types, including the various components of market, credit, and operational risks.

[15] Generally, a yield curve is a graph showing the term structure of interest rates by plotting the yields of all instruments of the same quality by maturities ranging from the shortest to the longest available. The resulting curve shows whether short-term interest rates are higher or lower than long-term interest rates.

[16] For example, a bank that has 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.

[17] Spread risk refers to the potential changes in value of an instrument or portfolio arising from differences in the behavior of baseline yield curves, such as those for U.S. Treasury securities, and yield curves reflecting sector, quality, or instrument specific factors. A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other interest rates, such as specifying a completely separate yield curve for non-government instruments (for example, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.

[18] Directional risk is the risk that a spot price will increase or decrease. Forward gap risk refers to the effects of owning a physical commodity versus owning a forward position in a commodity. Interest

model should also take into account the market characteristics, for example, delivery dates and the scope provided to traders to close out positions.

D. Quantitative Standards

1. A bank may use one of a number of generally accepted measurement techniques including, for example, an internal model based on variance-covariance matrices, historical simulations, or Monte Carlo simulations so long as the model employed captures all the material market risks.[19] The following minimum standards apply for purposes of using an internal model for calculating market risk capital requirements:

a. Value-at-risk must be calculated on a daily basis using a 99th percentile, one-tailed confidence interval[20] and the holding period must be ten trading days. For positions that display linear price characteristics, a bank may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days by the square root of time.[21]

b. Value-at-risk must be calculated using an observation period of at least one year to measure historical changes in rates and prices.

c. A bank must update its historical rates and prices at least once every three months and must reassess them whenever market conditions change materially.

2. A bank may use discretion in recognizing empirical correlations within each market risk factor category.[22] However, empirical correlations among risk categories are not recognized. The value-at-risk measure for each risk category must be added together on a simple sum basis to determine the aggregate value-at-risk amount.

3. A bank's models must accurately capture the unique risks associated with options within each of the market risk factor categories. The following minimum criteria apply to the measurement of options risk:

a. A bank's internal model must capture the non-linear price characteristics of option positions using an options pricing technique. The bank must apply a minimum ten-day holding period to option positions or positions that display option-like characteristics. Banks may not scale-up the daily value-at-risk numbers by the square root of time.

b. A bank's internal model must capture the volatilities of the rates and prices (that is, the vega) underlying option positions and a bank should measure the volatilities of the underlying instruments broken down by different option maturities.

4. The accuracy of a bank's internal model will be reviewed periodically by the Federal Reserve. Such review, during which, when appropriate, the Federal Reserve may take into consideration reports and opinions generated by external auditors or qualified consultants, will include, at a minimum:

a. Verification that the internal validation processes described in section III.B.2. of this Appendix E are operating in a satisfactory manner;

b. Affirmation that the formulae used in the calculation process and for the pricing of options and other complex instruments, are validated by a qualified unit of the bank, which in all cases must be independent from the trading areas;

c. Confirmation that the structure of the internal model is adequate with respect to the bank's activities and geographical coverage;

d. Confirmation that the results of the bank's back-testing of its internal measurement system (that is, comparing value-at-risk estimates with actual profits and losses) are being used effectively to monitor reliability of the model's estimates over time; and

e. Affirmation that, for regulatory capital purposes, the model processes all relevant data and that the modeling procedures conform with the parameters and specifications set forth in this appendix E.

IV. The Standardized Approach

A. Debt Instruments

1. *Specific Risk*. a. The capital requirement for specific risk is based on the identity of the obligor and, in the case of corporate securities, on the credit rating and maturity of the instrument. The specific risk capital requirement is calculated by weighting the current market value of each individual position, whether long or short, by the appropriate category factor as set forth below and summing the weighted values. In measuring specific risk, the bank may offset and exclude from its calculations any matched positions in the *identical* issue (including positions in derivatives). Even if the issuer is the same, no offsetting is permitted between different issues since differences in coupon rates, liquidity, call features, etc., mean that prices may diverge in the short run. The categories and factors are:

Category	Remaining maturity (contractual)	Factor (In percent)
Government	N/A	0.00
Qualifying	6 months or less	0.25
	6 to 12 months	1.00
	Over 12 months	1.60
Other	N/A	8.00

b. The *government* category includes all forms of debt instruments of central governments of the OECD-based group of countries[23] including bonds, Treasury bills and other short-term instruments, as well as local currency instruments of non-OECD central governments to the extent that the bank has liabilities booked in that currency.

c. The *qualifying* category includes securities of U.S. government-sponsored agencies, general obligation securities issued by states and other political subdivisions of the OECD-based group of countries, multilateral development banks, and debt instruments issued by U.S. depository institutions or OECD-banks that do not qualify as capital of the issuing institution.[24] It also includes other securities, including revenue securities issued by states and other political subdivisions of the OECD-based group of countries, that are rated investment-grade by at least two nationally recognized credit rating services, or rated investment-grade by one nationally recognized credit rating agency and not less than investment-grade by any other credit rating agency, or, with the exception of securities issued by U.S. firms and subject to review by the Federal Reserve, unrated but deemed to be of comparable investment quality by the reporting bank *and* the issuer has securities listed on a recognized stock exchange.

d. The *other* category includes debt securities not qualifying as government or qualifying securities. This would include non-OECD central government securities that do not meet the criteria for the government or qualifying categories. This category also includes instruments that qualify as capital issued by other banking organizations.

e. The Federal Reserve will consider the extent of a bank's position in non-investment grade instruments (sometimes referred to as high yield debt). If those holdings are not well-diversified or otherwise represent a material position to the institution, the Federal Reserve may prevent a bank from offsetting positions in these instruments with other positions in qualifying instruments that may be offset when calculating its general market risk requirement. In addition, the Board may impose a specific risk capital requirement as high as 16.0 percent.

2. *General Market Risk*. a. A bank may measure its exposure to general market risk using, on a continuous basis, either the

rate risk is the risk of a change in the cost of carrying forward positions and options. Basis risk is the risk that the relationship between the prices of similar commodities changes over time.

[19] In a variance/covariance approach, the change in value of the portfolio is calculated by combining the risk factor sensitivities of the individual positions—derived from valuation models—with a variance/covariance matrix based on risk factor volatilities and correlations. A bank using this approach would calculate the volatilities and correlations of the risk factors on the basis of the holding period and the observation period. A bank using a historical simulation would calculate the hypothetical change in value of the current portfolio in the light of historical movements in risk factors. This calculation would be done for each of the defined holding periods over a given historical measurement horizon to arrive at a range of simulated profits and losses. A bank using a Monte Carlo technique would consider historical movements to determine the probability of particular price and rate changes.

[20] A one-tailed confidence interval of 99 percent means that there is a 1 percent probability based on historical experience that the combination of positions in a bank's portfolio would result in a loss higher than the measured value-at-risk.

[21] This transformation entails multiplying a bank's value-at-risk by the square root of the ratio of the required holding period (ten days) to the holding period embodied in the value-at-risk figure. For example, the value-at-risk calculated according to a one-day holding period would be scaled-up by the ''square root of time'' by multiplying the value-at-risk by 3.16 (the square root of the ratio of a ten-day holding period to a one-day holding period).

[22] While a bank has flexibility to use correlations, the Federal Reserve must be satisfied that there is integrity in the bank's process for calculating correlations.

[23] The OECD-based group of countries is defined in section III.B.1. of appendix A of this part.

[24] U.S. government-sponsored agencies, multilateral development banks, and OECD banks are defined in section III.C.2. of appendix A of this part.

maturity method (which uses standardized risk weights that approximate the price sensitivity of various instruments) or the duration method (where the institution calculates the precise duration of each instrument, weighted by a specified change in interest rates).

b. Both methods use a maturity-ladder that incorporates a series of ''time-bands'' and ''zones'' to group together securities of similar maturities and that are designed to take into account differences in price sensitivities and interest rate volatilities across different maturities. Under either method, the capital requirement for general market risk is the sum of a base charge that results from fully netting various risk-weighted positions and a series of additional charges (add-ons), which effectively ''disallow'' part of the previous full netting to address basis and yield curve risk.

c. For each currency in which a bank has significant positions, a separate capital requirement must be calculated. No netting of positions is permitted across different currencies. Offsetting positions of the same amount in the same issues, whether actual or notional, may be excluded from the calculation, as well as closely matched swaps, forwards, futures, and forward rate agreements (FRAs) that meet the conditions set out in section IV.A.3. of this Appendix E.

d. In the *maturity method,* the bank distributes each long or short position (at current market value) of a debt instrument into the time-bands of the maturity ladder. Fixed-rate instruments are allocated according to the remaining term to maturity and floating-rate instruments according to the next repricing date. A callable bond trading above par is slotted according to its first call date, while a callable bond priced below par is slotted according to remaining maturity. Fixed-rate mortgage-backed securities, including collateralized mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs), are slotted according to their expected weighted average lives.

e. Once all long and short positions are slotted into the appropriate time-band, the long positions in each time-band are summed and the short positions in each time-band are summed. The summed long and/or short positions are multiplied by the appropriate risk-weight factor (reflecting the price sensitivity of the positions to changes in interest rates) to determine the risk-weighted long and/or short position for each time-band. The risk weights for each time-band are set out in Table I below:

TABLE I.—MATURITY METHOD: TIME-BANDS AND WEIGHTS

Zone	Coupon 3% or more	Coupon less than 3% and zero coupon bonds	Risk weights [percent]
1	up to 1 month	up to 1 month	0.00
	1 up to 3 months	1 up to 3 months	0.20
	3 up to 6 months	3 up to 6 months	0.40
	6 up to 12 months	6 up to 12 months	0.70
2	1 up to 2 years	1 up to 1.9 years	1.25
	2 up to 3 years	1.9 up to 2.8 yrs	1.75
	3 up to 4 years	2.8 up to 3.6 yrs	2.25
3	4 up to 5 years	3.6 up to 4.3 yrs	2.75
	5 up to 7 years	4.3 up to 5.7 yrs	3.25
	7 up to 10 years	5.7 up to 7.3 yrs	3.75
	10 up to 15 years	7.3 up to 9.3 yrs	4.50
	15 up to 20 years	9.3 up to 10.6 yrs	5.25
	Over 20 years	10.6 up to 12 yrs	6.00
		12 up to 20 yrs	8.00
		Over 20 years	12.50

f. Within each time-band for which there are risk-weighted long and short positions, the risk-weighted long and short positions are then netted, resulting in a single net risk-weighted long or short position for each time-band. Since different instruments and different maturities may be included and netted within each time-band, a capital requirement, referred to as the vertical disallowance, is assessed to allow for basis risk. The vertical disallowance capital requirement is 10.0 percent of the position eliminated by the intra-time-band netting, that is, 10.0 percent of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, 10.0 percent of either position.[25] The vertical disallowances for each time-band are absolute values, that is, neither long nor short. The vertical disallowances for all time-bands in the maturity ladder are summed and included as an element of the general market risk capital requirement.

g. Within each zone for which there are risk-weighted long and short positions in different time-bands, the weighted long and short positions in all of the time-bands within the zone are then netted, resulting in a single net long or short position for each zone. Since different instruments and different maturities may be included and netted within each zone, a capital requirement, referred to as the horizontal disallowance, is assessed to allow for the imperfect correlation of interest rates along the yield curve. The horizontal disallowance capital requirement is calculated as a percentage of the position eliminated by the intra-zone netting, that is, a percentage of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, a percentage of either position.[26] The percent disallowance factors for intra-zone netting are set out in Table II in section IV.A.2.h. of this Appendix E. The horizontal disallowances, like the vertical disallowances, are absolute values that are summed and included as an element of the general market risk capital requirement.

h. Risk-weighted long and short positions in different zones are then netted between the zones. Zone 1 and zone 2 are netted if possible, reducing or eliminating the net long or short position in zone 1 or zone 2 as appropriate. Zone 2 and zone 3 are then netted if possible, reducing or eliminating the net long or short position in zone 2 or zone 3 as appropriate. Zone 3 and zone 1 are then netted if possible, reducing or eliminating the long or short position in zone 3 and zone 1 as appropriate. A horizontal disallowance capital requirement is then assessed, calculated as a percentage of the position eliminated by the inter-zone netting. The horizontal disallowance capital requirements for each zone are then summed as absolute values and included in the general market risk capital charge. The percent disallowance factors for inter-zone netting are set out in Table II below:

[25] For example, if the sum of the weighted longs in a time-band is $100 million and the sum of the weighted shorts is $90 million, the vertical disallowance for the time-band is 10.0 percent of $90 million, or $9 million.

[26] For example, if the sum of the weighted longs in the 1–3 month time-band in Zone 1 is $8 million and the sum of the weighted shorts in the 3–6 month time-band is $10 million, the horizontal disallowance for the zone if forty percent of $8 million, or $3.2 million.

TABLE II.—HORIZONTAL DISALLOWANCES

Zone	Time-band	Within the zone (percent)	Between adjacent zones (percent)	Between zones 1–3 (percent)
1	0–1 month	40	40	100
	1–3 months			
	3–6 months			
	6–12 months			
2	1–2 years	30	40	100
	2–3 years			
	3–4 years			
3	1–5 years	30	40	100
	5–7 years			
	7–10 years			
	0–15 years			
	5–20 years			
	over 20 years			

i. Finally, the net risk-weighted long or net risk-weighted short positions remaining in the zones are summed to reach a single net risk-weighted long or net risk-weighted short position for the bank's portfolio. The sum of the absolute value of this position and the vertical and horizontal disallowances is the capital requirement for general market risk. An example of the calculation of general market risk under the maturity method is in Attachment II to this appendix E.

j. In the *duration method,* the bank, after calculating each instrument's modified duration [27] using a formula that is subject to supervisory review, multiplies that modified duration by the interest rate shock specified for an instrument of that duration in Table III in section IV.A.2.k. of this appendix E. The resulting product (representing the expected percentage change in the price of the instrument for the given interest rate shock) is then multiplied by the current market value of the instrument. The resulting amount is then slotted as a long or short position into a time-band in the maturity ladder in Table III on the basis of the instrument's modified duration.[28]

k. Once all of the bank's traded debt instruments have been slotted into the maturity ladder, the bank conducts the same rounds of netting and disallowances described in sections IV.A.2.f. through IV.A.2.h. of this appendix E for the maturity method, with the exception that the vertical disallowance requirement for the duration method is 5.0 percent (horizontal disallowances continue to be those set out in Table II).[29] As with the maturity method, the sum of the absolute value of the final net position and the vertical and horizontal disallowances is the general market risk capital requirement:

TABLE III.—DURATION METHOD: TIME-BANDS AND ASSUMED CHANGES IN YIELD

Zone	Time-band	Assumed change in yield
1	Up to 1 month	1.00
	1 up to 3 months	1.00
	3 up to 6 months	1.00
	6 up to 12 months	1.00
2	1.0 up to 1.8 years	0.90
	1.8 up to 2.6 years	0.80
	2.6 up to 3.3 years	0.75
3	3.3 up to 4.0 years	0.75
	4.0 up to 5.2 years	0.70
	5.2 up to 6.8 years	0.65
	6.8 up to 8.6 years	0.60
	8.6 up to 9.9 years	0.60
	9.9 up to 11.3 years ..	0.60
	11.3 up to 16.6 years	0.60
	Over 16.6 years	0.60

3. *Interest rate derivatives.* a. Debt derivatives and other off-balance-sheet positions that are affected by changes in interest rates are included in the measurement system under section IV.A. of this Appendix E (except for options and the associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this Appendix E). A summary of the treatment for debt derivatives is set out in Attachment III to this Appendix E.

b. Derivatives are converted into positions in the relevant underlying instrument and are included in the calculation of specific and general market risk capital charges as described above. The amount to be included is the market value of the principal amount of the underlying or of the notional underlying. For instruments where the apparent notional amount differs from the effective notional amount, a bank must use the effective notional amount.

c. Futures and forward contracts (including FRAs) are broken down into a combination of a long position and short position in the notional security. The maturity of a future or a FRA is the period until delivery or exercise of the contract, plus the life of the underlying instrument.[30] Where a range of instruments may be delivered to fulfill the contract, the bank may chose which deliverable instrument goes into the maturity or duration ladder as the notional underlying. In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

d. Swaps are treated as two notional positions in the relevant instruments with appropriate maturities. The receiving side is treated as the long position and the paying side is treated as the short position.[31] The separate sides of cross-currency swaps or forward foreign exchange transactions are slotted in the relevant maturity ladders for the currencies concerned. For swaps that pay or receive a fixed or floating interest rate against some other reference price, for example, an equity index, the interest rate component is slotted into the appropriate repricing maturity category, with the long or short position attributable to the equity component being included in the equity framework set out in section IV.B. of this Appendix E.[32]

[27] The duration of an instrument is its approximate percentage change in price for a 100 basis point parallel shift in the yield curve assuming that its cash flow does not change the yield curve shifts. Modified duration is duration divided by a factor of 1 plus the interest rate.

[28] For example, an instrument held by a bank with a maturity of 4 years and 3 months and a current market value of $1,000 might have a modified duration of 3.5 years. Based on its modified duration, it would be subjected to the 75-basis point interest rate shock, resulting in an expected price change of 2.625 percent (3.5 × 0.75). The corresponding expected change in price of $26.25, calculated as 2.625 percent of $1,000, would be slotted as a long position in the 3.3 to 4.0 year time-band of the maturity ladder.

[29] Two different vertical disallowances are used since the duration method takes into account an instrument's specific characteristics (maturity and coupon) and there is less opportunity for measurement error.

[30] For example, a long position in a June three-month interest rate future (taken in April) is reported as a long position in a government security with a maturity of five months an a short position in a government security with a maturity to two months.

[31] For example, an interest rate swap under which a bank is receiving floating-rate interest and paying fixed is treated as a long position in a floating rate instrument with a maturity equivalent to the period until the next interest reset date and a short position in a fixed-rate instrument with a maturity equivalent to the remaining life of the swap.

[32] A bank with a large swap book may, with prior approval of the Federal Reserve, use alternative

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e. A bank may offset long and short positions (both actual and notional) in identical derivative instruments with exactly the same issuer, coupon, currency, and maturity before slotting these positions into time-bands. A matched position in a future and its corresponding underlying may also be fully offset and, thus, excluded from the calculation, except when the future comprises a range of deliverable instruments. However, in cases where, among the range of deliverable instruments, there is a readily identifiable underlying instrument that is most profitable for the trader with a short position to deliver, positions in the futures contract and the instrument may be offset. No offsetting is allowed between positions in different currencies.

f. Offsetting positions in the same category of instruments can in certain circumstances be regarded as matched and treated by the bank as a single net position which should be entered into the appropriate time-band. To qualify for this treatment the positions must be based on the same underlying instrument, be of the same nominal value, and be denominated in the same currency. The separate sides of different swaps may also be ''matched'' subject to the same conditions. In addition:

i. For futures, offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical instruments and the instruments must mature within seven days of each other;

ii. For swaps and FRAs, the reference rate (for floating rate positions) must be identical and the coupon closely matched (i.e., within 15 basis points); and

iii. For swaps, FRAs and forwards, the next interest reset date, or for fixed coupon positions or forwards the remaining maturity, must correspond within the following limits: If the reset (remaining maturity) dates occur within one month, then the reset dates must be on the same day; if the reset dates occur between one month and one year later, then the reset dates must occur within seven days of each other, or if the reset dates occur over one year later, then the reset dates must occur within thirty days of each other.

g. Interest rate and currency swaps, FRAs, forward foreign exchange contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on a short-term (e.g., LIBOR) interest rate index. However, in the case of futures contracts where the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge will apply according to the category of the issuer as set out in section IV.A.1. of this Appendix E.

B. Equities

1. *Specific risk*. The measure of specific risk is calculated on the basis of the bank's gross equity positions, that is, the absolute sum of all long equity positions and of all short equity positions at current market value.[33] The specific risk capital requirement is 8.0 percent of that sum, unless the portfolio is both liquid and well-diversified, in which case the specific risk capital requirement is 4.0 percent of the gross equity position. A specific risk charge of 2.0 percent applies to the net long or short position in a broad, diversified equity index and is viewed as necessary to provide for risks associated with contract execution.[34]

2. *General Market risk*. The measure of general market risk is based on the difference between the sum of the long positions and the sum of the short positions (i.e., the overall net position in an equity market) at current market value. An overall net position must be separately calculated for each national market in which the bank holds equities. The capital requirement for general market risk is 8.0 percent of the net position in each equity market.

3. *Equity derivatives*. a. Equity derivatives and other off-balance-sheet positions that are affected by changes in equity prices are included in the measurement system under section IV.B. of this Appendix E (except for equity options, equity index options, and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this Appendix E).[35] This includes futures and swaps on both individual equities and on equity indices. Equity derivatives should be converted into notional equity positions in the relevant underlying. A summary of the rules for equity derivatives is set out in Attachment III to this Appendix E.

b. Futures and forward contracts relating to individual equities should be reported at current market prices of the underlying. Futures relating to equity indices should be reported as the marked-to-market value of the notional underlying equity portfolio. Equity swaps are treated as two notional positions, with the receiving side as the long position and the paying side as the short position.[36] If one of the legs involves receiving/paying a fixed or floating interest rate, the exposure should be slotted into the appropriate repricing maturity band for debt securities. The stock index is covered by the equity treatment.

c. In the case of futures-related arbitrage strategies, the 2.0 percent specific risk charge applicable to broad diversified equity indices may be applied to only one index. The opposite position is exempt from a specific risk charge. The strategies qualifying for this treatment are:

i. When the bank takes an opposite position in exactly the same index at different dates; and

ii. When the bank has an opposite position in different but similar indices at the same date, subject to supervisory oversight.

d. If a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broad diversified equity index matches a basket of securities, it may exclude both positions from the standardized approach on condition that the trade has been deliberately entered into and separately controlled and the composition of the basket of stocks represents at least 90 percent of the market value of the index. In such a case, the minimum capital requirement is 4.0 percent (that is, 2.0 percent of the gross value of the positions on each side) to reflect risk associated with executing the transaction. This applies even if all of the securities comprising the index are held in identical proportions. Any excess value of the securities comprising the basket over the value of the futures contract or excess value of the futures contract over the value of the basket is treated as an open long or short position.

e. If a bank takes a position in depository receipts[37] against an opposite position in the underlying equity, it may offset the position.

C. Foreign Exchange Risk

1. The capital requirement for foreign exchange risk covers the risk of holding or taking positions in foreign currencies, including gold, and is based on a bank's net open long positions or net open short positions in each currency, whether or not those positions are in the trading portfolio, plus the net open position in gold, regardless of sign.[38]

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formulae to calculate the positions to be included in the maturity or duration ladder. For example, a bank could first convert the payments required by the swap into present values. For that purpose, each payment would be discounted using zero coupon yields, and the payment's present value entered into the apprioriate time-band using procedures that apply to zero (or low) coupon bonds. The net amounts would then be treated as bonds, and slotted into the general market risk framework. Such alternative treatments will, however, only be allowed if: (i) the Federal Reserve is fully satisified with the accuracy of the system being used, (ii) the positions calculated fully reflect the sensitivity of the cash flows to interest rate changes; and (iii) the positions are denominated in the same currency.

[33] Matched positions in each additional equity in each national market may be treated as offsetting and excluded from the capital calculation, with any remaining position included in the calculations for specific and general market risk. For example, a future in a given equity may be offset against an opposite cash position in the same equity.

[34] A portfolio that is liquid and well-diversified is characterized by a limited sensitivity to price changes of any single equity issue or closely related group of equity issues held in the portfolio. The volatility of the portfolio's value should not be dominated by the volatility of any individual equity issue or by equity issues from any single industry or economic sector. In general, such portfolios should be characterized by a large number of individual equity positions, with no single position representing a large portion of the portfolio's total market value. In addition, it would generally be the case that a sizeable proportion of the portfolio would be comprised of issues traded on organized exchanges or in well-established over-the-counter markets.

[35] Where equities are part of a forward contract (both equities to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be appropriately included in the measurement systems in sections IV.A. and IV.C. of this Appendix E.

[36] For example, an equity swap in which a bank is receiving an amount based on the change in value of one particular equity or equity index and paying a different index will be trated as a long position in the former and a short position in the latter.

[37] Depository receipts are instruments issued by a trust company or other depository institution evidencing the deposit of foreign securities and facilitating trading in such instruments on U.S. stock exchanges.

[38] Gold is treated as a foreign exchange position rather than a commodity because its volatility is more in line with foreign currencies and banks manage it in a manner similar to foreign currencies.

2. A bank's net open position in each currency (and gold) is calculated by summing:

a. The net spot position (i.e., all asset items less all liability items, including accrued interest earned but not yet received and accrued expenses, denominated in the currency in question);

b. All foreign exchange derivative instruments and other off-balance-sheet positions that are affected by changes in exchange rates are included in the measurement system under section IV.C. of this Appendix E (except for options and their associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this Appendix E). Forward currency positions should be valued at current spot market exchange rates. For a bank in which the basis of its normal management accounting is to use net present values, forward positions may be discounted to net present values as an acceptable way of measuring currency positions for regulatory capital purposes;

c. Guarantees (and similar instruments) that are certain to be called and are likely to be irrevocable;

d. Net future income/expenses not yet accrued but already fully hedged (at the discretion of the bank). A bank that includes future income and expenses must do so on a consistent basis without selecting expected future flows in order to reduce the bank's position; and

e. Any other item representing a profit or loss in foreign currencies.

3. For measuring a bank's open positions, positions in composite currencies, such as the ECU, may be either treated as a currency in their own right or split into their component parts on a consistent basis. Positions in gold are measured in the same manner as described in section IV.D. of this Appendix E.[39]

4. The capital requirement is determined by converting the nominal amount (or net present value) of the net open position in each foreign currency (and gold) at spot rates into the reporting currency. The capital requirement is 8.0 percent of the sum of:

a. The greater of the sum of the net short open positions or the sum of the net long open positions (absolute values); and

b. The net open position in gold, regardless of sign.[40]

5. Where a bank is assessing its foreign exchange risk on a consolidated basis, it may be technically impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the bank. In such cases, the internal limit in each currency may be used as a proxy for the positions, provided there is adequate ex post monitoring of actual positions complying with such limits. In these circumstances, the limits should be added, regardless of sign, to the net open position in each currency.

D. Commodities Risk

1. *Measurement methods.* This section provides a minimum capital requirement to cover the risk of holding or taking positions in commodities. There are two methods under the standardized approach for measuring commodity market risk—the simplified method and the maturity method. These methods are only appropriate for banks that conduct a limited amount of commodities business. All other banks must adopt an internal measurement system conforming to the criteria in section III. of this Appendix E.

2. *Base capital requirement.* Under both the simplified and maturity methods, each long and short commodity position (spot and forward) is expressed in terms of the standard unit of measurement (such as barrels, kilos, or grams). The open positions in each category of commodities are then converted at current spot rates into U.S. currency, with long and short positions offset to arrive at the net open position in each commodity. Positions in different categories of commodities may not, generally, be offset.[41] Under either method, the base capital requirement is 15.0 percent of the net open position, long or short, in each commodity.[42]

3. *Simplified method.* To protect a bank against basis risk, interest rate risk, and forward gap risk, each category of commodity is also subject to a 3.0 percent capital requirement on the bank's gross positions, long plus short, in the particular commodity. In valuing gross positions in commodity derivatives for this purpose, a bank should use the current spot price. The total capital requirement for commodities risk is the sum of the 15.0 percent base charges for each net commodity position and the 3.0 percent requirements on the gross commodity positions.

4. *Maturity method.* a. Under this method, a bank must slot each long and short commodity position (converted into U.S. currency at current spot rates) into a maturity ladder. The time-bands for the maturity ladder are; from zero to one month, one up to three months, three up to six months, six up to twelve months, one up to two years, two up to three years, and over three years. A separate maturity ladder is used for each category of commodity. Physical commodities are allocated to the first time-band.

b. In order to capture forward gap and interest rate risk within a time-band (together sometimes referred to as curvature/spread risk), offsetting long and short positions in each time-band are subject to an additional capital requirement. Beginning with the shortest-term time-band and continuing with subsequent time-bands, the amount of the matched short position plus the amount of the matched long position is multiplied by a spread rate of 1.5 percent.

c. The unmatched net position from shorter-term time-bands must be carried forward to offset exposures in longer-term time-bands. A capital requirement of 0.6 percent of the net position carried forward is added for each time-band that the net position is carried forward.[43] The total capital requirement for commodities risk is the sum of the 15.0 percent base capital requirement for each net commodity position and the additional requirements for matched positions and for unmatched positions carried forward. An example of this calculation is in Attachment IV to this Appendix E.

5. *Commodity derivatives.* Commodity derivatives and other off-balance-sheet positions that are affected by changes in commodity prices are included in the measurement system under section IV.D. of this Appendix E (except for options and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this Appendix E). Commodity derivatives are converted into notional commodity positions. Under the maturity method, the positions are slotted into maturity time-bands as follows:

a. Futures and forward contracts relating to individual commodities are incorporated in the measurement system as notional amounts (of, for example, barrels or kilos) that are converted to U.S. dollars at current spot rates and are assigned a maturity according to expiration date;

b. Commodity swaps where one side of the contract is a fixed price and the other side is the current market price are incorporated as a series of positions equal to the notional amount of the contract at current spot rates, with one position corresponding to each payment on the swap and slotted in the maturity ladder accordingly. The positions are long positions if the bank is paying a fixed price and receiving a floating price, and short positions if the bank is receiving a fixed price and paying a floating price;[44] and

c. Commodity swaps where the sides of the transaction are in different commodities are included in the relevant reporting ladder. No offsetting is allowed unless the commodities are in the same sub-category.

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[39] Where gold is part of a forward contract (quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be included in measurement system in section IV.A. (as a zero coupon instrument) and IV.C. of this Appendix E.

[40] For example, a bank has the following net currency positions: Yen=+50, DM=+100, GB=+150, FFR=−20, US$=−180, and gold=−35. The bank would sum its long positions (total=+300) and sum its short positions (total=−200). The bank's capital requirement for foreign exchange market risk would be: (300 (the larger of the summed long and short positions) +35 (gold)) ×8.0%=$26.80.

[41] However, offsetting is permitted between different sub-categories of the same commodity in cases where the sub-categories are deliverable against each other.

[42] When the funding of a commodity position opens a bank to interest rate or foreign exchange exposure the relevant positions should be included in the measures of interest rate and foreign exchange risk described in sections IV.A. and IV.C. of this Appendix E. When a commodity is part of a forward contract, any interest or foreign currency exposure from the other side of the contract should be appropriately included in the measurement systems in sections IV.A. and IV.C. of this Appendix E.

[43] For example, if $200 short is carried forward from the 3–6 month time-band to the 1–2 year time-band, the capital charge would be $200×.006×2=$2.40.

[44] If one of the sides of the transaction involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing maturity band in section IV.A. of this Appendix E.

E. Options

1. Three alternatives are available for a bank to use in measuring its market risk for options activities. A bank that only has purchased options may use the simplified method set forth in section IV.E.2. of this Appendix E. A bank that also writes options may use the scenario method described in section IV.E.3. of this Appendix E or the delta-plus method set forth in section IV.E.4. of this Appendix E.[45] These methods may only be used by banks which, in relative terms, have limited options activities. Banks with more significant options business are expected to adopt an internal measurement system conforming to the criteria in section III. of this Appendix E. Regardless of the method used, specific risk related to the issuer of an instrument still applies to options positions for equities, equity indices and corporate debt securities as set forth in sections IV.A. and IV.B. of this Appendix E. There remains a separate capital requirement for counterparty credit risk as set forth in appendix A to this part.

2. Under the simplified and scenario methods, the positions for the options and the associated underlying, cash or forward, are not included in the measurement framework for debt securities, equities, foreign exchange or commodities risk as set forth in sections IV.A. through IV.D. of this Appendix E. Rather, they are subject to capital requirements as calculated in this section IV.E. The capital requirements calculated under this section IV.E. should then be added to the capital requirements for debt securities, equities, foreign exchange, and commodities risk as appropriate. Under the delta-plus method, the delta equivalent position [46] for each option is included in the measurement frameworks set forth in sections IV.A. through IV.D. of this Appendix E.

3. A bank that has only a limited amount and range of purchased options may use the following simplified approach to measure its market risk exposure.

a. For a bank with a long cash position and a long put or with a short cash position and a long call, the capital requirement is the market value of the underlying instrument multiplied by the sum of the specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this Appendix E [47]), less the amount the option is in the money (if any) bounded at zero.[48]

b. For a bank with a long call or a long put, the capital charge is the lesser of:

i. The market value of the underlying security multiplied by the sum of specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this Appendix E [49]); or

ii. The market value of the option.

c. Under this measure, the capital requirement for currency options is 8.0 percent of the market value of the underlying and for commodity options is 15.0 percent of the market value of the underlying.

4. Under the scenario approach, a bank revalues its options and related hedging positions by changing the underlying rate or price over a specified range and by assuming different levels of volatility for that rate or price.

a. For each of its option portfolios, a bank constructs a grid based on a fixed range of changes in the portfolio's risk factors and calculates changes in the value of the option portfolio at each point within the grid. For this purpose, an option portfolio consists of an option and any related hedging positions or multiple options and related hedging positions that are grouped together according to their remaining maturity or the type of underlying.

b. Options based on interest rates and debt instruments are grouped into portfolios according to the maturity zones that are set forth in section IV.A. of this Appendix E. (Zone 1 instruments have a remaining maturity of up to 1 year, zone 2 instruments have a remaining maturity from 1 year up to 4 years, and zone 3 instruments have a remaining maturity of 4 years or more.) These options and the associated hedging positions should be evaluated under the assumption that the relevant interest rates move simultaneously. For options based on equities, separate grids are constructed for each individual equity issue and index. For options based on exchange rates, separate grids are constructed for individual exchange rates. For options based on commodities, separate grids are constructed for each category of commodity (as defined in sections I.B.3. and IV.D. of this Appendix E).

c. For option portfolios with options based on equities, exchange rates, and commodities, the first dimension of the grid consists of rate or price changes within a specified range above and below the current market value of the underlying; for equities, the range is ±12.0 percent (or in the case of an index ±8.0 percent), for exchange rates the range is ±8.0 percent, and for commodities the range is ±15.0 percent. For option portfolios with options based on interest rates, the range for the first dimension of the grid depends on the remaining maturity zone. The range for zone 1 is ±100 basis points, the range for zone 2 is ±90 basis points, and the range for zone 3 is ±75 basis points. For all option portfolios, the range is divided into at least ten equally spaced intervals. The second dimension of each grid is a shift in the volatility of the underlying rate or price equal to ±25.0 percent of the current volatility.[50]

d. For each assumed volatility and rate or price change (a scenario), the bank revalues each option portfolio. The market risk capital requirement for the portfolio is the largest loss in value from among the scenario revaluations. The total market risk capital requirement for all option portfolios is the sum of the individual option portfolio capital requirements.

e. The Federal Reserve will review the application of the scenario approach, particularly regarding the precise way the analysis is constructed. A bank using the scenario approach should meet the appropriate qualitative criteria set forth in section III.B. of this Appendix E.

5. Under the delta-plus method, a bank that writes options may include delta-weighted options positions within each measurement framework as set forth in sections IV.A. through IV.D. of this Appendix E.

a. Options positions should be measured as a position equal to the market value of the underlying instrument multiplied by the delta. In addition, a bank must measure the sensitivities of the option's gamma (the change of the delta for a given change in the price of the underlying) and vega (the sensitivity of the option price with respect to a change in volatility) to calculate the total capital requirement. These sensitivities may be calculated according to an exchange model approved by the Federal Reserve or to the bank's own options pricing model, subject to review by the Federal Reserve.

b. For options with debt instruments or interest rates as the underlying instrument, delta-weighted options positions should be slotted into the debt instrument time-bands in section IV.A. of this Appendix E using a two-legged approach (as is used for other derivatives), requiring one entry at the time the underlying contract takes effect and one at the time the underlying contract matures.[51] Floating rate instruments with

[45] Unless all their written option positions are hedged by perfectly matched long positions in exactly the same options, in which case there is no capital requirement for market risk.

[46] The delta equivalent of an option is the option's delta value multiplied by its principal or notional value. The delta value of an option represents the expected change in the option's price as a proportion of a small change in the price of the underlying instrument. For example, an option whose price changes $1 for every $2 dollar change in the price of the underlying instrument has a delta of 0.50.

[47] Some options (e.g., where the underlying is an interest rate, a currency, or a commodity) bear no specific risk but specific risk will be present in the case of options on corporate debt securities and for options on equities and equity indices.

[48] For example, if a holder of 100 shares currently valued at $10 each has an equivalent put option with a strike price of $11, the capital charge would be: $1,000×16.0 percent (e.g., 8.0 percent specific plus 8.0 percent general market risk)=$160, less the amount the option is in the money ($11−$10)×100=$100, i.e., the capital charge would be $60. A similar methodology applies for options whose underlying is a foreign currency, a debt security or a commodity.

[49] See footnote 47 in section IV.E.3.a. of this appendix E.

[50] For example, if the underlying of an equity instrument has a current market value of $100 and a volatility of 20 percent, the first dimension of the grid would range from $88 to $112, divided into ten intervals of $2.40 and the second dimension would assume volatilities of 15 percent, 20 percent, and 25 percent.

[51] For example, in April, a purchased call option on a June three-month interest-rate future would be considered on the basis of its delta-equivalent value to be a long position with a maturity of five months and a short position with a maturity of two months. The written option would be slotted as a long

caps or floors should be treated as a combination of floating rate securities and a series of European-style options.[52] A bank must also calculate the gamma and vega for each such option position (including hedge positions). The results should be slotted into separate maturity ladders by currency. For options such as caps and floors whose underlying instrument is an interest rate, the delta and gamma should be expressed in terms of a hypothetical underlying security. Subsequently:

i. For gamma risk, for each time-band, net gammas that are negative are multiplied by the risk weights set out in Table IV in section IV.E.5.b.iv. of this Appendix E and by the square of the market value of the underlying instrument (net positive gammas may be disregarded);

ii. For volatility risk, a bank calculates the capital requirements for vega in each time-band assuming a proportional shift in volatility of ±25.0 percent;

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk for each time-band; and

iv. The delta plus method risk weights are:

TABLE IV.—DELTA PLUS METHOD RISK WEIGHTS

Time-band	Modified duration (average assumed for time band)	Assumed interest rate change (%)	Risk-weight for gamma[1]
Under 1 month	0.00	1.00	0.00000
1 up to 3 months	0.20	1.00	0.00020
3 up to 6 months	0.40	1.00	0.00080
6 up to 12 months	0.70	1.00	0.00245
1 up to 2 years	1.40	0.90	0.00794
2 up to 3 years	2.20	0.80	0.01549
3 up to 4 years	3.00	0.75	0.02531
4 up to 5 years	3.65	0.75	0.03747
5 up to 7 years	4.65	0.70	0.05298
7 up to 10 years	5.80	0.65	0.07106
10 up to 15 years	7.50	0.60	0.10125
15 up to 20 years	8.75	0.60	0.13781
Over 20 years	10.00	0.60	0.18000

[1] According to the Taylor expansion, the risk weights are calculated as ½ (modified duration x assumed interest rate change)[2]/100.

c. For options with equities as the underlying, delta-weighted option positions should be incorporated in the measure of market risk set forth in section IV.B. of this Appendix E. Individual equity issues and indices should be treated as separate underlyings. In addition to the capital requirement for delta risk, a bank must apply a further capital charge for gamma and vega risk:

i. For gamma risk, the net gammas that are negative for each underlying are multiplied by 0.72 percent (in the case of an individual equity) or 0.32 percent (in the case of an index as the underlying) and by the square of the market value of the underlying;

ii. For volatility risk, a bank calculates the capital requirement for vega for each underlying, assuming a proportional shift in volatility of ±25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the individual capital requirements for vega risk.

d. For options of foreign exchange and gold positions, the net delta (or delta-based) equivalent of the total book of foreign currency and gold options is incorporated into the measurement of the exposure in a single currency position as set forth in section IV.C. of this Appendix E. The gamma and vega risks are measured as follows:

i. For gamma risk, for each underlying exchange rate, net gammas that are negative are multiplied by 0.32 percent and by the square of the market value of the positions;

ii. For volatility risk, a bank calculates the capital requirements for vega for each currency pair and gold assuming a proportional shift in volatility of ±25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

e. For options on commodities, the delta-weighted positions are incorporated in one of the measures described in section IV.D. of this Appendix E. In addition, a bank must apply a capital requirement for gamma and vega risk:

i. For gamma risk, net gammas that are negative for each underlying are multiplied by 1.125 percent and by the square of the market value of the commodity;

ii. For volatility risk, a bank calculates the capital requirements for vega for each commodity assuming a proportional shift in volatility of ±25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

f. Under certain conditions and to a limited extent, the Federal Reserve may permit banks that are significant traders in options with debt securities or interest rates as the underlying to net positive and negative gammas and vegas across time-bands. Such netting must be based on prudent and conservative assumptions and the bank must materially meet the qualitative standards set forth in section III.B. of this Appendix E.

g. A bank may base the calculation of vega risk on a volatility ladder in which the implied change in volatility varies with the maturity of the option. The assumed proportional shift in volatility must be at least ±25.0 percent at the short end of the maturity spectrum. The proportional shift for longer maturities must be at least as stringent in statistical terms as the 25.0 percent shift at the short end.

h. A bank should also monitor the risks of rho (the rate of change of the value of the option with respect to the interest rate) and theta (the rate of change of the value of the option with respect to time).

Attachments to Appendix E

Attachment I—Sample Calculation of Eligible Tier 1, Tier 2, and Tier 3 Capital for the Risk-Based Capital Ratio Adjusted for Market Risk

a. In each example the weighted-risk assets are $8000 and the market risk-adjusted assets are $625 (capital requirement for market risk=$50 $50×12.5=$625):

Example 1: A bank has the following qualifying capital:

Tier 1=$600 Tier 2=$100 Tier 3=$1000

position with a maturity of two months and short position with a maturity of five months.

[52] For example, the holder of a three-year floating rate bond indexed to six-month LIBOR with a cap of 15 percent would treat the bond as a debt security that reprices in six months, and a series of five written call options a FRA with a strike rate of 15 percent, each slotted as a short position at the expiration date of the option and as a long position at the time the FRA matures.

(1) The minimum capital requirement for credit risk is $640 ($8000×8.0%). This requirement could be satisfied with $540 of Tier 1 capital and $100 of Tier 2 capital.

(2) The remaining capital available for market risk would be:

Tier 1=$60, Tier 2=0, and Tier 3=$1000. The minimum capital requirement for market risk is $50 ($625×8.0%). Eligible Tier 3 capital would be limited to $125 ($50×2.5).

(3) The Tier 1 capital required to support market risk could be satisfied by allocating $14 ($50×.285), with eligible Tier 3 capital used for market risk being $36 ($50 − $14).

(4) Total qualifying and eligible capital would be:

$540 (Tier 1)+$100 (Tier 2)+$60 (Tier 1, comprising $14 allocated for market risk and $46 unallocated)+$36 (Tier 3)=$736. The bank's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $736/$8,625)=8.5%.

Example 2: A bank has the following qualifying capital:

Tier 1=$500 Tier 2=$140 Tier 3=$600

(1) The minimum capital requirement for credit risk is $640 ($8000×8.0%). This requirement could be satisfied with $500 of Tier 1 capital and $140 of Tier 2 capital.

(2) The remaining capital available for market risk would be: Tier 1=0, Tier 2=$0, and Tier 3=$600. Eligible Tier 3 capital would be limited to $0 (0×2.5). Because there is no Tier 1 capital required to support market risk, no eligible Tier 3 capital may be used for market risk.

(3) Total qualifying and eligible capital would be: $500 (Tier 1)+$140 (Tier 2)=$640. The bank's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $640/$8,625)=7.4%.

b. In both of the examples described in paragraph a. of this attachment the total of Tier 2 and Tier 3 capital for credit and market risk is not greater than 100 percent of Tier 1 capital for credit and market risk and the total of Tier 2 capital for credit risk is not greater than 100 percent of Tier 1 capital for credit risk.

Attachment II—Sample Calculation of General Market Risk for Debt Instruments Using the Maturity Method

a. A bank with the following positions would slot them into a maturity ladder as shown below:

i. Qualifying bond, $13.33mn market value, remaining maturity 8 years, coupon 8%;

ii. Government bond, $75mn market value, remaining maturity 2 months, coupon 7%;

iii. Interest rate swap, $150 mn, bank receives floating rate interest and pays fixed, next interest reset after 12 months, remaining life of swap is 8 years (assumes the current interest rate is identical to the one the swap is based on); and

iv. Long position in interest rate future, $50mn, delivery date after 6 months, life of underlying government security is 3.5 years (assumes the current interest rate is identical to the one the swap is based on).

Zone	Time-band and position	Risk wght [%]	Risk-weighted position	Net time-band positions	Net zone positions
1	0–1 mth	0.00			
	1–3 mth Long 75 Gov. bond	0.20	Long 0.15	Long 0.15	Long 1.00.
	3–6 mth	0.40	Short 0.20	Short 0.20	
	Short 50 Future				
	6–12 mths	0.70	Long 1.05	Long 1.05	
	Long 150 Swap				
2	1–2 yrs	1.25			
	2–3 yrs	1.75			
	3–4 yrs	2.25	Long 1.125	Long 1.125	Long 1.125
	Long 50 Future				
3	4–5 yrs	2.75			
	5–7 yrs	3.25			
	7–10 yrs	3.75	Short 5.625	Short 5.125	Short 5.125
	Short 150 Swap				
	Long 13.33 Qual Bond		Long 0.50		
	10–15 yrs	4.50			
	15–20 yrs	5.25			
	Over 2 yrs	6.00			

b. A vertical disallowance would be calculated for time-band 7–10 years. It would be 10 percent of the matched positions in the time-band—10.0×0.5=0.05 ($50,000).

c. A horizontal disallowance would be calculated for zone 1. It would be 40 percent of the matched positions in the zone—40.0×0.20=0.80 ($80,000). The remaining net position in Zone 1 would be +1.00.

d. A horizontal disallowance would be calculated for adjacent zones 2 and 3. It would be 40 percent of the matched positions between the zones—40.0×1.125=0.45 (450,000). The remaining position in zone 3 would be −4.00.

e. A horizontal disallowance would be calculated between zones 1 and 3. It would be 100 percent of the matched positions between the zones—100×1.00=1.00 (1,000,000).

f. The remaining net open position for the bank would be 3.00 ($3,000,000). The total capital requirement for general market risk for this portfolio would be:

The vertical disallowance	$50,000
Horizontal disallowance in zone 1	80,000
Horizontal disallowance—zones 2 and 3	450,000
Horizontal disallowance—zones 1 and 3	1,000,000
Overall net open position	3,000,000
Total requirement for general market risk	4,580,000

Attachment III—Summary of Treatment for Interest Rate and Equity Derivatives

Summary of Treatment for Interest Rate Derivatives

Instrument	Specific risk charge	General market risk charge
Exchange-Traded Future		
Government security	No	Yes, as two positions.
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates (e.g. LIBOR)	No	Yes, as two positions.
OTC Forward		
Government security	No	Yes, as two positions.

Summary of Treatment for Interest Rate Derivatives—Continued

Instrument	Specific risk charge	General market risk charge
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates	No	Yes, as two positions.
FRAs, Swaps	No	Yes, as two positions.
Forward foreign exchange	No	Yes, as one position in each currency.
Options:		For each type of transaction, either:
Government security	No	(a) Carve out together with the associated hedging positions —simplified method —scenario analysis —internal models, or
Corporate debt security	Yes	(b) General market risk charge according to the Delta-plus method (gamma and vega receive separate capital charges)
Index on short-term interest rates	No	

Note: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

Summary of Treatment for Equity Derivatives

Instrument	Specific risk charge	General market risk charge
Exchange-Traded or OTC Future:		
Individual equity	Yes	Yes, as underlying.
Index	2.0%	Yes, as underlying.
Options:		For each type of transactions either:
Individual equity	yes	(a) Carve out together with the associated hedging positions —simplified method —scenario approach —internal models, or
Index	2.0%	(b) General market risk requirement according to the Delta-plus method (gamma and vega receive separate capital charges).

Note: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

Attachment IV—Sample Calculation of Standardized Approach for Commodities Risk

Time-band	Position	Spread rate	Capital calculation	Capital charge
0 up to 1 month	None			
1 up to 3 months	None			
3 up to 6 months	Long 800	1.5%	800 long+800 short (matched)×1.5%=	24
	Short 1000		200 short carried forward to 1–2 yrs, capital charge: 200×2×0.6%=.	2.4
6 up to 12 months	None			
1 up to 2 yrs	Long 600		200 long+200 short (matched)×1.5%=	6
			400 long carried forward to over 3 yrs capital charge: 400×2×0.6%=.	4.8
2 up to 3 yrs	None			
Over 3 years	Short 600		400 long+400 short (matched)×1.5%=	12
			Net position: 200 capital charge: 200×15.0%=	30

NOTE: Assume all positions are in the same commodity and converted at current spot rates into U.S. dollars. The total capital requirement would be $79.2.

Attachment V—Sample Calculation for Delta-Plus Method for Options

a. Assume a bank has a European short call option on a commodity with an exercise price of 490 and a market value of the underlying 12 months from the expiration of the option at 500; a risk-free interest rate at 8% per annum, and the volatility at 20 percent. The current delta for this position is according to the Black-Scholes formula −0.721 (that is, the price of the option changes by −0.721 if the price of the underlying moves by 1). The gamma is −0.0034 (that is, the delta changes by −0.0034 from −0.721 to −0.7244 if the price of the underlying moves by 1). The current value of the option is 65.48.

b. The first step under the delta-plus method is to multiply the market value of the commodity by the absolute value of the delta. 500 x 0.721 = 360.5. The delta-weighted position is then incorporated into the measure described in section IV.D. of this Appendix E. If the bank uses the maturity approach and no other positions exist, the delta-weighted position is multiplied by 0.15 to calculate the capital requirement for delta. 360.5 x 0.15 = 54.075.

c. The capital requirement for gamma is calculated according to the Taylor expansion by multiplying the absolute value of the assumed gamma of −0.0034 by 1.125% and by the square of the market value of the underlying. $-0.0034 \times 0.0125 \times 500^2 = 10.625$.

d. The capital requirement for vega is calculated next. The assumed current (implied) volatility is 20%. Since only an increase in volatility carries a risk of loss for a short call option, the volatility has to be increased by a relative shift of 25%. This means that the vega capital requirement has to be calculated on the basis of a change in volatility of 5 percentage points from 20% to 25% in this example. According to the Black-Scholes formula used here, the vega equals 168. Thus, a 1% or 0.01 increase in volatility increases the value of the option by 1.68. Accordingly, a change in volatility of 5 percentage points increases the value of 5 x 1.68 = 8.4. This is the capital requirement for vega risk. The total capital requirement would be $73.10 (54.075 + 10.625 + 8.4).

PART 225—BANK HOLDING COMPANIES AND CHANGE IN BANK CONTROL (REGULATION Y)

1. The authority citation for part 225 continues to read as follows:

Authority: 12 U.S.C. 1817(j)(13), 1818, 1828(o), 1831i, 1831p-1, 1843(c)(8), 1844(b), 1972(1), 3106, 3108, 3310, 3331–3351, 3907, and 3909.

2. In part 225, appendix A to part 225 is amended by revising the first and second paragraphs of section I. to read as follows:

Appendix A to Part 225—Capital Adequacy Guidelines for Bank Holding Companies: Risk-Based Measure

I. Overview

The Board of Governors of the Federal Reserve System has adopted a risk-based capital measure to assist in the assessment of the capital adequacy of bank holding companies (banking organizations).[1] The principal objectives of this measure are to (i) make regulatory capital requirements more sensitive to differences in risk profiles among banking organizations; (ii) factor off-balance-sheet exposures into the assessment of capital adequacy; (iii) minimize disincentives to holding liquid, low-risk assets; and (iv) achieve greater consistency in the evaluation of the capital adequacy of major banking organizations throughout the world.

The risk-based capital guidelines include both a definition of capital and a framework for calculating weighted risk assets by assigning assets and off-balance-sheet items to broad risk categories.[2] An institution's risk-based capital ratio is calculated by dividing its qualifying capital (the numerator of the ratio) by its weighted risk assets (the denominator).[3] The definition of qualifying capital is outlined below in section II. of this appendix A, and the procedures for calculating weighted risk assets are discussed in section III. of this appendix A. Attachment I to this appendix A illustrates a sample calculation of weighted risk assets and the risk-based capital ratio.

* * * * *

3. In Part 225 a new appendix E is added to read as follows:

[1] Some banking organizations are also subject to capital requirements for market risk as set forth in appendix E of this part. Banking organizations that are subject to the market risk measure are required to follow the guidelines set forth in appendix E of this part for determining qualifying and eligible capital, calculating market risk-equivalent assets and adding them into weighted-risk assets, and calculating risk-based capital ratios adjusted for market risk. Supervisory ratios that relate capital to total assets for bank holding companies are outlined in appendices B and D of this part.

[2] The risk-based capital measure is based upon a framework developed jointly by supervisory authorities from the countries represented on the Basle Committee on Banking Regulations and Supervisory Practices (Basle Supervisors' Committee) and endorsed by the Group of Ten Central Bank Governors. The framework is described in a paper prepared by the Basle Supervisors' Committee entitled ''International Convergence of Capital Measurement,'' July 1988.

[3] Banking organizations generally are expected to utilize period-end amounts in calculating their risk-based capital ratios. When necessary and appropriate, ratios based on average balances may also be calculated on a case-by-case basis. Moreover, to the extent banking organizations have data on average balances that can be used to calculate risk-based ratios, the Federal Reserve will take such data into account.

Appendix E to Part 225—Capital Adequacy Guidelines for Bank Holding Companies: Market Risk Measure

I. Introduction

A. Overview

1. The Board of Governors of the Federal Reserve System has adopted a framework for determining capital requirements for the market risk exposure of bank holding companies (banking organizations).[1] For this purpose, market risk is defined as the risk of losses in a banking organization's on- and off-balance-sheet positions arising from movements in market prices. The market risks subject to these capital requirements are those associated with debt and equity instruments held in the banking organization's trading account, as well as foreign exchange risk and commodities risk throughout the organization, including options and other derivative contracts in each risk category.

2. Effective December 31, 1997, the market risk measure will be applied to all bank holding companies that, on a consolidated basis:

a. Have total assets in excess of $5 billion; *and* have a total volume of trading activities (measured as the sum of the banking organization's trading assets and liabilities[2] on a daily average basis for the quarter) that is 3.0 percent or more of the total assets of the banking organization, or have interest rate, foreign exchange, equity, and commodity off-balance-sheet derivative contracts relating to trading activities whose total notional amounts exceed $5 billion; or

b. Have total assets of $5 billion or less; *and* have trading activities exceeding 10.0 percent of the total assets of the banking organization.

3. Such banking organizations are still subject to the risk-based capital measure set forth in appendix A of this part, subject to the exclusion of certain assets specified in this appendix E. However, these banking organizations must calculate their market risk-equivalent assets and determine risk-based capital ratios adjusted for market risk in accordance with this appendix E.[3]

4. The market risk measure provides two ways for a banking organization to determine its exposure to market risk. A banking organization may use its internal risk measurement model, subject to the conditions and criteria set forth in section III. of this appendix E (referred to as the internal models approach), or when appropriate, a

[1] The market risk measure is based on a framework developed jointly by supervisory authorities from the countries represented on the Basle Committee on Banking Supervision (Basle Supervisors Committee) and endorsed by the Group of Ten Central Bank Governors. The framework is described in a paper prepared by the Basle Supervisors Committee entitled ''[Proposal to issue a] Supplement to the Basle Capital Accord to Cover Market Risks.'' [April] 1995.

[2] As reflected in the Consolidated Financial Statements for Bank Holding Companies (FR Y–9C Report).

[3] The Federal Reserve may apply all or portions of this appendix E to other banking organizations when deemed necessary for safety and soundness purposes.

banking organization may use all or portions of the alternative measurement system described in section IV. of this appendix E (referred to as the standardized approach).

a. With prior approval from the Federal Reserve, for regulatory capital purposes, a banking organization may use its internal risk measurement model to measure its value-at-risk [4] for each of the following risk factor categories; interest rates, exchange rates, equity prices, and commodity prices. The value-at-risk amount for each risk factor category should include volatilities of related options. The value-at-risk amount for each risk factor category is summed to determine the aggregate value-at-risk for the banking organization.

b. The standardized approach uses a set of standardized calculations and assumptions to measure market risk exposure depending on its source; debt instruments, equities, foreign currencies, and commodities, including volatilities of related options.

5. The Board generally expects any banking organization that is subject to the market risk measure, especially those with large trading accounts, to comply with the measure by using internal risk-measurement models. A banking organization may not change its measurement approach for the purpose of minimizing capital requirements. In limited instances, on a case-by-case basis, the Federal Reserve may permit a banking organization that has internal models to incorporate risk measures of negligible exposures, for example, *de minimis* positions, activities in remote locations, minor exposures in a currency, or activities that present negligible risk to the banking organization, in an alternative manner, so long as it adequately captures the risk.

6. The risk-based capital ratios adjusted for market risk determined in accordance with this appendix E are *minimum* supervisory ratios. Banking organizations generally are expected to operate with capital positions well above the minimum ratios. In all cases, banking organizations should hold capital commensurate with the level and nature of the risks to which they are exposed.

7. The Federal Reserve will monitor the implementation and effect of these guidelines in relation to domestic and international developments in the banking industry. When necessary and appropriate, the Board will consider the need to modify this appendix E in light of any significant changes in the economy, financial markets, banking practices, or other relevant factors.

B. Market Risks Subject to a Capital Requirement.

1. *General Market Risk and Specific Risk.* A banking organization must hold capital against exposure to general market risk and specific risk arising from its trading and other foreign exchange and commodity activities. For this purpose, general market risk refers to changes in the market value of covered transactions resulting from market movements, such as changing levels of market interest rates, broad equity indices, or currency exchange rates. Specific risk refers to credit risk, that is, the risk that the issuer of a debt or equity instrument might default, as well as to other factors that affect the market value of specific instruments but that do not materially alter market conditions.[5]

2. *Trading Activities.* a. The general market risk and specific risk capital requirements for trading activities are based on on- and off-balance-sheet positions in a banking organization's trading account. For this purpose, trading account means positions in financial instruments acquired with the intent to resell in order to profit from short-term price movements (or other price or interest-rate variations), including, but not limited to:

i. Assets acquired with the intent to resell to customers;

ii. Positions in financial instruments arising from matched principal brokering and market making; or

iii. Positions taken in order to hedge other elements of the trading account (that is, reduce risk by offsetting other positions that have exposure to changes in market rates or prices).[6] Trading activities may include positions in debt instruments, equities, foreign currencies, and commodity instruments, or related derivative [7] or other off-balance-sheet contracts.

b. Debt instruments in the trading account are all fixed-rate and floating-rate debt securities and instruments that behave like debt, including non-convertible preferred stock. Convertible bonds, i.e., preferred stock or debt issues that are convertible, at a stated price, into common shares of the issuer, should be treated as debt instruments if they trade like debt instruments and as equities if they trade like equities. Also included are derivative contracts of debt instruments and other off-balance-sheet instruments in the trading account that react to changes in interest rates. A security that has been sold subject to a repurchase agreement or lent subject to a securities lending agreement is treated as if it were still owned by the lender of the security. Such transactions remain subject to the capital requirements for credit risk for the off- balance-sheet portion of the transaction as set forth in section III.D. of appendix A of this part.

c. Equities in the trading account are equity instruments that behave like equities. The instruments covered include common stocks (whether voting or non-voting), convertible securities that behave like equities, and commitments to buy or sell equity securities. Also included are derivative contracts of equity instruments and other off-balance-sheet instruments in the trading account that are affected by changes in equity prices. However, non-convertible preferred stock is included in debt instruments.

3. *Foreign Exchange and Commodities Risk.* Foreign exchange or commodities positions, whether or not included in a banking organization's trading account, are subject to a capital requirement for the market risk of those positions.

a. The capital requirement for foreign exchange risk applies to a banking organization's total currency and gold positions. This includes spot positions (that is, asset items and liability items, including accrued interest and expenses, denominated in each currency); forward positions (that is, forward foreign exchange transactions, including currency futures and the principal on currency swaps not included in the spot position); and certain guarantees. It includes future income and expenses from foreign currency transactions not yet accrued but already fully hedged (at the discretion of the reporting bank), foreign exchange derivative and other off-balance-sheet positions that are affected by changes in exchange rates, and any other item representing a profit or loss in foreign currencies.

b. A banking organization may, subject to approval by the Federal Reserve, exclude from its foreign exchange positions any structural positions in foreign currencies. For this purpose, such structural positions are limited to transactions designed to hedge a banking organization's capital ratios against the effect of adverse exchange rate movements on subordinated debt, equity, or minority interests in consolidated subsidiaries and dotation capital assigned to foreign branches that are denominated in foreign currencies. Also included are any positions related to unconsolidated subsidiaries and to other items that are deducted from a banking organization's capital when calculating its capital base. In any event, such structural foreign currency positions must reflect long-term policies of the institution and not relate to trading positions.

c. A banking organization doing negligible business in foreign currency and that does not take foreign exchange positions for its own account may be exempted from the capital requirement for foreign exchange risk provided that:

i. Its foreign currency business, defined as the greater of the sum of its gross long positions and the sum of its gross short positions in all foreign currencies, does not exceed 100 percent of eligible capital as defined in section II. of this appendix E; and

ii. Its overall net open foreign exchange position as determined in section IV.C.2. of this appendix E does not exceed 2.0 percent of its eligible capital.

[4] A banking organization evaluates its current positions and estimates future market volatility through a value-at-risk measure, which is an estimate representing, with a certain degree of statistical confidence, the maximum amount by which the market value of trading positions could decline during a specific period of time. The value-at-risk is generated through an internal model that employs a series of market risk factors (for example, market rates and princes that affect the value of trading positions).

[5] This Appendix E does not impose specific risk capital requirements for foreign exchange risk and commodities positions because they do not have the type of issuer-specific risk associated with debt and equity instruments in the trade account.

[6] At a banking organization's option, when non-trading account instruments are hedged with instruments in the trading account, on- or off-balance-sheet, the non-trading account instruments may be included in the measure for general market risk. Such non-trading account instruments remain subject to the credit risk capital charges of appendix A of this part.

[7] In general terms, a derivative is a financial contract whose value is derived from the values of one or more underlying assets or reference rates or indexes of asset values (referred to as ''the underlying''). Derivatives include standardized contracts that are traded on exchanges and customized, privately negotiated contracts known as over-the-counter (OTC) derivatives.

d. The capital requirement for commodities risk applies to a banking organization's total commodities positions, including commodity futures, commodity swaps, and all other commodity derivatives or other off-balance-sheet positions that are affected by changes in commodity prices. A commodity is defined as a physical product that is or can be traded on a secondary market (such as agricultural products, minerals (including oil), and precious metals), but excluding gold (which is treated as foreign exchange).

C. Capital Requirements

1. *Capital Requirements.* The minimum capital requirement for a bank holding company subject to the market risk measure is the sum of:

a. The capital requirement for credit risk as determined in accordance with appendix A of this part, *excluding* debt and equity instruments in the trading book and positions in commodities, but *including* the counterparty credit risk requirements on all over-the-counter derivative activities whether in the banking organization's trading account or not; and

b. The capital requirement for market risk as determined by the internal models approach, the standardized approach, or a combination of the two approaches deemed to be appropriate by the Federal Reserve.

2. *Internal Models.* a. For a banking organization approved to use the internal models approach, the capital requirement for market risk is the higher of:

i. The banking organization's previous day's aggregate value-at-risk amount calculated subject to certain supervisory requirements set forth in section III. of this appendix E; or

ii. An average of the daily aggregate value-at-risk amounts, calculated subject to the same restrictions, measured on each of the preceding sixty (60) business days, multiplied by a minimum ''multiplication factor'' of three (3).[8]

b. A banking organization approved to use the internal models approach may also be subject to a separate capital requirement for specific market risk of traded debt and equity instruments to the extent that the specific market risk associated with these instruments is not captured by the banking organization's models. However, for all banking organizations using internal models, the total specific risk charge should in no case be less than one-half the specific risk charges calculated according to the standardized approach.

3. *Standardized approach.* A banking organization whose model has not been approved by the Federal Reserve must use the standardized approach for measuring its market risk. For a banking organization using this approach, the capital requirement for market risk is the sum of the market risk capital requirement for debt and equity instruments in the trading account, foreign exchange and commodities risk throughout the banking organization, and options and other derivative positions in each risk category as set forth in sections IV.A to IV.E. of this appendix E.[9]

4. *Partial models.* a. With approval from the Federal Reserve, a banking organization whose internal model does not cover all risk factor categories may use the standardized approach to measure market risk exposure arising from the risk factor categories that are not covered. The Federal Reserve will approve combining the two approaches only on a temporary basis in situations where the banking organization is developing, but has not fully implemented, a comprehensive value-at-risk measurement system. When a banking organization uses both approaches, each risk factor category (that is, interest rates, exchange rates, equity prices, and commodity prices) must be measured using one or the other approach. The methods may not be combined within a risk factor category. Once a banking organization adopts an acceptable value-at-risk model for a particular risk factor category, it may not revert to the standardized approach except in unusual circumstances and with prior approval of the Federal Reserve.

b. For a banking organization using a combination of approaches, the capital requirement for market risk is the sum of (i) the appropriate value-at-risk amount (as determined under section I.C.2.a. of this appendix E, aggregating the value-at-risk amount for each risk factor category included in the internal model), and (ii) the capital requirement for each risk category that is calculated using the standardized approach.

5. *Application.* The capital requirements for market risk apply to bank holding companies on a worldwide consolidated basis. The Federal Reserve may, however, evaluate market risk on an unconsolidated basis when necessary. For example, when there are obstacles to the repatriation of profits from a foreign subsidiary or where management structure does not allow timely management of risk on a consolidated basis.

6. *Other Considerations.* All transactions, including forward sales and purchases, should be included in the calculation of market risk capital requirements from the date on which they were entered into. The Federal Reserve expects banking organizations to meet their capital requirements for market risk on a continuous basis (that is, at a minimum, at the close of each business day).

II. Qualifying Capital and the Market Risk-Adjusted Capital Ratio

A. Qualifying and Eligible Capital

1. The principal forms of qualifying capital for market risk are Tier 1 capital and Tier 2 capital as defined in section II. of appendix A of this part and subject to the conditions and limitations of appendix A of this part. A banking organization may use Tier 3 capital for the sole purpose of meeting a portion of the capital requirements for market risk.[10]

2. Tier 3 capital consists of short-term subordinated debt that is subject to a lock-in clause providing that neither interest nor principal payment is due (even at maturity) if such payment would cause the issuing banking organization to fall or remain below the minimum 8.0 percent risk-based capital requirement as set forth in appendix A of this part and adjusted for market risk.

3. In order to qualify as Tier 3 capital, the short-term debt must be unsecured, subordinated, and fully paid up; it must have an original maturity of at least two years; and it may not be redeemed before maturity without prior approval by the Federal Reserve. In addition, it may not contain or be covered by any covenants, terms, or restrictions that are inconsistent with safe and sound banking practices.

4. Eligible Tier 3 capital may not exceed 250 percent of a banking organization's Tier 1 capital allocated for market risk and the maximum eligible amount of Tier 2 and Tier 3 capital together is limited to 100 percent of Tier 1 capital. (Examples of how to calculate these limits are set forth in Attachment I to this appendix E.) Tier 2 elements may be substituted for Tier 3 up to the same limit of 250 percent, so long as the overall limits for Tier 2 capital set forth in appendix A of this part are not exceeded, that is, Tier 2 capital may not exceed total Tier 1 capital, and long-term subordinated debt may not exceed 50 percent of Tier 1 capital.

B. Calculation of Eligible Capital and the Capital Ratio

1. In order to calculate eligible capital, a banking organization must first calculate its minimum capital requirement for credit risk in accordance with appendix A of this part and then its capital requirement for market risk. Eligible capital is the sum of the banking organization's qualifying Tier 1 capital, its qualifying Tier 2 capital subject to the limits stated above, and its eligible Tier 3 capital subject to the conditions set out under section II. of this appendix E.

2. A banking organization that is subject to the market risk measure must calculate its risk-based capital ratios as follows:

a. Determine total weighted-risk assets using the procedures and criteria set forth in appendix A of this part, excluding debt and equity instruments in the trading book and positions in commodities, but including all over-the-counter derivative activities whether in the banking organization's trading account or not.

[8] The Federal Reserve may adjust the multiplication factor for a banking organization to increase its capital requirement based on an assessment of the quality and historic accuracy of the banking organization's risk management system.

[9] Section IV.E. provides several alternatives for measuring the market risk of options. Under two of the alternatives, the simplified and scenario methods, the underlying position of an option is ''carved-out,'' and is not included in the prescribed risk measure for the underlying. Instead it is evaluated together with the related option according to the procedures described for options to determine the capital requirement. Under the third alternative, the ''delta-plus'' approach, the delta-equivalent value of each position is included in the measurement framework for the appropriate risk category (that is, debt or equity instruments in the trading account, foreign exchange or commodities risk).

[10] A banking organization may not use Tier 3 capital to satisfy any capital requirements for counterparty credit risk under appendix A of this part, including counterparty credit risk associated with derivative transactions in either the trading or non-trading accounts.

b. Calculate the measure for market risk using the internal models approach, the standardized approach, or an approved combination of these two approaches.

c. Multiply the measure for market risk by 12.5 (i.e., the reciprocal of the 8.0 percent minimum risk-based capital ratio). The resulting product is referred to as ''market risk-equivalent assets.''

d. Add market risk-equivalent assets to the weighted-risk assets compiled for credit risk purposes (section II.B.2.a. of this appendix E). The sum of these two amounts is the denominator of the risk-based capital ratios adjusted for market risk. The numerator of the total risk-based capital ratio is eligible capital and the numerator of the Tier 1 risk-based capital ratio is Tier 1 capital.

III. The Internal Models Approach

A. Use of Models

1. With prior approval of the Federal Reserve, a banking organization may use its internal risk measurement model(s) for purposes of measuring value-at-risk and determining the associated regulatory capital requirements for market risk exposure.

a. Requests for approval under section III.A.1. of this appendix E should include, at a minimum, a complete description of the banking organization's internal modeling and risk management systems and how these systems conform to the criteria set forth in this section III., an explanation of the policies and procedures established by the banking organization to ensure continued compliance with such criteria, a discussion of internal and external validation procedures, and a description of other relevant policies and procedures consistent with sound practices.

b. The Federal Reserve will approve an internal model for regulatory capital purposes only after determining that the banking organization's internal model and risk management systems meet the criteria in section III. of this appendix E. Such a determination may require on-site examinations of the systems. The Federal Reserve may require modification to an internal model as deemed necessary to ensure compliance, on a continuing basis, with the provisions of this appendix E. A banking organization's internal model will be subject to continuing review, both on-and off-site, by the Federal Reserve.[11]

2. A banking organization should ensure that the level of sophistication of its internal model is commensurate with the nature and volume of the banking organization's trading activity in the risk factor categories covered by this appendix E and measures market risk as accurately as possible. In addition, the model should be adjusted to reflect changing portfolio composition and changing market conditions.

B. Qualitative Criteria

1. A banking organization using the internal models approach should have market risk management systems that are conceptually sound and implemented with integrity. Internal risk measurement models must be closely integrated into the day-to-day risk management process of the banking organization. For example, the risk measurement model must be used in conjunction with internal trading and exposure limits.

2. A banking organization must meet the following minimum qualitative criteria before using its internal model to measure its exposure to market risk.[12]

a. A banking organization must have a risk control unit that is independent from business trading units and reports directly to senior management of the banking organization. The unit must be responsible for designing and implementing the banking organization's risk management system and analyzing daily reports on the output of the banking organization's risk measurement model in the context of trading limits. The unit must conduct regular back-testing.[13]

b. Senior management must be actively involved in the risk control process. The daily reports produced by the risk management unit must be reviewed by a level of management with sufficient authority to enforce both reductions in positions taken by individual traders, as well as in the banking organization's overall risk exposure.

c. The banking organization must have a routine and rigorous program of stress-testing[14] to identify the effect of low-probability events on the banking organization's trading portfolio. Senior management must routinely review the results of stress-testing in the context of the potential effect of the events on bank capital and the appropriate procedures the banking organization should take to minimize losses. The policies of the banking organization set by management and the board of directors should identify appropriate stress-tests and the procedures to follow in response to the test results.

d. The banking organization must have established procedures for ensuring compliance with a documented set of internal policies and controls, as well as for monitoring the overall operation of the risk measurement system.

e. Not less than once a year, the banking organization must conduct, as part of its regular internal audit process, an independent review of the risk measurement system. This review must include both the activities of the business trading units and of the independent risk control unit of the banking organization.

f. Not less than once a year, the banking organization must conduct a review of its overall risk management process. The review must consider:

i. The adequacy of the documentation of the risk management system and process and the organization of the risk control unit;

ii. The integration of market risk measures into daily risk management and the integrity of the management information system;

iii. The process the banking organization employs for approving risk pricing models and valuation systems that are used by front- and back-office personnel;

iv. The scope of market risks captured by the risk measurement model and the validation of any significant changes in the risk measurement process;

v. The accuracy and completeness of position data, the accuracy and appropriateness of volatility and correlation assumptions, and the accuracy of valuation and risk sensitivity calculations;

vi. The verification process the banking organization employs to evaluate the consistency, timeliness, and reliability of data sources used to run internal models, including the independence of such data sources; and

vii. The verification process the banking organization uses to evaluate back-testing that is conducted to assess the model's accuracy.

C. Market Risk Factors

1. *Overview.* For regulatory capital purposes, a banking organization's internal risk measurement system(s) must use sufficient risk factors to capture the risks inherent in the banking organization's portfolio of on- and off-balance-sheet trading positions and must, subject to the following guidelines, cover interest rates, equity prices, exchange rates, commodity prices, and volatilities related to options positions in each risk factor category. The level of sophistication of the banking organization's risk factors must be commensurate with the nature and scope of the risks taken by the banking organization.

2. *Interest Rates.* a. A banking organization must use a set of market risk factors corresponding to interest rates in each currency in which it has material interest rate-sensitive on- or off-balance-sheet positions. The risk measurement system must model the yield curve[15] using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve must 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.

b. For material exposures to interest rate movements in the major currencies and markets, a banking organization 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

[11] Banking organizations that need to modify their existing modeling procedures to accommodate the requirements of this appendix E should, nonetheless, continue to use the internal models they consider most appropriate in evaluating risks for other purposes.

[12] If the Federal Reserve is not satisfied with the extent to which a banking organization meets these criteria, the Federal Reserve may adjust the multiplication factor used to calculate market risk capital requirements or otherwise increase capital requirements.

[13] Back-testing includes *ex post* comparisons of the risk measures generated by the model against the actual daily changes in portfolio value.

[14] Stress-testing should cover a range of factors that can create extraordinary losses or gains in trading portfolios or make the control of risk in those portfolios difficult. These factors include low-probability events of all types, including the various components of market, credit, and operational risks.

[15] Generally, a yield curve is a graph showing the term structure of interest rates by plotting the yields of all instruments of the same quality by maturities ranging from the shortest to the longest available. The resulting curve shows whether short-term interest rates are higher or lower than long-term interest rates.

nature of the banking organization's trading strategies.[16] The risk measurement system must incorporate separate risk factors to capture spread risk.[17]

3. *Exchange rates.* A banking organization must use market risk factors corresponding to the exchange rate between the domestic currency and each foreign currency in which the banking organization has a significant exposure. The risk measurement system must incorporate market risk factors corresponding to the individual foreign currencies in which the banking organization's positions are denominated.

4. *Equity prices.* A banking organization must use risk factors corresponding to each of the equity markets in which it holds significant positions. The sophistication and nature of the modeling technique for a given market must correspond to the banking organization's exposure to the overall market as well as to the banking organization's concentration in individual equity issues in that market. At a minimum, there must be a risk factor designed to capture market-wide movements in equity prices (such as a market index), but additional risk factors could track various sectors or individual issues.

5. *Commodity prices.* A banking organization must use market risk factors corresponding to each of the commodity markets in which it holds significant positions. The internal model must encompass directional risk, forward gap and interest rate risk, and basis risk.[18] The model should also take into account the market characteristics, for example, delivery dates and the scope provided to traders to close out positions.

D. Quantitative Standards

1. A banking organization may use one of a number of generally accepted measurement techniques including, for example, an internal model based on variance-covariance matrices, historical simulations, or Monte Carlo simulations so long as the model employed captures all the material market risks.[19] The following minimum standards apply for purposes of using an internal model for calculating market risk capital requirements:

a. Value-at-risk must be calculated on a daily basis using a 99th percentile, one-tailed confidence interval[20] and the holding period must be ten trading days. For positions that display linear price characteristics, a banking organization may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days by the square root of time.[21]

b. Value-at-risk must be calculated using an observation period of at least one year to measure historical changes in rates and prices.

c. A banking organization must update its historical rates and prices at least once every three months and must reassess them whenever market conditions change materially.

2. A banking organization may use discretion in recognizing empirical correlations within each market risk factor category.[22] However, empirical correlations among risk categories are not recognized. The value-at-risk measure for each risk category must be added together on a simple sum basis to determine the aggregate value-at-risk amount.

3. A banking organization's models must accurately capture the unique risks associated with options within each of the market risk factor categories. The following minimum criteria apply to the measurement of options risk:

a. A banking organization's internal model must capture the non-linear price characteristics of option positions using an options pricing technique. The banking organization must apply a minimum ten-day holding period to option positions or positions that display option-like characteristics. Banking organizations may not scale-up the daily value-at-risk numbers by the square root of time.

b. A banking organization's internal model must capture the volatilities of the rates and prices (that is, the vega) underlying option positions and a banking organization should measure the volatilities of the underlying instruments broken down by different option maturities.

4. The accuracy of a banking organization's internal model will be reviewed periodically by the Federal Reserve. Such review, during which, when appropriate, the Federal Reserve may take into consideration reports and opinions generated by external auditors or qualified consultants, will include, at a minimum:

a. Verification that the internal validation processes described in section III.B.2. of this appendix E are operating in a satisfactory manner;

b. Affirmation that the formulae used in the calculation process and for the pricing of options and other complex instruments, are validated by a qualified unit of the banking organization, which in all cases must be independent from the trading areas;

c. Confirmation that the structure of the internal model is adequate with respect to the banking organization's activities and geographical coverage;

d. Confirmation that the results of the banking organization's back-testing of its internal measurement system (that is, comparing value-at-risk estimates with actual profits and losses) are being used effectively to monitor reliability of the model's estimates over time; and

e. Affirmation that, for regulatory capital purposes, the model processes all relevant data and that the modeling procedures conform with the parameters and specifications set forth in this appendix E.

IV. The Standardized Approach

A. Debt Instruments

1. *Specific Risk.* a. The capital requirement for specific risk is based on the identity of the obligor and, in the case of corporate securities, on the credit rating and maturity of the instrument. The specific risk capital requirement is calculated by weighting the current market value of each individual position, whether long or short, by the appropriate category factor as set forth below and summing the weighted values. In measuring specific risk, the banking organization may offset and exclude from its calculations any matched positions in the *identical* issue (including positions in derivatives). Even if the issuer is the same, no offsetting is permitted between different issues since differences in coupon rates, liquidity, call features, etc., mean that prices may diverge in the short run. The categories and factors are:

Category	Remaining maturity [contractual]	Factor [In percent]
Government	N/A	0.00
Qualifying	6 months or less.	0.25

[16] For example, a banking organization that has 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 accurately capture interest rate risk.

[17] Spread risk refers to the potential changes in value of an instrument or portfolio arising from differences in the behavior of baseline yield curves, such as those for U.S. Treasury securities, and yield curves reflecting sector, quality, or instrument specific factors. A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other interest rates, such as specifying a completely separate yield curve for non-government instruments (for example, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.

[18] Directional risk is the risk that a spot price will increase or decrease. Forward gap risk refers to the effects of owning a physical commodity versus owning a forward position in a commodity. Interest rate risk is the risk of a change in the cost of carrying forward positions and options. Basis risk is the risk that the relationship between the prices of similar commodities changes over time.

[19] In a variance/covariance approach, the change in value of the portfolio is calculated by combining the risk factor sensitivities of the individual positions—derived from valuation models—with a variance/covariance matrix based on risk factor volatilities and correlations. A banking organization using this approach would calculate the volatilities and correlations of the risk factors on the basis of the holding period and the observation period. A banking organization using a historical simulation would calculate the hypothetical change in value of the current portfolio in the light of historical movements in risk factors. This calculation would be done for each of the defined holding periods over a given historical measurement horizon to arrive at a range of simulated profits and losses. A banking organization using a Monte Carlo technique would consider historical movements to determine the probability of particular price and rate changes.

[20] A one-tailed confidence interval of 99 percent means that there is a 1 percent probability based on historical experience that the combination of positions in a banking organization's portfolio would result in a loss higher than the measured value-at-risk.

[21] This transformation entails multiplying a banking organization's value-at-risk by the square root of the ratio of the required holding period (ten days) to the holding period embodied in the value-at-risk figure. For example, the value-at-risk calculated according to a one-day holding period would be scaled-up by the ''square root of time'' by multiplying the value-at-risk by 3.16 (the square root of the ratio of a ten-day holding period to a one-day holding period).

[22] While a banking organization has flexibility to use correlations, the Federal Reserve must be satisfied that there is integrity in the banking organization's process for calculating correlations.

Category	Remaining maturity [contractual]	Factor [In percent]
	6 to 12 months	1.00
	over 12 months	1.60
Other	N/A	8.00

b. The *government* category includes all forms of debt instruments of central governments of the OECD-based group of countries[23] including bonds, Treasury bills and other short-term instruments, as well as local currency instruments of non-OECD central governments to the extent that the subsidiary depository institutions have liabilities booked in that currency.

c. The *qualifying* category includes securities of U.S. government-sponsored agencies, general obligation securities issued by states and other political subdivisions of the OECD-based group of countries, multilateral development banks, and debt instruments issued by U.S. depository institutions or OECD-banks that do not qualify as capital of the issuing institution.[24] It also includes other securities, including revenue securities issued by states and other political subdivisions of the OECD-based group of countries, that are rated investment-grade by at least two nationally recognized credit rating services, or rated investment-grade by one nationally recognized credit rating agency and not less than investment-grade by any other credit rating agency, or, with the exception of securities issued by U.S. firms and subject to review by the Federal Reserve, unrated but deemed to be of comparable investment quality by the reporting banking organization *and* the issuer has securities listed on a recognized stock exchange.

d. The *other* category includes debt securities not qualifying as government or qualifying securities. This would include non-OECD central government securities that do not meet the criteria for the government or qualifying categories. This category also includes instruments that qualify as capital issued by other banking organizations.

e. The Federal Reserve will consider the extent of a banking organization's position in non-investment grade instruments (sometimes referred to as high yield debt). If those holdings are not well-diversified or otherwise represent a material position to the institution, the Federal Reserve may prevent a banking organization from offsetting positions in these instruments with other positions in qualifying instruments that may be offset when calculating its general market risk requirement. In addition, the Board may impose a specific risk capital requirement as high as 16.0 percent.

2. *General Market Risk.* a. A banking organization may measure its exposure to general market risk using, on a continuous basis, either the maturity method (which uses standardized risk weights that approximate the price sensitivity of various instruments) or the duration method (where the institution calculates the precise duration of each instrument, weighted by a specified change in interest rates).

b. Both methods use a maturity-ladder that incorporates a series of ''time-bands'' and ''zones'' to group together securities of similar maturities and that are designed to take into account differences in price sensitivities and interest rate volatilities across different maturities. Under either method, the capital requirement for general market risk is the sum of a base charge that results from fully netting various risk-weighted positions and a series of additional charges (add-ons), which effectively ''disallow'' part of the previous full netting to address basis and yield curve risk.

c. For each currency in which a banking organization has significant positions, a separate capital requirement must be calculated. No netting of positions is permitted across different currencies. Offsetting positions of the same amount in the same issues, whether actual or notional, may be excluded from the calculation, as well as closely matched swaps, forwards, futures, and forward rate agreements (FRAs) that meet the conditions set out in section IV.A.3. of this appendix E.

d. In the *maturity method,* the banking organization distributes each long or short position (at current market value) of a debt instrument into the time bands of the maturity ladder. Fixed-rate instruments are allocated according to the remaining term to maturity and floating-rate instruments according to the next repricing date. A callable bond trading above par is slotted according to its first call date, while a callable bond priced below par is slotted according to remaining maturity. Fixed-rate mortgage-backed securities, including collateralized mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs), are slotted according to their expected weighted average lives.

e. Once all long and short positions are slotted into the appropriate time band, the long positions in each time-band are summed and the short positions in each time-band are summed. The summed long and/or short positions are multiplied by the appropriate risk-weight factor (reflecting the price sensitivity of the positions to changes in interest rates) to determine the risk-weighted long and/or short position for each time-band. The risk weights for each time-band are set out in Table I below:

TABLE I.—MATURITY METHOD: TIME-BANDS AND WEIGHTS

Zone	Coupon 3% or more	Coupon less than 3% and zero coupon bonds	Risk weights [percent]
1	Up to 1 month	Up to 1 month	0.00
	1 up to 3 months	1 up to 3 months	0.20
	3 up to 6 months	3 up to 6 months	0.40
	6 up to 12 months	6 up to 12 months	0.70
2	1 up to 2 years	1 up to 1.9 years	1.25
	2 up to 3 years	1.9 up to 2.8 years	1.75
	3 up to 4 years	2.8 up to 3.6 years	2.25
3	4 up to 5 years	3.6 up to 4.3 years	2.75
	5 up to 7 years	4.3 up to 5.7 years	3.25
	7 up to 10 years	5.7 up to 7.3 years	3.75
	10 up to 15 years	7.3 up to 9.3 years	4.50
	15 up to 20 years	9.3 up to 10.6 years	5.25
	Over 20 years	10.6 up to 12 years	6.00
		12 up to 20 years	8.00
		Over 20 years	12.50

f. Within each time-band for which there are risk-weighted long and short positions, the risk-weighted long and short positions are then netted, resulting in a single net risk-weighted long or short position for each time-band. Since different instruments and different maturities may be included and netted within each time, a capital requirement, referred to as the vertical

[23] The OECD-based group of countries is defined in section III.B.1 of appendix A of this part.

[24] U.S. government-sponsored agencies, multilateral development banks, and OECD banks are defined in section III.C.2. of appendix A of this part.

disallowance, is assessed to allow for basis risk. The vertical disallowance capital requirement is 10.0 percent of the position eliminated by the intra-time-band netting, that is, 10.0 percent of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, 10.0 percent of either position.[25] The vertical disallowances for each time-band are absolute values, that is, neither long nor short. The vertical disallowances for all time-bands in the maturity ladder are summed and included as an element of the general market risk capital requirement.

g. Within each zone for which there are risk-weighted long and short positions in different time-bands, the weighted long and short positions in all of the time-bands within the zone are then netted, resulting in a single net long or short position for each zone. Since different instruments and different maturities may be included and netted within each zone, a capital requirement, referred to as the horizontal disallowance, is assessed to allow for the imperfect correlation of interest rates along the yield curve. The horizontal disallowance capital requirement is calculated as a percentage of the position eliminated by the intra-zone netting, that is, a percentage of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, a percentage of either position.[26] The percent disallowance factors for intra-zone netting are set out in Table II in section IV.A.2.h. of this appendix E. The horizontal disallowances, like the vertical disallowances, are absolute values that are summed and included as an element of the general market risk capital requirement.

h. Risk-weighted long and short positions in different zones are then netted between the zones. Zone 1 and zone 2 are netted if possible, reducing or eliminating the net long or short position in zone 1 or zone 2 as appropriate. Zone 2 and zone 3 are then netted if possible, reducing or eliminating the net long or short position in zone 2 or zone 3 as appropriate. Zone 3 and zone 1 are then netted if possible, reducing or eliminating the long or short position in zone 3 and zone 1 as appropriate. A horizontal disallowance capital requirement is then assessed, calculated as a percentage of the position eliminated by the inter-zone netting. The horizontal disallowance capital requirements for each zone are then summed as absolute values and included in the general market risk capital charge. The percent disallowance factors for inter-zone netting are set out in Table II below:

TABLE II.—HORIZONTAL DISALLOWANCES

Zone	Time-band	Within the zone	Between adjacent zones	Between zones 1–3
1	0–1 month 1–3 months. 3–6 months. 6–12 months.	40 percent.	40 percent.	100 percent.
2	1–2 years 2–3 years. 3–4 years.	30 percent	40 percent	100 percent
3	1–5 years. 5–7 years. 7–10 years. 10–15 years. 15–20 years. Over 20 years.	30 percent	40 percent	100 percent

i. Finally, the net risk-weighted long or net risk-weighted short positions remaining in the zones are summed to reach a single net risk-weighted long or net risk-weighted short position for the banking organization's portfolio. The sum of the absolute value of this position and the vertical and horizontal disallowances is the capital requirement for general market risk. An example of the calculation of general market risk under the maturity method is in Attachment II to this appendix E.

j. In the *duration method*, the banking organization, after calculating each instrument's modified duration[27] using a formula that is subject to supervisory review, multiplies that modified duration by the interest rate shock specified for an instrument of that duration in Table III in section IV.A.2.k. of this appendix E. The resulting product (representing the expected percentage change in the price of the instrument for the given interest rate shock) is then multiplied by the current market value of the instrument. The resulting amount is then slotted as a long or short position into a time-band in the maturity ladder in Table III on the basis of the instrument's modified duration.[28]

k. Once all of the banking organization's traded debt instruments have been slotted into the maturity ladder, the banking organization conducts the same rounds of netting and disallowances described in sections IV.A.2.f. through IV.A.2.h. of this appendix E for the maturity method, with the exception that the vertical disallowance requirement for the duration method is 5.0 percent (horizontal disallowances continue to be those set out in Table II).[29] As with the maturity method, the sum of the absolute value of the final net position and the vertical and horizontal disallowances is the general market risk capital requirement:

TABLE III—DURATION METHOD: TIME-BANDS AND ASSUMED CHANGES IN YIELD

Zone	Time-band	Assumed change in yield
1	Up to 1 month	1.00
	1 up to 3 months	1.00
	3 up to 6 months	1.00
	6 up to 12 months	1.00
2	1.0 up to 1.8 years	0.90
	1.8 up to 2.6 years	0.80
	2.6 up to 3.3 years	0.75
3	3.3 up to 4.0 years	0.75
	4.0 up to 5.2 years	0.70
	5.2 up to 6.8 years	0.65
	6.8 up to 8.6 years	0.60
	8.6 up to 9.9 years	0.60
	9.9 up to 11.3 yrs	0.60

[25] For example, if the sum of the weighted longs in a time-band is $100 million and the sum of the weighted shorts is $90 million, the vertical disallowance for the time-band is 10.0 percent of $90 million, or $9 million.

[26] For example, if the sum of the weighted longs in the 1–3 month time-band in Zone 1 is $8 million and the sum of the weighted shorts in the 3–6 month time-band is $10 million, the horizontal disallowance for the zone is forty percent of $8 million, or $3.2 million.

[27] The duration of an instrument is its approximate percentage change in price for a 100 basis point parallel shift in the yield curve assuming that its cash flow does not change when the yield curve shifts. Modified duration is duration divided by a factor of 1 plus the interest rate.

[28] For example, an instrument held by a banking organization with a maturity of 4 years and 3 months and a current market value of $1,000 might have a modified duration of 3.5 years. Based on its modified duration, it would be subjected to the 75-basis point interest rate shock, resulting in an expected price change of 2.625 percent (3.5×0.75). the corresponding expected change in price of $26.25, calculated as 2.625 percent of $1,000, would be slotted as a long position in the 3.3 to 4.0 year time-band of the maturity ladder.

[29] Two different vertical disallowances are used since the duration method takes into account an instrument's specific characteristics (maturity and coupon) and there is less opportunity for measurement error.

TABLE III—DURATION METHOD: TIME-BANDS AND ASSUMED CHANGES IN YIELD—Continued

Zone	Time-band	Assumed change in yield
	11.3 up to 16.6 yrs	0.60
	Over 16.6 years	0.60

3. *Interest rate derivatives.* a. Debt derivatives and other off-balance-sheet positions that are affected by changes in interest rates are included in the measurement system under section IV.A. of this appendix E (except for options and the associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix E). A summary of the treatment for debt derivatives is set out in Attachment III to this appendix E.

b. Derivatives are converted into positions in the relevant underlying instrument and are included in the calculation of specific and general market risk capital charges as described above. The amount to be included is the market value of the principal amount of the underlying or of the notional underlying. For instruments where the apparent notional amount differs from the effective notional amount, a banking organization must use the effective notional amount.

c. Futures and forward contracts (including FRAs) are broken down into a combination of a long position and short position in the notional security. The maturity of a future or a FRA is the period until delivery or exercise of the contract, plus the life of the underlying instrument.[30] Where a range of instruments may be delivered to fulfill the contract, the banking organization may chose which deliverable instrument goes into the maturity or duration ladder as the notional underlying. In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

d. Swaps are treated as two notional positions in the relevant instruments with appropriate maturities. The receiving side is treated as the long position and the paying side is treated as the short position.[31] The separate sides of cross-currency swaps or forward foreign exchange transactions are slotted in the relevant maturity ladders for the currencies concerned. For swaps that pay or receive a fixed or floating interest rate against some other reference price, for example, an equity index, the interest rate component is slotted into the appropriate repricing maturity category, with the long or short position attributable to the equity component being included in the equity framework set out in section IV.B. of this appendix E.[32]

e. A banking organization may offset long and short positions (both actual and notional) in identical derivative instruments with exactly the same issuer, coupon, currency, and maturity before slotting these positions into time-bands. A matched position in a future and its corresponding underlying may also be fully offset and, thus, excluded from the calculation, except when the future comprises a range of deliverable instruments. However, in cases where, among the range of deliverable instruments, there is a readily identifiable underlying instrument that is most profitable for the trader with a short position to deliver, positions in the futures contract and the instrument may be offset. No offsetting is allowed between positions in different currencies.

f. Offsetting positions in the same category of instruments can in certain circumstances be regarded as matched and treated by the banking organization as a single net position which should be entered into the appropriate time-band. To qualify for this treatment the positions must be based on the same underlying instrument, be of the same nominal value, and be denominated in the same currency. The separate sides of different swaps may also be ''matched'' subject to the same conditions. In addition:

i. For futures, offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical instruments and the instruments must mature within seven days of each other;

ii. For swaps and FRAs, the reference rate (for floating rate positions) must be identical and the coupon closely matched (i.e., within 15 basis points); and

iii. For swaps, FRAs and forwards, the next interest reset date, or for fixed coupon positions or forwards the remaining maturity, must correspond within the following limits: If the reset (remaining maturity) dates occur within one month, then the reset dates must be on the same day; if the reset dates occur between one month and one year later, then the reset dates must occur within seven days of each other, or if the reset dates occur over one year later, then the reset dates must occur within thirty days of each other.

g. Interest rate and currency swaps, FRAs, forward foreign exchange contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on a short-term (e.g., LIBOR) interest rate index. However, in the case of futures contracts where the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge will apply according to the category of the issuer as set out in section IV.A.2. of this appendix E.

B. Equities

1. *Specific risk.* The measure of specific risk is calculated on the basis of the banking organization's gross equity positions, that is, the absolute sum of all long equity positions and of all short equity positions at current market value.[33] The specific risk capital requirement is 8.0 percent of that sum, unless the portfolio is both liquid and well-diversified, in which case the specific risk capital requirement is 4.0 percent of the gross equity position. A specific risk charge of 2.0 percent applies to the net long or short position in a broad, diversified equity index and is viewed as necessary to provide for risks associated with contract execution.[34]

2. *General Market risk.* The measure of general market risk is based on the difference between the sum of the long positions and the sum of the short positions (i.e., the overall net position in an equity market) at current market value. An overall net position must be separately calculated for each national market in which the banking organization holds equities. The capital requirement for general market risk is 8.0 percent of the net position in each equity market.

3. *Equity derivatives.* a. Equity derivatives and other off-balance-sheet positions that are affected by changes in equity prices are included in the measurement system under section IV.B. of this appendix E (except for equity options, equity index options, and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix E).[35] This includes futures and swaps on both

[30] For example, a long position in a June three-month interest rate future (taken in April) is reported as a long position in a government security with a maturity of five months and a short position in a government security with a maturity of two months.

[31] For example, an interest rate swap under which a banking organization is receiving floating-rate interest and paying fixed is treated as a long position in a floating rate instrument with a maturity equivalent to the period until the next interest reset date and a short position in a fixed-rate instrument with a maturity equivalent to the remaining life of the swap.

[32] A banking organization with a large swap book may, with prior approval of the Federal Reserve, use alternative formulae to calculate the positions to be included in the maturity or duration ladder. For example, a banking organization could first convert the payments required by the swap into present values. For that purpose, each payment would be discounted using zero coupon yields, and the payment's present value entered into the appropriate time-band using procedures that apply to zero (or low) coupon bonds. The net amounts would then be treated as bonds, and slotted into the general market risk framework. Such alternative treatments will, however, only be allowed if: (i) the Federal Reserve is fully satisfied with the accuracy of the system being used, (ii) the positions calculated fully reflect the sensitivity of the cash flows to interest rate changes; and (iii) the positions are denominated in the same currency.

[33] Matched positions in each identical equity in each national market may be treated as offsetting and excluded from the capital calculation, with any remaining position included in the calculations for specific and general market risk. For example, a future in a given equity may be offset against an opposite cash position in the same equity.

[34] A portfolio that is liquid and well-diversified is characterized by a limited sensitivity to price changes of any single equity issue or closely related group of equity issues held in the portfolio. The volatility of the portfolio's value should not be dominated by the volatility of any individual equity issue or by equity issues from any single industry or economic sector. In general, such portfolios should be characterized by a large number of individual equity positions, with no single position representing a large portion of the portfolio's total market value. In addition, it would generally be the case that a sizable proportion of the portfolio would be comprised of issues traded on organized exchanges or in well-established over-the-counter markets.

[35] Where equities are part of a forward contract (both equities to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be appropriately included in the measurement system in sections IV.A. and IV.C. of this appendix E.

individual equities and on equity indices. Equity derivatives should be converted into notional equity positions in the relevant underlying. A summary of the rules for equity derivatives is set out in Attachment III to this appendix E.

b. Futures and forward contracts relating to individual equities should be reported at current market prices of the underlying. Futures relating to equity indices should be reported as the marked-to-market value of the notional underlying equity portfolio. Equity swaps are treated as two notional positions, with the receiving side as the long position and the paying side as the short position.[36] If one of the legs involves receiving/paying a fixed or floating interest rate, the exposure should be slotted into the appropriate repricing maturity band for debt securities. The stock index is covered by the equity treatment.

c. In the case of futures-related arbitrage strategies, the 2.0 percent specific risk charge applicable to broad diversified equity indices may be applied to only one index. The opposite position is exempt from a specific risk charge. The strategies qualifying for this treatment are:

i. When the banking organization takes an opposite position in exactly the same index at different dates; and

ii. When the banking organization has an opposite position in different but similar indices at the same date, subject to supervisory oversight.

d. If a banking organization engages in a deliberate arbitrage strategy, in which a futures contract on a broad diversified equity index matches a basket of securities, it may exclude both positions from the standardized approach on condition that the trade has been deliberately entered into and separately controlled and the composition of the basket of stocks represents at least 90 percent of the market value of the index. In such a case, the minimum capital requirement is 4.0 percent (that is, 2.0 percent of the gross value of the positions on each side) to reflect risk associated with executing the transaction. This applies even if all of the securities comprising the index are held in identical proportions. Any excess value of the securities comprising the basket over the value of the futures contract or excess value of the futures contract over the value of the basket is treated as an open long or short position.

e. If a banking organization takes a position in depository receipts[37] against an opposite position in the underlying equity, it may offset the position.

C. Foreign Exchange Risk

1. The capital requirement for foreign exchange risk covers the risk of holding or taking positions in foreign currencies, including gold, and is based on a banking organization's net open long positions or net open short positions in each currency, whether or not those positions are in the trading portfolio, plus the net open position in gold, regardless of sign.[38]

2. A banking organization's net open position in each currency (and gold) is calculated by summing:

a. The net spot position (i.e., all asset items less all liability items, including accrued interest earned but not yet received and accrued expenses, denominated in the currency in question);

b. All foreign exchange derivative instruments and other off-balance-sheet positions that are affected by changes in exchange rates are included in the measurement system under section IV.C. of this appendix E (except for options and their associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix E). Forward currency positions should be valued at current spot market exchange rates. For a banking organization in which the basis of its normal management accounting is to use net present values, forward positions may be discounted to net present values as an acceptable way of measuring currency positions for regulatory capital purposes;

c. Guarantees (and similar instruments) that are certain to be called and are likely to be irrevocable;

d. Net future income/expenses not yet accrued but already fully hedged (at the discretion of the banking organization). A banking organization that includes future income and expenses must do so on a consistent basis without selecting expected future flows in order to reduce the banking organization's position; and

e. Any other item representing a profit or loss in foreign currencies.

3. For measuring a banking organization's open positions, positions in composite currencies, such as the ECU, may be either treated as a currency in their own right or split into their component parts on a consistent basis. Positions in gold are measured in the same manner as described in section IV.D. of this appendix E.[39]

4. The capital requirement is determined by converting the nominal amount (or net present value) of the net open position in each foreign currency (and gold) at spot rates into the reporting currency. The capital requirement is 8.0 percent of the sum of:

a. The greater of the sum of the net short open positions or, the sum of the net long open positions; and

b. The net open position in gold, regardless of sign.[40]

5. Where a banking organization is assessing its foreign exchange risk on a consolidated basis, it may be technically impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the banking organization. In such cases, the internal limit in each currency may be used as a proxy for the positions, provided there is adequate ex post monitoring of actual positions complying with such limits. In these circumstances, the limits should be added, regardless of sign, to the net open position in each currency.

D. Commodities Risk.

1. *Measurement methods.* This section provides a minimum capital requirement to cover the risk of holding or taking positions in commodities. There are two methods under the standardized approach for measuring commodity market risk—the simplified method and the maturity method. These methods are only appropriate for banking organizations that conduct a limited amount of commodities business. All other banking organizations must adopt an internal measurement system conforming to the criteria in section III. of this appendix E.

2. *Base capital requirement.* Under both the simplified and maturity methods, each long and short commodity position (spot and forward) is expressed in terms of the standard unit of measurement (such as barrels, kilos, or grams). The open positions in each category of commodities are then converted at current spot rates into U.S. currency, with long and short positions offset to arrive at the net open position in each commodity. Positions in different categories of commodities may not, generally, be offset.[41] Under either method, the base capital requirement is 15.0 percent of the net open position, long or short, in each commodity.[42]

3. *Simplified method.* To protect a banking organization against basis risk, interest rate risk, and forward gap risk, each category of commodity is also subject to a 3.0 percent capital requirement on the banking organization's gross positions, long plus short, in the particular commodity. In

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[36] For example, an equity swap in which a banking organization is receiving an amount based on the change in value of one particular equity or equity index and paying a different index will be treated as a long position in the former and a short position in the latter.

[37] Depository receipts are instruments issued by a trust company or other depository institution evidencing the deposit of foreign securities and facilitating trading in such instruments on U.S. stock exchanges.

[38] Gold is treated as a foreign exchange position rather than a commodity because its volatility is more in line with foreign currencies and banking organizations manage it in a manner similar to foreign currencies.

[39] Where gold is part of a forward contract (quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be included in the measurement system in section IV.A. (as a zero coupon instrument) and IV.C. of this appendix E.

[40] For examples, a banking organizations has the following net currency positions: Yen=+50, DM=+100, GB=+150, FFR=−20, US$=−180, and gold=−35. The banking organization would sum its long positions (total=+300) and sum its short positions (total=−200). The banking organization's capital requirement for foreign exchange market risk would be: (300 (the larger of the summed long and short positions) + 35 (gold))×8.0%=26.80.

[41] However, offsetting is permitted between different sub-categories of the same commodity in cases where the sub-categories are deliverable against each other.

[42] When the funding of a commodity position opens a banking organization to interest rate or foreign exchange exposure the relevant positions should be included in the measures of interest rate and foreign exchange risk described in section IV.A. and IV.C of this appendix E. When a commodity is part of a forward contract, any interest or foreign currency exposure from the other side of the contract should be appropriately included in the measurement systems in sections IV.A. and IV.C. of this appendix E.

valuing gross positions in commodity derivatives for this purpose, a banking organization should use the current spot price. The total capital requirement for commodities risk is the sum of the 15.0 percent base charges for each net commodity position and the 3.0 percent requirements on the gross commodity positions.

4. *Maturity method*. a. Under this method, a banking organization must slot each long and short commodity position (converted into U.S. currency at current spot rates) into a maturity ladder. The time-bands for the maturity ladder are; from zero to one month, one up to three months, three up to six months, six up to twelve months, one up to two years, two up to three years, and over three years. A separate maturity ladder is used for each category of commodity. Physical commodities are allocated to the first time-band.

b. In order to capture forward gap and interest rate risk within a time-band (together sometimes referred to as curvature/spread risk), offsetting long and short positions in each time-band are subject to an additional capital requirement. Beginning with the shortest-term time-band and continuing with subsequent time-bands, the amount of the matched short positions plus the amount of the matched long position is multiplied by a spread rate of 1.5 percent.

c. The unmatched net position from shorter-term time-bands must be carried forward to offset exposures in longer-term time-bands. A capital requirement of 0.6 percent of the net position carried forward is added for each time-band that the net position is carried forward.[43] The total capital requirement for commodities risk is the sum of the 15.0 percent base capital requirement for each net commodity position and the additional requirements for matched positions and for unmatched positions carried forward. An example of this calculation is in Attachment IV to this appendix E.

5. *Commodity derivatives*. Commodity derivatives and other off-balance-sheet positions that are affected by changes in commodity prices are included in the measurement system under section IV.D. of this appendix E (except for options and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix E). Commodity derivatives are converted into notional commodity positions. Under the maturity method, the positions are slotted into maturity time-bands as follows:

a. Futures and forward contracts relating to individual commodities are incorporated in the measurement system as notional amounts (of, for example, barrels or kilos) that are converted to U.S. dollars at current spot rates and are assigned a maturity according to expiration date;

b. Commodity swaps where one side of the contract is a fixed price and the other side is the current market price are incorporated as a series of positions equal to the notional amount of the contract at current spot rates, with one position corresponding to each payment on the swap and slotted in the maturity ladder accordingly. The positions are long positions if the banking organization is paying a fixed price and receiving a floating price, and short positions if the banking organization is receiving a fixed price and paying a floating price;[44] and

c. Commodity swaps where the sides of the transaction are in different commodities are included in the relevant reporting ladder. No offsetting is allowed unless the commodities are in the same sub-category.

E. Options

1. Three alternatives are available for a banking organization to use in measuring its market risk for options activities. A banking organization that only has purchased options may use the simplified method set forth in section IV.E.2. of this appendix E. A banking organization that also writes options may use the scenario method described in section IV.E.3. of this appendix E or the delta-plus method set forth in section IV.E.4. of this appendix E.[45] These methods may only be used by banking organizations which, in relative terms, have limited options activities. Banking organizations with more significant options business are expected to adopt an internal measurement system conforming to the criteria in section III. of this appendix E. Regardless of the method used, specific risk related to the issuer of an instrument still applies to options positions for equities, equity indices and corporate debt securities as set forth in sections IV.A. and IV.B. of this appendix E. There remains a separate capital requirement for counterparty credit risk as set forth in appendix A to this part.

2. Under the simplified and scenario methods, the positions for the options and the associated underlying, cash or forward, are not included in the measurement framework for debt securities, equities, foreign exchange or commodities risk as set forth in sections IV.A. through IV.D. of this appendix E. Rather, they are subject to capital requirements as calculated in this section. The capital requirements calculated under this section IV.E. should then be added to the capital requirements for debt securities, equities, foreign exchange and commodities risk as appropriate. Under the delta-plus method, the delta equivalent position[46] for each option is included in the measurement frameworks set forth in sections IV.A. through IV.D. of this appendix E.

3. A banking organization that has only a limited amount and range of purchased options may use the following simplified approach to measure its market risk exposure.

a. For a banking organization with a long cash position and a long put or with a short cash position and a long call, the capital requirement is the market value of the underlying instrument multiplied by the sum of the specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this appendix E.[47]), less the amount the option is in the money (if any) bounded at zero.[48]

b. For a banking organization with a long call or a long put, the capital charge is the lesser of:

i. The market value of the underlying security multiplied by the sum of specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this appendix E[49]); or

ii. The market value of the option.

c. Under this measure, the capital requirement for currency options is 8.0 percent of the market value of the underlying and for commodity options is 15.0 percent of the market value of the underlying.

4. Under the scenario approach, a banking organization revalues its options and related hedging positions by changing the underlying rate or price over a specified range and by assuming different levels of volatility for that rate or price.

a. For each of its option portfolios, a banking organization constructs a grid based on a fixed range of changes in the portfolio's risk factors and calculates changes in the value of the option portfolio at each point within the grid. For this purpose, an option portfolio consists of an option and any related hedging positions or multiple options and related hedging positions that are grouped together according to their remaining maturity or the type of underlying.

b. Options based on interest rates and debt instruments are grouped into portfolios according to the maturity zones that are set forth in section IV.A. of this appendix E. (Zone 1 instruments have a remaining maturity of up to 1 year, zone 2 instruments

[43] For example, if $200 short is carried forward from the 3–6 month time-band to the 1–2 year time-band, the capital charge would be $200 × .006 × 2 = $2.40.

[44] If one of the sides of the transaction involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing maturity band in section IV.A. of this appendix E.

[45] Unless all their written option positions are hedged by perfectly matched long positions in exactly the same options, in which case there is no capital requirement for market risk.

[46] The delta equivalent of an option is the option's delta value multiplied by its principal or notional value. The delta value of an option represents the expected change in the option's price as a proportion of a small change in the price of the underlying instrument. For example, an option whose price changes $1 for every $2 dollar change in the price of the underlying instrument has a delta of 0.50.

[47] Some options (e.g., where the underlying is an interest rate, a currency, or a commodity) bear no specific risk but specific risk will be present in the case of options on corporate debt securities and for options on equities and equity indices.

[48] For example, if a holder of 100 shares currently valued at $10 each has an equivalent put option with a strike price of $11, the capital charge would be: $1,000×16.0 percent (e.g., 8.0 percent specific plus 8.0 percent general market risk) = $160, less the amount the option is in the money ($11 − $10)×100 = $100, i.e., the capital charge would be $60. A similar methodology applies for options whose underlying is a foreign currency, a debt security or a commodity.

[49] See footnote 47 in section IV.E.3.a of this appendix E.

have a remaining maturity from 1 year up to 4 years, and zone 3 instruments have a remaining maturity of 4 years or more.) These options and the associated hedging positions should be evaluated under the assumption that the relevant interest rates move simultaneously. For options based on equities, separate grids are constructed for each individual equity issue and index. For options based on exchange rates, separate grids are constructed for individual exchange rates. For options based on commodities, separate grids are constructed for each category of commodity (as defined in sections I.B.3. and IV.D. of this appendix E).

c. For option portfolios with options based on equities, exchange rates, and commodities, the first dimension of the grid consists of rate or price changes within a specified range above and below the current market value of the underlying; for equities, the range is ± 12.0 percent (or in the case of an index ± 8.0 percent), for exchange rates the range is ± 8.0 percent, and for commodities the range is ± 15.0 percent. For option portfolios with options based on interest rates, the range for the first dimension of the grid depends on the remaining maturity zone. The range for zone 1 is ± 100 basis points, the range for zone 2 is ± 90 basis points, and the range for zone 3 is ± 75 basis points. For all option portfolios, the range is divided into at least ten equally spaced intervals. The second dimension of each grid is a shift in the volatility of the underlying rate or price equal to ± 25.0 percent of the current volatility.[50]

d. For each assumed volatility and rate or price change (a scenario), the banking organization revalues each option portfolio. The market risk capital requirement for the portfolio is the largest loss in value from among the scenario revaluations. The total market risk capital requirement for all option portfolios is the sum of the individual option portfolio capital requirements.

e. The Federal Reserve will review the application of the scenario approach, particularly regarding the precise way the analysis is constructed. A banking organization using the scenario approach should meet the appropriate qualitative criteria set forth in section III.B. of this appendix E.

5. Under the delta-plus method, a banking organization that writes options may include delta-weighted options positions within each measurement framework as set forth in sections IV.A. through IV.D. of this appendix E.

a. Options positions should be measured as a position equal to the market value of the underlying instrument multiplied by the delta. In addition, a banking organization must measure the sensitivities of the option's gamma (the change of the delta for a given change in the price of the underlying) and vega (the sensitivity of the option price with respect to a change in volatility) to calculate the total capital requirement. These sensitivities may be calculated according to an exchange model approved by the Federal Reserve or to the banking organization's own options pricing model, subject to review by the Federal Reserve.

b. For options with debt instruments or interest rates as the underlying instrument, delta-weighted options positions should be slotted into the debt instrument time-bands in section IV.A. of this appendix E using a two-legged approach (as is used for other derivatives), requiring one entry at the time the underlying contract takes effect and one at the time the underlying contract matures.[51] Floating rate instruments with caps or floors should be treated as a combination of floating rate securities and a series of European-style options.[52] A banking organization must also calculate the gamma and vega for each such option position (including hedge positions). The results should be slotted into separate maturity ladders by currency. For options such as caps and floors whose underlying instrument is an interest rate, the delta and gamma should be expressed in terms of a hypothetical underlying security. Subsequently:

i. For gamma risk, for each time-band, net gammas that are negative are multiplied by the risk weights set out in Table IV in section IV.E.5.b.iv. of this appendix E and by the square of the market value of the underlying instrument (net positive gammas may be disregarded);

ii. For volatility risk, a banking organization calculates the capital requirements for vega in each time-band assuming a proportional shift in volatility of ± 25.0 percent;

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk for each time-band; and

iv. The delta plus method risk weights are:

TABLE IV.—DELTA PLUS METHOD RISK WEIGHTS

Time-band	Modified duration (average assumed for time band)	Assumed interest rate change (%)	Risk-weight for gamma[1]
Under 1 month	0.00	1.00	0.00000
1 up to 3 months	0.20	1.00	0.00020
3 up to 6 months	0.40	1.00	0.00080
6 up to 12 months	0.70	1.00	0.00245
1 up to 2 years	1.40	0.90	0.00794
2 up to 3 years	2.20	0.80	0.01549
3 up to 4 years	3.00	0.75	0.02531
4 up to 5 years	3.65	0.75	0.03747
5 up to 7 years	4.65	0.70	0.05298
7 up to 10 years	5.80	0.65	0.07106
10 up to 15 years	7.50	0.60	0.10125
15 up to 20 years	8.75	0.60	0.13781
Over 20 years	10.00	0.60	0.18000

[1] According to the Taylor expansion, the risk weights are calculated as ½ (modified duration × assumed interest rate change)[2] 100.

c. For options with equities as the underlying, delta-weighted option positions should be incorporated in the measure of market risk set forth in section IV.B. of this appendix E. Individual equity issues and indices should be treated as separate underlyings. In addition to the capital requirement for delta risk, a banking

[50] For example, if the underlying in an equity instrument with a current market value of $100 and a volatility of 20 percent, the first dimension of the grid would range from $88 to $112, divided into ten intervals of $2.40 and the second dimension would assume volatilities of 15 percent, 20 percent, and 25 percent.

[51] For example, in April, a purchased call option on a June three-month interest-rate future would be considered on the basis of its delta-equivalent value to be a long position with a maturity of five months and a short position with a maturity of two months. The written option would be slotted as a long position with a maturity of two months and a short position with a maturity of five months.

[52] For example, the holder of a three-year floating rate bond indexed to six-month LIBOR with a cap of 15 percent would treat the bond as a debt security that reprices in six months, and a series of five written call options on a FRA with a strike rate of 15 percent, each slotted as a short position at the expiration date of the option and as a long position at the time the FRA matures.

organization should apply a further capital charge for gamma and vega risk:

i. For gamma risk, the net gammas that are negative for each underlying are multiplied by 0.72 percent (in the case of an individual equity) or 0.32 percent (in the case of an index as the underlying) and by the square of the market value of the underlying;

ii. For volatility risk, a banking organization calculates the capital requirement for vega for each underlying, assuming a proportional shift in volatility of ±25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the individual capital requirements for vega risk.

d. For options of foreign exchange and gold positions, the net delta (or delta-based) equivalent of the total book of foreign currency and gold options is incorporated into the measurement of the exposure in a single currency position as set forth in section IV.C. of this appendix E. The gamma and vega risks should be measured as follows:

i. For gamma risk, for each underlying exchange rate, net gammas that are negative are multiplied by 0.32 percent and by the square of the market value of the positions;

ii. For volatility risk, a banking organization calculates the capital requirements for vega for each currency pair and gold assuming a proportional shift in volatility of ± 25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

e. For options on commodities, the delta-weighted positions are incorporated in one of the measures described in section IV.D. of this appendix E. In addition, a banking organization must apply a capital requirement for gamma and vega risk:

i. For gamma risk, net gammas that are negative for each underlying are multiplied by 1.125 percent and by the square of the market value of the commodity;

ii. For volatility risk, a banking organization calculates the capital requirements for vega for each commodity assuming a proportional shift in volatility of +/− 25.0 percent; and

iii. The capital requirement is the absolute value of the sum of the individual capital requirements for net negative gammas plus the absolute value of the sum of the individual capital requirements for vega risk.

f. Under certain conditions and to a limited extent, the Federal Reserve may permit banking organizations that are significant traders in options with debt securities or interest rates as the underlying to net positive and negative gammas and vegas across time-bands. Such netting must be based on prudent and conservative assumptions and the banking organization must materially meet the qualitative standards set forth in section III.B. of this appendix E.

g. A banking organization may base the calculation of vega risk on a volatility ladder in which the implied change in volatility varies with the maturity of the option. The assumed proportional shift in volatility must be at least +/- 25.0 percent at the short end of the maturity spectrum. The proportional shift for longer maturities must be at least as stringent instatistical terms as the 25.0 percent shift at the short end.

h. A banking organization should also monitor the risks of rho (the rate of change of the value of the option with respect to the interest rate) and theta (the rate of change of the value of the option with respect to time).

Attachments to Appendix E

Attachment I—Sample Calculation of Eligible Tier 1, Tier 2, and Tier 3 Capital for the Risk-Based Capital Ratio Adjusted for Market Risk

a. In each example the weighted-risk assets are $8000 and the market risk-adjusted assets are $625 (capital requirement for market risk = $50, $50 x 12.5 = $625):

Example 1: A banking organization has the following qualifying capital: Tier 1 = $600, Tier 2 = $100, Tier 3 = $1000.

(1) The minimum capital requirement for credit risk is $640 ($8000 x 8.0%). This requirement could be satisfied with $540 of Tier 1 capital and $100 of Tier 2 capital.

(2) The remaining capital available for market risk would be: Tier 1 = $60, Tier 2 = 0, and Tier 3 = $1000. The minimum capital requirement for market risk is $50 ($625 x 8.0%). Eligible Tier 3 capital would be limited to $125 ($50 x 2.5).

(3) The Tier 1 capital required to support market risk could be satisfied by allocating $14 ($50 x .285), with eligible Tier 3 capital used for market risk being $36 ($50 − $14).

(4) Total qualifying and eligible capital would be: $540 (Tier 1) + $100 (Tier 2) + $60 (Tier 1, comprising $14 allocated for market risk and $46 unallocated) + $36 (Tier 3) = $736. The banking organization's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $736/$8,625) = 8.5%.

Example 2: A banking organization has the following qualifying capital: Tier 1 = $500, Tier 2 = $140, Tier 3 = $600.

(1) The minimum capital requirement for credit risk is $640 ($8000 x 8.0%). This requirement could be satisfied with $500 of Tier 1 capital and $140 of Tier 2 capital.

(2) The remaining capital available for market risk would be: Tier 1 = 0, Tier 2 = $0, and Tier 3 = $600. Eligible Tier 3 capital would be limited to $0 (0 x 2.5). Because there is no Tier 1 capital required to support market risk, no eligible Tier 3 capital may be used for market risk.

(3) Total qualifying and eligible capital would be: $500 (Tier 1) + $140 (Tier 2) = $640. The banking organization's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $640/$8,625) = 7.4%.

b. In both of the examples described in paragraph a. of this attachment the total of Tier 2 and Tier 3 capital for credit and market risk is not greater than 100 percent of Tier 1 capital for credit and market risk and the total of Tier 2 capital for credit risk is not greater than 100 percent of Tier 1 capital for credit risk.

Attachment II—Sample Calculation of General Market Risk for Debt Instruments Using the Maturity Method

a. A banking organization with the following positions would slot them into a maturity ladder as shown below:

i. Qualifying bond, $13.33mn market value, remaining maturity 8 years, coupon 8%;

ii. Government bond, $75mn market value, remaining maturity 2 months, coupon 7%;

iii. Interest rate swap, $150mn, banking organization receives floating rate interest and pays fixed, next interest reset after 12 months, remaining life of swap is 8 years (assumes the current interest rate is identical to the one the swap is based on); and

iv. Long position in interest rate future, $50mn, delivery date after 6 months, life of underlying government security is 3.5 years (assumes the current interest rate is identical to the one the swap is based on).

Zone	Time-band and position	Risk wght (%)	Risk-weighted position	Net time-band positions	Net zone positions
1	10–1 mth	0.00			
	1–3 mth Long 75 Gov.bond	0.20	Long 0.15	Long 0.15	Long 1.00
	3–6 mt Short 50 Future	0.40	Short 0.20	Short 0.20	
	6–12 mths Long 150 Swap	0.70	Long 1.05	Long 1.05.	
2	1–2 yrs	1.25			
	2–3 yrs	1.75			
	3–4 yrs Long 50 Future	2.25	Long 1.125	Long 1.125	Long 1.125
3	4–5 yrs	2.75			
	5–7 yrs	3.25			
	7–10 yrs Short 150 Swap Long 13.13 Qual Bond	3.75	Short 5.625 Long 0.50	Short 5.125	Short 5.125
	10–15 yrs	4.50			

Zone	Time-band and position	Risk wght (%)	Risk-weighted position	Net time-band positions	Net zone positions
	15–20 yrs	5.25			
	over 20 yrs	6.00			

b. A vertical disallowance would be calculated for time-band 7–10 years. It would be 10 percent of the matched positions in the time-band—10.0x0.5=0.05 ($50,000).

c. A horizontal disallowance would be calculated for zone 1. It would be 40 percent of the matched positions in the zone—40.0x0.20=0.80 ($80,000). The remaining net position in Zone 1 would be +1.00 .

d. A horizontal disallowance would be calculated for adjacent zones 2 and 3. It would be 40 percent of the matched positions between the zones—40.0x1.125=0.45 (450,000). The remaining position in zone 3 would be −4.00.

e. A horizontal disallowance would be calculated between zones 1 and 3. It would be 100 percent of the matched positions between the zones—100x1.00=1.00 (1,000,000).

f. The remaining net open position for the banking organization would be 3.00 ($3,000,000).

The total capital requirement for general market risk for this portfolio would be:

The vertical disallowance	$50,000
Horizontal disallowance in zone 1	80,000
Horizontal disallowance between zones 2 and 3	450,000
Horizontal disallowance between zones 1 and 3	1,000,000
The overall net open position	3,000,000
Total requirement for general market risk	4,580,000

Attachment III—Summary of Treatment for Interest Rate and Equity Derivatives

SUMMARY OF TREATMENT FOR INTEREST RATE DERIVATIVES

Instrument	Specific risk charge	General market risk charge
Exchange-Traded Future:		
Government security	No	Yes, as two positions.
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates (e.g. LIBOR)	No	Yes, as two positions.
OTC Forward:		
Government security	No	Yes, as two positions.
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates	No	Yes, as two positions.
FRAs, Swaps	No	Yes, as two positions.
Forward foreign exchange	No	Yes, as one position in each currency.
Options:		
Government security	No	For each type of transaction, either:
Corporate debt security	Yes	(a) Carve out together with the associated hedging positions
Index on short-term interest rates	No	—simplified method—scenario analysis—internal models, or
		(b) General market risk charge according to the Delta-plus method (gamma and vega receive separate capital charges)

NOTE: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

SUMMARY OF TREATMENT FOR EQUITY DERIVATIVES

Instrument	Specific risk charge	General market risk charge
Exchange-Traded or OTC Future:		
Individual equity	Yes	Yes, as underlying.
Index	2.0%	Yes, as underlying.
Options:		
Individual equity	yes	For each type of transactions either:
Index	2.0%	(a) Carve out together with the associated hedging positions
		—simplified method—scenario approach—internal models, or
		(b) General market risk requirement according to the Delta-plus method (gamma and vega receive separate capital charges).

NOTE: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

Attachment IV—Sample Calculation of Standardized Approach for Commodities Risk

Time band	Position	Spread rate	Capital calculation	Capital charge
0 up to 1 month	None			
1 up to 3 months	None			
3 up to 6 months	Long 800	1.5%	800 long+800 short (matched)×1.5%=	24
	Short 1000		200 Short carried forward to 1–2 yrs, capital charge: 200×2×0.6%=.	24
6 up to 12 months	None.			
1 up to 2 yrs	Long 600		200 long+200 short (matched)×1.5%=	6

Time band	Position	Spread rate	Capital calculation	Capital charge
			400 long carried forward to over 3 yrs capital charge: 400×2×0.6%=.	4.8
2 up to 3 yrs	None			
over 3 years	Short 600		400 long+400 short (matched)+1.5%=	12
			Net position: 200 capital charge: 200×15.0%=	30

NOTE: Assume all positions are in the same commodity and converted at current spot rates into U.S. dollars. The total capital requirement would be $79.2.

Attachment V—Sample Calculation for Delta-Plus Method for Options

a. Assume a banking organization has a European short call option on a commodity with an exercise price of 490 and a market value of the underlying 12 months from the expiration of the option at 500; a risk-free interest rate at 8% per annum, and the volatility at 20 percent. The current delta for this position is according to the Black-Scholes formula −0.721 (that is, the price of the option changes by −0.721 if the price of the underlying moves by 1). The gamma is −0.0034 (that is, the delta changes by −0.0034 from −0.721 to −0.7244 if the price of the underlying moves by 1). The current value of the option is 65.48.

b. The first step under the delta-plus method is to multiply the market value of the commodity by the absolute value of the delta. 500×0.721=360.5. The delta-weighted position is then incorporated into the measure described in section IV.D. of this Appendix E. If the banking organization uses the maturity approach and no other positions exist, the delta-weighted position is multiplied by 0.15 to calculate the capital requirement for delta. 360.5×0.15=54.075.

c. The capital requirement for gamma is calculated according to the Taylor expansion by multiplying the absolute value of the assumed gamma of −0.0034 by 1.125% and by the square of the market value of the underlying. $0.0034 \times 0.0125 \times 500^2 = 10.625$

d. The capital requirement for vega is calculated next. The assumed current (implied) volatility is 20%. Since only an increase in volatility carries a risk of loss for a short call option, the volatility has to be increased by a relative shift of 25%. This means that the vega capital requirement has to be calculated on the basis of a change in volatility of 5 percentage points from 20% to 25% in this example. According to the Black-Scholes formula used here, the vega equals 168. Thus, a 1% or 0.01 increase in volatility increases the value of the option by 1.68. Accordingly, a change in volatility of 5 percentage points increases the value of 5×1.68=8.4. This is the capital requirement for vega risk. The total capital requirement would be $73.10 (54.075+10.625+8.4).

By Order of the Board of Governors of the Federal Reserve System, July 12, 1995.

William W. Wiles,

Secretary of the Board.

FEDERAL DEPOSIT INSURANCE CORPORATION

12 CFR Chapter III

For the reasons indicated in the preamble, the FDIC Board of Directors hereby proposes to amend part 325 of chapter III of Title 12 of the Code of Federal Regulations as follows:

PART 325—CAPITAL MAINTENANCE

1. The authority citation for part 325 continues to read as follows:

Authority: 12 U.S.C. 1815(a), 1815(b), 1816, 1818(a), 1818(b), 1818(c), 1818(t), 1819(Tenth), 1828(c), 1828(d), 1828(i), 1828(n), 1828(o), 1831o, 3907, 3909, 4808; Pub. L. 102–233, 105 Stat. 1761, 1789, 1790 (12 U.S.C. 1831n note); Pub. L. 102–242, 105 Stat. 2236, 2355, 2386 (12 U.S.C. 1828 note).

2. Appendix A to part 325 is amended in the introductory text, by adding a new paragraph after the third undesignated paragraph to read as follows:

Appendix A to Part 325—Statement of Policy on Risk-Based Capital

* * * * *

In addition, when certain banks that engage in trading activities calculate their risk-based capital ratio under this appendix A, they must also refer to appendix C of this part, which incorporates capital charges for certain market risks into the risk-based capital ratio. When calculating their risk-based capital ratio under this appendix A, such banks are required to refer to appendix C of this part for supplemental rules to determine qualifying and eligible capital, calculate risk-weighted assets, calculate market-risk equivalent assets and add them to risk- weighted assets, and calculate risk-based capital ratios adjusted for market risk.

* * * * *

3. A new appendix C is added to part 325 to read as follows:

Appendix C to Part 325—Risk-Based Capital for State Non-Member Banks: Market Risk

(i) The Federal Deposit Insurance Corporation (FDIC) has adopted a framework to supplement the risk-based capital requirements set out in appendix A of this part with capital requirements for the market risk exposure of state non-member banks.[1] For this purpose, market risk refers to the risk of losses in a bank's on- and off-balance-sheet positions arising from movements in market prices. The market risks subject to these capital requirements are those associated with debt and equity instruments held in the bank's trading account, as well as foreign exchange risk and commodities risk throughout the bank, including options and other derivative contracts in each risk category. As is further detailed in section II of this appendix C, debt and equity instruments and commodities positions subject to the measure for market risk under this appendix C are generally excluded from the calculation of risk-weighted assets under appendix A of this part.

(ii) This appendix C provides two ways for a bank to determine its exposure to market risk. A bank may use its internal risk measurement model, subject to the conditions and criteria set forth in section III of this appendix C (referred to as the internal models approach), or when appropriate, a bank may use all or portions of the alternative measurement system described in section IV of this appendix C (referred to as the standardized approach).

(iii) With prior approval from the FDIC, for regulatory capital purposes, a bank may use its internal risk measurement model to measure its value-at-risk[2] for each of the following risk factor categories: interest rates, exchange rates, equity prices, and commodity prices. The value-at-risk amount for each risk factor category should include volatilities of related options. The value-at-risk amount for each risk factor category is summed to determine the aggregate value-at- risk for the bank.

(iv) The standardized approach uses a set of standardized calculations and assumptions to measure market risk exposure depending on its source: debt instruments, equities, foreign currencies, and commodities, including volatilities of related options.[3]

[1] The market risk measure is based on a framework developed jointly by supervisory authorities from the countries represented on the Basle Committee on Banking Supervision (Basle Supervisors Committee) and endorsed by the Group of Ten Central Bank Governors. The framework is described in a paper prepared by the Basle Supervisors Committee entitled ''Proposal to issue a Supplement to the Basle Capital Accord to Cover Market Risks''. April 1995.

[2] A bank evaluates its current positions and estimates future market volatility through a value-at-risk measure, which is an estimate representing, with a certain degree of statistical confidence, the maximum amount by which the market value of trading positions could decline during a specific period of time. The value-at-risk is generated through an internal model that employs a series of market risk factors (for example, market rates and prices that affect the value of trading positions).

[3] There are three alternatives for measuring the market risk of options under the standardized approach. Under two of the alternatives, the

Continued

(v) The FDIC generally expects any bank that is subject to this appendix C, especially those with large trading accounts, to compute the measure for market risk by using internal risk-measurement models. A bank may not change its measurement approach for the purpose of minimizing capital requirements. In limited instances, on a case-by-case basis, the FDIC may permit a bank that has internal models to incorporate alternative measures for market risk of negligible exposures (for example, *de minimis* positions, activities in remote locations, minor exposures in a currency, or activities that present negligible risk to the bank), so long as it adequately captures the risk.

(vi) The FDIC will monitor the implementation and effect of these guidelines in relation to domestic and international developments in the banking industry. When necessary and appropriate, the FDIC will consider the need to modify this appendix C in light of any significant changes in the economy, financial markets, banking practices, or other relevant factors.

I. Scope of the Market Risk Capital Requirement

A. Banks Subject to This Appendix C

1. Effective December 31, 1997, this appendix C will be applied to any FDIC-insured state-chartered bank that is not a member of the Federal Reserve System (excluding insured branches of foreign banks) and that, on a consolidated basis, either:

a. Has total assets in excess of $5 billion, and:

i. Has a total volume of trading activities (measured as the sum of the bank's trading assets and liabilities[4] on a daily average basis for the quarter) that is 3.0 percent or more of the total assets of the bank; or

ii. Has interest rate, foreign exchange, equity, and commodity off-balance-sheet derivative contracts relating to trading activities whose total notional amounts exceed $5 billion; or

b. Has total assets of $5 billion or less and has a total volume of trading activities exceeding 10.0 percent of the total assets of the bank.

2. Such banks identified in paragraph 1 (hereinafter referred to as ''banks''), when calculating their risk-based capital ratio under appendix A of this part, are required to refer to this appendix C for supplemental rules to determine their qualifying and eligible capital, calculate risk-weighted assets, calculate market-risk equivalent assets and add them to risk-weighted assets, and calculate risk-based capital ratios adjusted for market risk.[5]

B. Market Risks Subject to a Capital Requirement

1. *General Market Risk and Specific Risk*. A bank must hold capital against exposure to general market risk and specific risk arising from its trading and other foreign exchange and commodity activities. For this purpose, general market risk refers to changes in the market value of covered transactions resulting from market movements, such as changing levels of market interest rates, broad equity indices, or currency exchange rates. Specific risk refers to credit risk, that is, the risk that the issuer of a debt or equity instrument might default, as well as to other factors that affect the market value of specific instruments but that do not materially alter market conditions.[6]

2. *Trading Activities*. a. The measure for market risk in trading activities is based on on- and off-balance-sheet positions in a bank's trading account. For this purpose, the trading account consists of positions in financial instruments acquired with the intent to resell in order to profit from short-term price movements (or other price or interest-rate variations), including, but not limited to:

i. Assets acquired with the intent to resell to customers;

ii. Positions in financial instruments arising from matched principal brokering and market making; or

iii. Positions taken in order to hedge other elements of the trading account (that is, reduce risk by offsetting other positions that have exposure to changes in market rates or prices).[7]

b. Trading account activities may include positions in debt instruments, equities, foreign currencies, and commodity instruments, or related derivative[8] or other off-balance-sheet contracts.

c. The debt instruments in the trading account category consists of all fixed-rate and floating-rate debt securities and instruments that behave like debt, including non-convertible preferred stock. Convertible bonds, i.e., preferred stock or debt issues that are convertible, at a stated price, into common shares of the issuer, should be treated as debt instruments if they trade like debt instruments and as equities if they trade like equities. Also included are derivative contracts of debt instruments and other off-balance-sheet instruments in the trading account that react to changes in interest rates (for example, forward rate agreements (FRAs), bond futures, interest rate and cross-currency swaps and forward foreign exchange positions). A security that has been sold subject to a repurchase agreement or lent subject to a securities lending agreement is treated as if it were still owned by the lender of the security, but the off-balance-sheet portion of the transaction remains an element of risk-weighted assets as set forth in section II. of appendix A of this part.

d. The equities in the trading account category consist of equity instruments that behave like equities. The instruments covered include common stocks (whether voting or non-voting), convertible securities that behave like equities, and commitments to buy or sell equity securities. Also included are derivative contracts of equity instruments and other off-balance-sheet instruments in the trading account that are affected by changes in equity prices. However, non-convertible preferred stock is included in debt instruments.

3. *Foreign Exchange and Commodities Risk*. Foreign exchange or commodities positions, whether or not included in a bank's trading account, are subject to a measure for market risk of those positions.

a. The measure for market risk of foreign exchange applies to a bank's total currency and gold positions. This includes spot positions (that is, asset items and liability items, including accrued interest and expenses, denominated in each currency); forward positions (that is, forward foreign exchange transactions, including currency futures and the principal on currency swaps not included in the spot position); and certain guarantees. It also includes future income and expenses from foreign currency transactions not yet accrued but already fully hedged (at the discretion of the reporting bank), foreign exchange derivative and other off-balance-sheet positions that are affected by changes in exchange rates, and any other item representing a profit or loss in foreign currencies.

b. A bank doing negligible business in foreign currency and that does not take foreign exchange positions for its own account may be exempted from the market risk measure for foreign exchange risk provided that:

i. Its foreign currency business, defined as the greater of the sum of its gross long positions and the sum of its gross short positions in all foreign currencies as determined under section IV.C.2 of this appendix C, does not exceed 100 percent of eligible capital as defined in section II. of this appendix C; and

ii. Its overall net open foreign exchange position as determined under section IV.C.3. of this appendix C does not exceed 2.0 percent of eligible capital.

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simplified and scenario methods, the underlying position of an option is ''carved-out,'' and is not included in the prescribed risk measure for the underlying debt, equity, foreign exchange or commodity. Instead it is evaluated together with the related option according to the procedures described for options to determine the capital requirement. Under the third alternative, the ''delta-plus'' approach, the delta-equivalent value of each position is included in the measurement framework for the prescribed risk measure for the underlying.

[4] As reflected in the bank's quarterly Consolidated Reports of Condition and Income (call report.)

[5] The FDIC may apply all or portions of this appendix C to other state non-members banks when deemed necessary for safety and soundness purposes.

[6] This appendix C does not impose specific risk capital requirements for foreign exchange risk and commodities positions because they do no have the type of issuer-specific risk associated with debt and equity instruments in the trading account.

[7] Subject to FDIC review, when on- or off-balance-sheet non-trading account instruments are deliberately used to hedge trading account instruments, the non-trading account instruments may be included in the measure for general market risk, but if so included, are not included in the measure for specific risk and instead remain an element of risk-weighted assets under section II of appendix A of this part. Instruments such as swaps used to hedge non-trading account activities should be excluded from the measure for market risk if they are not part of the trading account.

[8] In general terms, a derivative is a financial contract whose value is derived from the values of one or more underlying assets or reference rates or indexes of asset values (referred to as ''the underlying''). Derivatives include standardized contracts that are traded on exchanges and customized, privately negotiated contracts known as over-the-counter (OTC) derivatives.

c. A bank may, subject to approval by the FDIC, exclude from its foreign exchange positions any structural positions in foreign currencies. For this purpose, such structural positions are limited to transactions designed to hedge a bank's capital ratios against the effect of adverse exchange rate movements on subordinated debt, equity, or minority interests in consolidated subsidiaries and dotation capital assigned to foreign branches that are denominated in foreign currencies. Also included are any positions related to unconsolidated subsidiaries and to other items that are deducted from a bank's capital when calculating its capital base. In any event, such structural foreign currency positions must reflect long-term policies of the institution and not relate to trading positions.

d. The measure for market risk of commodities applies to a bank's total commodities positions, including commodity futures, commodity swaps, and all other commodity derivatives or other off-balance-sheet positions that are affected by changes in commodity prices. A commodity is defined as a physical product that is or can be traded on a secondary market (such as agricultural products, minerals (including oil), and precious metals), but excluding gold (which is treated as foreign exchange).

II. Qualifying Capital and the Market Risk-Adjusted Capital Ratio

A. Qualifying and Eligible Capital

1. The principal forms of qualifying capital for market risk are Tier 1 capital and Tier 2 capital as defined in, and subject to the conditions and limitations of, section I of appendix A of this part. A bank may use Tier 3 capital for the sole purpose of meeting a portion of the capital requirements for market risk. Tier 3 capital may be allocated only to support market-risk equivalent assets, and may in no event be allocated to support capital requirements associated with risk-weighted assets under appendix A of this part.

2. Tier 3 capital consists of short-term subordinated debt that is subject to a lock-in clause providing that neither interest nor principal payment is due (even at maturity) if such payment would cause the issuing bank to fall or remain below the minimum 8.0 percent risk-based capital requirement as set forth in appendix A of this part and adjusted for market risk.

3. In order to qualify as Tier 3 capital, the short-term debt must be unsecured, subordinated, and fully paid up; it must have an original maturity of at least two years; and it may not be redeemed before maturity without prior approval by the FDIC. In addition, it may not contain or be covered by any covenants, terms, or restrictions that are inconsistent with safe and sound banking practices.

B. Calculation of Eligible Capital and the Capital Ratio

A bank that is subject to the market risk measure must calculate its risk-based capital ratio and eligible capital as follows:

1. Determine total risk-weighted assets under appendix A of this part, excluding from risk-weighted assets:

a. All debt and equity instruments in the trading account required to be included under the measure for market risk, with the exception of over-the-counter derivatives or non-trading account instruments used to hedge trading account instruments and included in the measure for general market risk at the bank's option; and

b. All positions in commodities required to be included under the measure for market risk.

2. Calculate the total measure for market risk using the internal models approach, the standardized approach, or an approved combination of these two approaches:

a. *Internal Models.* i. For a bank approved to use the internal models approach under section III of this appendix C, the total measure for market risk is the higher of:

A. The bank's previous day's aggregate value-at-risk amount; or

B. An average of the daily aggregate value-at-risk amounts measured on each of the preceding 60 business days multiplied by a minimum ''multiplication factor'' of 3. The FDIC may adjust the multiplication factor for a bank to increase its capital requirement based on an assessment of the quality and historic accuracy of the bank's risk management system.

ii. Additionally, if a bank's internal model does not capture the specific risk of debt and equity instruments in the trading account,[9] the specific risk measure as calculated under the standardized approach may be added to the bank's measure for market risk.

b. *Standardized Approach.* A bank that has not obtained the FDIC's approval to use an internal model must use the standardized approach for measuring its market risk. For a bank using this approach, the total measure for market risk is the sum of the market risk measures for debt and equity instruments in the trading account, foreign exchange and commodities risk throughout the bank, and options and other derivative positions in each risk category as set forth in sections IV.A through IV.E. of this appendix C.

c. *Partial Models.* With approval from the FDIC, a bank whose internal model does not cover all risk factor categories may use the standardized approach for measuring market risk arising from the risk factor categories that are not covered. The FDIC will approve combining the two approaches only on a temporary basis in situations in which the institution is developing but has not fully implemented a comprehensive internal model. When a bank uses both approaches, each risk factor category (i.e., interest rates, equity prices, exchange rates, and commodity prices) must be measured using one or the other approach. The methods may not be combined within a single risk factor category. Once a bank adopts an acceptable internal model for a particular risk factor category, it may not revert to the standardized approach except in unusual circumstances and with the prior approval of the FDIC.[10] For a bank using a combination of approaches, the total measure for market risk is the sum of:

i. The appropriate value-at-risk measure (as determined in paragraph B.2.a. of this section, aggregating the value-at-risk measure for each risk factor category included in the internal model); and

ii. The measure for market risk for each risk factor category that is calculated using the standardized approach.

3. Calculate the market-risk equivalent assets by multiplying the total measure for market risk by 12.5 (i.e., the reciprocal of the 8.0 percent minimum risk-based capital ratio).

4. Add the market-risk equivalent assets to total risk-weighted assets (as determined in paragraph B.1. of this section). The sum of these two amounts is the denominator of the total risk-based capital ratio, adjusted for market risk.

5.a. In order to calculate eligible capital to be included in the numerator of the ratio, a bank must first allocate the qualifying Tier 1 and Tier 2 capital necessary to support total risk-weighted assets (as determined in paragraph B.1. of this section) in accordance with the terms and restrictions of section I of appendix A of this part, achieving at least the minimum supervisory ratio in section III. of appendix A of this part. Remaining Tier 1, eligible Tier 2, and eligible Tier 3 capital should then be allocated to support market-risk equivalent assets (as determined in paragraph B.3. of this section), achieving at least a minimum supervisory ratio of 8.0 percent, subject to the following restrictions:

i. Eligible Tier 3 capital may not exceed 250 percent of a bank's Tier 1 capital allocated for market risk;

ii. Tier 2 elements may be substituted for Tier 3 up to the same 250 percent limit, so long as the overall limits for Tier 2 capital set out in section I of appendix A of this part are not exceeded (i.e., Tier 2 capital may not exceed total Tier 1 capital, and long-term subordinated debt may not exceed 50 percent of Tier 1 capital); and

iii. The maximum eligible amount of Tier 2 and Tier 3 capital, summed together, may not exceed 100 percent of Tier 1 capital.

b. Eligible capital for the total risk-based capital ratio is then the sum of the bank's qualifying Tier 1 capital, its qualifying Tier 2 capital subject to the limits stated in this paragraph and eligible Tier 3 capital subject to the limits stated in this paragraph B.5.[11]

C. Consolidation and Reporting

1. The capital requirements for market risk apply to banks on a worldwide consolidated basis. The FDIC may, however, evaluate market risk on an unconsolidated basis when necessary (for example, when there are

[9] If a bank uses an internal model that measures specific risk of debt and equity instruments in the trading account, the measure should in no case be less than one-half the specific risk measure as calculated under the standardized approach (taking into account the effect of the multiplier under paragraph B.2.a.ii. of this section).

[10] Banks that have modeling capabilities are expected to use their internal models for measuring market risk for regulatory capital purposes. However, the FDIC may permit a bank to use another measurement technique for *de minimis* positions, activities in remote locations, minor exposures in a currency, or in activities that present negligible risk to the bank.

[11] Examples of the method used to calculate eligible capital are set forth in attachment I to this appendix C.

obstacles to the repatriation of profits from a foreign subsidiary or where management structure does not allow timely management of risk on a consolidated basis).

2. All transactions, including forward sales and purchases, should be included in the calculation of market risk capital requirements from the date on which they were entered into. Although banks subject to the capital requirements for market risk will continue to report their capital on a quarterly basis, the FDIC expects banks to meet their capital requirements for market risk on a continuous basis (that is, at a minimum, at the close of each business day).

3. The risk-based capital ratios adjusted for market risk are minimum supervisory ratios. The FDIC expects banks to operate with capital positions well above the minimum ratios. In all cases, banks should hold capital commensurate with the level and nature of the risks to which they are exposed.

III. The Internal Models Approach

A. Use of Models

1. With prior approval of the FDIC, a bank may use its internal risk measurement model(s) for measuring value-at-risk to be used as the measure for market risk.

a. Requests for approval should include, at a minimum, a complete description of the bank's internal modeling and risk management systems and how these systems conform to the criteria set forth in this section III, an explanation of the policies and procedures established by the bank to ensure continued compliance with such criteria, a discussion of internal and external validation procedures, and a description of other relevant policies and procedures consistent with sound practices.

b. The FDIC will approve an internal model for regulatory capital purposes only after determining that the bank's internal model and risk management systems meet the criteria in this section III. Such a determination may require on-site examinations of the systems. The FDIC may require modification to an internal model as deemed necessary to ensure compliance, on a continuing basis, with the provisions of this appendix C. A bank's internal model will be subject to continuing review, both on- and off-site, by the FDIC.[12]

2. A bank should ensure that the level of sophistication of its internal model is commensurate with the nature and volume of the bank's trading activity in the risk factor categories covered by this appendix C and measures market risk as accurately as possible. In addition, the model should be adjusted to reflect changing portfolio composition and changing market conditions.

B. Qualitative Criteria

1. A bank using the internal models approach should have market risk management systems that are conceptually sound and implemented with integrity. Internal risk measurement models must be closely integrated into the day-to-day risk management process of the bank. For example, the risk measurement model must be used in conjunction with internal trading and exposure limits.

2. A bank must meet the following minimum qualitative criteria before using its internal model as the measure for market risk:[13]

a. A bank must have a risk control unit that is independent from business trading units and reports directly to senior management of the bank. The unit must be responsible for designing and implementing the bank's risk management system and analyzing daily reports on the output of the bank's risk measurement model in the context of trading limits. The unit must conduct regular back-testing.[14]

b. Senior management must be actively involved in the risk control process. The daily reports produced by the risk management unit must be reviewed by a level of management with sufficient authority to enforce both reductions in positions taken by individual traders, as well as in the bank's overall risk exposure.

c. The bank must have a routine and rigorous program of stress-testing to identify the effect of low-probability events on the bank's trading portfolio. Bank stress-testing should cover a range of factors that can create extraordinary losses or gains in trading portfolios or make the control of risk in those portfolios difficult. These factors include low-probability events of all types, including the various components of market, credit, and operational risks. Senior management must routinely review the results of stress-testing in the context of the potential effect of the events on bank capital and the appropriate procedures the bank should take to minimize losses. The policies of the bank set by management and the bank's board of directors should identify appropriate stress-tests and the procedures to follow in response to the test results.

d. The bank must have established procedures for ensuring compliance with a documented set of internal policies and controls, as well as for monitoring the overall operation of the risk measurement system.

e. Not less than once a year, the bank must conduct, as part of its regular internal audit process, an independent review of the risk measurement system. This review must include both the activities of the business trading units and of the independent risk control unit of the bank.

f. Not less than once a year, the bank must conduct a review of its overall risk management process. The review must consider:

i. The adequacy of the documentation of the risk management system and process, and the organization of the risk control unit;

ii. The integration of market risk measures into daily risk management and the integrity of the management information system;

iii. The process the bank employs for approving risk pricing models and valuation systems that are used by front- and back-office personnel;

iv. The scope of market risks captured by the risk measurement model and the validation of any significant changes in the risk measurement process;

v. The accuracy and completeness of position data, the accuracy and appropriateness of volatility and correlation assumptions, and the accuracy of valuation and risk sensitivity calculations;

vi. The verification process the bank employs to evaluate the consistency, timeliness, and reliability of data sources used to run internal models, including the independence of such data sources; and

vii. The verification process the bank uses to evaluate back-testing that is conducted to assess the model's accuracy.

C. Market Risk Factors

1. *Generally*. For regulatory capital purposes, a bank's internal risk measurement system must use sufficient risk factors to capture the risks inherent in the bank's portfolio of on- and off-balance-sheet trading positions and must, subject to the following guidelines, cover interest rates, equity prices, exchange rates, commodity prices, and volatilities related to options positions in each risk factor category. The level of sophistication of the bank's risk factors must be commensurate with the nature and scope of the risks taken by the bank.

2. *Interest Rates*. a. A bank must use a set of market risk factors corresponding to interest rates in each currency in which it has material interest rate-sensitive on- or off-balance-sheet positions. The risk measurement system must model the yield curve [15] using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve must 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.

b. For significant exposures to interest rate movements in the major currencies and markets, a bank 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.[16] The risk measurement system must incorporate separate risk factors to capture spread risk.[17]

[12] Banks that need to modify their existing modeling procedures to accommodate the requirements of this appendix C should, nonetheless, continue to use the internal models they consider most appropriate in evaluating risks for other purposes.

[13] If the FDIC is not satisfied with the extent to which a bank meets these criteria, the FDIC may adjust the multiplication factor used in section II.B.2.a.ii. of this appendix C to determine the total measure for market risk or otherwise increase capital requirements.

[14] Back-testing includes *ex post* comparisions of the risk measures generated by the model against the actual daily changes in portfolio value.

[15] Generally, a yield curve is a graph showing the term structure of interest rates by plotting the yields of all instruments of the same quality by maturities ranging from the shortest to the longest available. The resulting curve shows whether short-term interest rates are higher or lower than long-term interest rates.

[16] For example, a bank that has 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 accurately capture interest rate risk.

[17] For these purposes, spread risk refers to the potential changes in value of an instrument or

3. *Exchange Rates.* A bank must use market risk factors corresponding to the exchange rate between the domestic currency and each foreign currency in which the bank has a significant exposure. The risk measurement system must incorporate market risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated.

4. *Equity Prices.* A bank must use risk factors corresponding to each of the equity markets in which it holds significant positions. The sophistication and nature of the modeling technique for a given market must correspond to the bank's exposure to the overall market as well as to the bank's concentration in individual equity issues in that market. At a minimum, there must be a risk factor designed to capture market-wide movements in equity prices (such as a market index), but additional risk factors could track various sectors or individual issues.

5. *Commodity Prices.* A bank must use market risk factors corresponding to each of the commodity markets in which it holds significant positions. The internal model must encompass directional risk, forward gap and interest rate risk, and basis risk.[18] The model should also take into account the market characteristics, for example, delivery dates and the scope provided to traders to close out positions.

D. Quantitative Standards

1. A bank may use one of a number of generally accepted measurement techniques including, for example, an internal model based on variance-covariance matrices, historical simulations, or Monte Carlo simulations, so long as the model employed captures all significant market risks.[19] The following minimum standards apply for purposes of using an internal model for calculating market risk capital requirements:

a. Value-at-risk must be calculated on a daily basis using a 99th percentile, one-tailed confidence interval[20] and the holding period must be ten trading days. For positions that display linear price characteristics, a bank may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days by the square root of time.[21]

b. Value-at-risk must be calculated using an observation period of at least one year to measure historical changes in rates and prices.

c. A bank must update its historical rates and prices at least once every three months and must reassess them whenever there is a change in market conditions of any significance.

2. A bank may use its discretion in recognizing empirical correlations within each market risk factor category, provided that the FDIC is satisfied that there is integrity in the bank's process for calculating correlations. However, empirical correlations among risk categories are not recognized. The value-at-risk measure for each risk category must be added together on a simple sum basis to determine the aggregate value-at-risk amount.

3. A bank's model must accurately capture the unique risks associated with options within each of the market risk factor categories. The following minimum criteria apply to the measurement of options risk:

a. A bank's internal model must capture the non-linear price characteristics of option positions using an options pricing technique. The bank must apply a minimum ten-day holding period to option positions or positions that display option-like characteristics. Banks may not scale-up the daily value-at-risk numbers by the square root of time.

b. A bank's internal model must, for example, capture the sensitivity of the value of the options positions to changes in the volatility of the options' underlying rates or prices (that is, the vega) and must measure the volatilities of options positions broken down by different maturities.

4. The accuracy of a bank's internal model will be reviewed periodically by the FDIC. Such review—during which, when appropriate, the FDIC may take into consideration reports and opinions generated by external auditors or qualified consultants—will include at a minimum:

a. Verification that the internal validation processes described in paragraph B.2. of this section are operating in a satisfactory manner;

b. Assurance that the formulae used in the calculation process and for the pricing of options and other complex instruments, are validated by a qualified unit of the bank, which in all cases must be independent from the trading areas;

c. Confirmation that the structure of the internal model is adequate with respect to the bank's activities and geographical coverage;

d. Confirmation that the results of the bank's back-testing of its internal measurement system (that is, comparing value-at-risk estimates with actual profits and losses) are being used effectively to monitor reliability of the model's estimates over time; and

e. Assurance that, for regulatory capital purposes, the model processes all relevant data and that the modeling procedures conform with the parameters and specifications set forth in this appendix C.

IV. The Standardized Approach

A. Debt Instruments

1. *Specific Risk.* a. The specific risk element of the measure for market risk is based on the identity of the obligor and, in the case of corporate securities, on the credit rating and maturity of the instrument. The specific risk element is calculated by weighting the current market value of each individual position, whether long or short, by the appropriate factor as set forth below and summing the weighted values. In determining specific risk, the bank may offset and exclude from its calculations any matched positions in the *identical* issue (including positions in derivatives). Even if the issuer is the same, no offsetting is permitted between different issues since differences in coupon rates, liquidity, call features, etc., mean that prices may diverge in the short run. The categories and factors are:

Category	Remaining maturity (contractual)	Factor (in percent)
Government ..	N/A	0.00
Qualifying	6 months or less.	0.25
	6 to 12 months.	1.00
	over 12 months.	1.60
Other	N/A	8.00

b. The *government* category consists of all forms of debt instruments of central governments of the OECD-based group of countries[22] including bonds, Treasury bills and other short-term instruments, as well as local currency instruments of non-OECD central governments to the extent that the bank has liabilities booked in that currency.

c. The *qualifying* category consists of securities of U.S. government-sponsored

portfolio arising from differences in the behavior of baseline yield curves, such as those for U.S. Treasury securities, and yield curves reflecting sector, quality, or instrument specific factors. A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other interest rates, such as specifying a completely separate yield curve for non-government instruments (for example, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.

[18] For these purposes, directional risk refers to the risk that a spot price will increase or decrease. Forward gap risk refers to the effects of owning a physical commodity versus owning a forward position in a commodity. Interest rate risk refers to the risk of a change in the cost of carrying forward positions and options. Basis risk refers to the risk that the relationship between the prices of similar commodities changes over time.

[19] For these purposes, a variance/covariance approach refers to an approach in which the change in value of the portfolio is calculated by combining the risk factor sensitivities of the individual positions—derived from valuation models—with a variance/covariance matrix based on risk factor volatilities and correlations. A bank using this approach would calculate the volatilities and correlations of the risk factors on the basis of the holding period and the observation period. The historical simulation approach refers to an approach in which a bank would calculate the hypothetical change in value of the current portfolio in light of historical movements in risk factors. This calculation would be done for each of the defined holding periods over a given historical measurement horizon to arrive at a range of simulated profits and losses. The Monte Carlo approach refers to an approach in which a bank would consider historical movements to determine the probability of particular price and rate changes.

[20] A one-tailed confidence interval of 99 percent means that there is a 1 percent probability based on historical experience that the combination of positions in a bank's portfolio would result in a loss higher than the measured value-at-risk.

[21] This transformation entails multiplying a bank's value-at-risk by the square root of the ratio of the required holding period (ten days) to the holding period embodied in the value-at-risk figure. For example, the value-at-risk calculated according to a one-day holding period would be scaled-up by the ''square root of time'' by multiplying the value-at-risk by 3.16 (the square root of the ratio of a ten-day holding period to a one-day holding period).

[22] As defined in section III.B. and III.C. of appendix A of this part.

agencies, general obligation securities issued by states and other political subdivisions of the OECD-based group of countries, multilateral development banks, and debt instruments issued by U.S. depository institutions or OECD-banks that do not qualify as capital of the issuing institution.[23] It also includes other securities, including revenue securities issued by states and other political subdivisions of the OECD-based group of countries, that are:

i. Rated investment-grade by at least two nationally recognized credit rating services, or rated investment-grade by one nationally recognized credit rating agency and not less than investment-grade by any other credit rating agency; or

ii. With the exception of securities issued by U.S. firms and subject to review by the FDIC, unrated but deemed to be of comparable investment quality by the reporting bank and issued by an entity which has securities listed on a recognized stock exchange.

d. The *other* category consists of debt securities not meeting the criteria for government or qualifying securities. This would include non-OECD central government securities that do not meet the criteria for the government or qualifying categories. This category also includes instruments that qualify as capital issued by other banking organizations.

e. The FDIC will consider the extent of a bank's position in non-investment grade instruments (sometimes referred to as ''high yield debt''). If those holdings are not well-diversified or otherwise represent a significant position to the institution, the FDIC may prevent a bank from offsetting positions in these instruments with other positions in qualifying instruments that may be offset when calculating its general market risk element. In addition, the FDIC may impose a specific risk factor as high as 16.0 percent.

2. *General Market Risk.* a. A bank may determine the general market risk element of the measure for market risk by using, on a continuous basis, either the maturity method (which uses standardized risk weights that approximate the price sensitivity of various instruments) or, subject to the FDIC's review, the duration method (in which the institution calculates the precise duration of each instrument, weighted by a specified change in interest rates).

b. Both methods use a maturity-ladder that incorporates a series of ''time bands'' and ''zones'' to group together securities of similar maturities and that are designed to take into account differences in price sensitivities and interest rate volatilities across different maturities. Under either method, the general market risk element is the sum of a base charge that results from fully netting various risk-weighted positions and a series of additional charges (add-ons), which effectively ''disallow'' part of the previous full netting to address basis and yield curve risk.

c. For each currency in which a bank has significant positions, a separate maturity ladder must be constructed. No netting of positions is permitted across different currencies. Offsetting positions of the same amount in the same issues, whether actual or notional, may be excluded from the calculation, as well as closely matched swaps, forwards, futures, and forward rate agreements (FRAs) that meet the conditions set out in paragraph A.3. of this section.

d. In the *maturity method,* the bank distributes each long or short position (at current market value) of a debt instrument into the time bands of the maturity ladder. Fixed-rate instruments are allocated according to the remaining term to maturity and floating-rate instruments according to the next repricing date. A callable bond trading above par is allocated according to its first call date, while a callable bond priced below par is allocated according to remaining maturity. Fixed-rate mortgage-backed securities, including collateralized mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs), are allocated according to their expected weighted average lives.

e. Once all long and short positions are allocated into the appropriate time band, the long positions in each time band are summed and the short positions in each time band are summed. The summed long and/or short positions are multiplied by the appropriate risk-weight factor (reflecting the price sensitivity of the positions to changes in interest rates) to determine the risk-weighted long and/or short position for each time band. The risk weights for each time band are set out in Table 1:

TABLE 1.—MATURITY METHOD: TIME BANDS AND WEIGHTS

Zone	Coupon 3% or more	Coupon less than 3 % and zero-coupon bonds	Risk weights
1	Up to 1 month	Up to 1 month	0.00
	1 up to 3 months	1 up to 3 months	0.20
	3 up to 6 months	3 up to 6 months	0.40
	6 up to 12 months	6 up to 12 months	0.70
2	1 up to 2 years	1 up to 1.9 years	1.25
	2 up to 3 years	1.9 up to 2.8 years	1.75
	3 up to 4 years	2.8 up to 3.6 years	2.25
3	4 up to 5 years	3.6 up to 4.3 years	2.75
	5 up to 7 years	4.3 up to 5.7 years	3.25
	7 up to 10 years	5.7 up to 7.3 years	3.75
	10 up to 15 years	7.3 up to 9.3 years	4.50
	15 up to 20 years	9.3 up to 10.6 years	5.25
	Over 20 years	10.6 up to 12 years	6.00
		12 up to 20 years	8.00
		Over 20 years	12.50

f. Next, within each time band for which there are risk-weighted long and short positions, the risk-weighted long and short positions are then netted, resulting in a single net risk-weighted long or short position for each time band. Since different instruments and different maturities may be included and netted within each time band, an addition to the risk measure, referred to as the vertical disallowance, is assessed to allow for basis risk. The vertical disallowance is 10.0 percent of the position eliminated by the intra-time band netting, that is, 10.0 percent of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, 10.0 percent of either position.[24] The vertical disallowances for each time band are absolute values, that is, neither long nor short. The vertical disallowances for all time bands in the maturity ladder are summed and included as an element of the general market risk element.

g. Next, within each zone for which there are risk-weighted long and short positions in different time bands, the weighted long and short positions in all of the time bands

[23] U.S. government-sponsored agencies, multilateral development banks, and OECD banks are defined in section III.C. of appendix A of this part.

[24] For example, if the sum of the weighted longs in a time band is $100 million and the sum of the weighted shorts is $90 million, the vertical disallowance for the time band is 10.0 percent of $90 million, or $9 million.

within the zone are then netted, resulting in a single net long or short position for each zone. Since different instruments and different maturities may be included and netted within each zone, an addition to the risk measure, referred to as the horizontal disallowance, is assessed to allow for the imperfect correlation of interest rates along the yield curve. The horizontal disallowance is calculated as a percentage of the position eliminated by the intra-zone netting, that is, a percentage of the smaller of the net risk-weighted long or net risk-weighted short position, or if the positions are equal, a percentage of either position.[25] The percent disallowance factors for intra-zone netting are set out in table 2. The horizontal disallowances, like the vertical disallowances, are absolute values that are summed and included as an element of the general market risk element.

h. Next, risk-weighted long and short positions in different zones are then netted between the zones. Zone 1 and zone 2 are netted if possible, reducing or eliminating the net long or short position in zone 1 or zone 2 as appropriate. Zone 2 and zone 3 are then netted if possible, reducing or eliminating the net long or short position in zone 2 or zone 3 as appropriate. Zone 3 and zone 1 are then netted if possible, reducing or eliminating the long or short position in zone 3 and zone 1 as appropriate. A horizontal disallowance is then assessed, calculated as a percentage of the position eliminated by the inter-zone netting. The horizontal disallowances for each zone are then summed as absolute values and included in the general market risk element. The percent disallowance factors for inter-zone netting are set out in Table 2:

TABLE 2.—HORIZONTAL DISALLOWANCES

Zone	Time band	Within the zone (percent)	Between adjacent zones (percent)	Between zones 1 & 3 (percent)
1	0–1 month	40	40	100
	1–3 months.			
	3–6 months.			
	6–12 months.			
2	1–2 years	30	40	100
	2–3 years.			
	3–4 years.			
3	1–5 years	30	40	100
	5–7 years.			
	7–10 years.			
	10–15 years.			
	15–20 years.			
	over 20 years.			

i. Finally, the net risk-weighted long or net risk-weighted short positions remaining in the zones are summed to reach a single net risk-weighted long or net risk-weighted short position for the bank's portfolio. The sum of the absolute value of this position and the vertical and horizontal disallowances is the general market risk element of the measure of market risk. An example of this calculation is in attachment II to this appendix.

j. In the *duration method,* the bank, after calculating each instrument's modified duration [26] using a formula that is subject to FDIC review, multiplies that modified duration by the interest rate shock specified for an instrument of that duration in table 3. The resulting product (representing the expected percentage change in the price of the instrument for the given interest rate shock) is then multiplied by the current market value of the instrument. The resulting amount is then allocated as a long or short position into a time band in the maturity ladder in table 3 on the basis of the instrument's modified duration.[27]

k. Once all of the bank's traded debt instruments have been allocated into the maturity ladder, the bank conducts the same rounds of netting and disallowances described in paragraphs A.2.f. through h. of the maturity method in this section, with the exception that the vertical disallowance requirement for the duration method is 5.0 percent. Horizontal disallowances continue to be those set out in table 2. As with the maturity method, the sum of the absolute value of the final net position and the vertical and horizontal disallowances is the general market risk element of the measure for market risk:

TABLE 3.—DURATION METHOD: TIME BANDS AND ASSUMED CHANGES IN YIELD

Zone	Time band	Assumed change in yield
1	Up to 1 month	1.00
	1 up to 3 months	1.00
	3 up to 6 months	1.00
	6 up to 12 months	1.00
2	1.0 up to 1.8 years	0.90
	1.8 up to 2.6 years	0.80
	2.6 up to 3.3 years	0.75
3	3.3 up to 4.0 years	0.75
	4.0 up to 5.2 years	0.70
	5.2 up to 6.8 years	0.65
	6.8 up to 8.6 years	0.60
	8.6 up to 9.9 years	0.60

TABLE 3.—DURATION METHOD: TIME BANDS AND ASSUMED CHANGES IN YIELD—Continued

Zone	Time band	Assumed change in yield
	9.9 up to 11.3 years ..	0.60
	11.3 up to 16.6 years	0.60
	Over 16.6 years 0.75 .	0.60

3. *Interest Rate Derivatives.* a. Debt derivatives and other off-balance-sheet positions that are affected by changes in interest rates are included in the measurement system under this section IV.A. (except for options and the associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix C). A summary of the treatment for debt derivatives is set out in Attachment III to this appendix C.

b. Derivatives are converted into positions in the relevant underlying instrument and are included in the calculation of the specific and general market risk elements. The amount to be included is the market value of the principal amount of the underlying or of

[25] For example, if the sum of the weighted longs in the 1–3 month time band in Zone 1 is $8 million and the sum of the weighted shorts in the 3–6 month time band is $10 million, the horizontal disallowance for the zone is forty percent of $8 million, or $3.2 million.

[26] The duration of an instrument is its approximate percentage change in price for a 100 basis point parallel shift in the yield curve assuming that its cash flow does not change when the yield curve shifts. Modified duration is duration divided by a factor of 1 plus the interest rate.

[27] For example, an instrument held by a bank with a maturity of 4 years and 3 months and a current market value of $1,000 might have a modified duration of 3.5 years. Based on its modified duration, it would be subjected to the 75-basis point interest rate shock, resulting in an expected price change of 2.625 percent (3.5×0.75). The corresponding expected change in price of $26.25, calculated as 2.625 percent of $1,000, would be slotted as a long position in the 3.3 to 4.0 year time band of the maturity ladder.

the notional underlying. If the apparent notional amount of an instrument differs from the effective notional amount, a bank must use the effective notional amount.

c. Futures and forward contracts (including FRAs) are broken down into a combination of a long position and short position in the notional security. The maturity of a future or a FRA is the period until delivery or exercise of the contract, plus the life of the underlying instrument.[28] If a range of instruments may be delivered to fulfill the contract, the bank may choose which deliverable instrument goes into the maturity or duration ladder as the notional underlying. In the case of a future on a corporate bond index, positions are included at the market value of the notional underlying portfolio of securities.

d. i. Swaps are treated as two notional positions in the relevant instruments with appropriate maturities. The receiving side is treated as the long position and the paying side is treated as the short position.[29] The separate sides of cross-currency swaps or forward foreign exchange transactions are allocated in the relevant maturity ladders for the currencies concerned. For swaps that pay or receive a fixed or floating interest rate against some other reference price, for example, an equity index, the long or short position attributable to the interest rate component is allocated into the appropriate repricing maturity category, with the long or short position attributable to the equity component being included in the equity framework set out in section IV.B. of this appendix C.

ii. A bank with a large swap book may, with prior approval of the FDIC, use alternative formulae to calculate the positions to be included in the maturity or duration ladder. For example, a bank could first convert the payments required by the swap into present values. For that purpose, each payment would be discounted using zero coupon yields, and the payment's present value entered into the appropriate time band using procedures that apply to zero (or low) coupon bonds. The net amounts would then be treated as bonds, and allocated into the general market risk framework. Such alternative treatments will, however, only be allowed if the FDIC is fully satisfied with the accuracy of the system being used; the positions calculated fully reflect the sensitivity of the cash flows to interest rate changes; and the positions are denominated in the same currency.

e. A bank may offset long and short positions (both actual and notional) in identical derivative instruments with exactly the same issuer, coupon, currency, and maturity before allocating these positions into time bands. A matched position in a future and its corresponding underlying may also be fully offset and, thus, excluded from the calculation, except when the future comprises a range of deliverable instruments. However, if, among the range of deliverable instruments, there is a readily identifiable underlying instrument that is most profitable for the trader with a short position to deliver, positions in the futures contract and the instrument may be offset. Positions in different currencies are not subject to offset.

f. Offsetting positions in the same category of instruments can in certain circumstances be regarded as matched and treated by the bank as a single net position which should be entered into the appropriate time band. To qualify for this treatment the positions must be based on the same underlying instrument, be of the same nominal value, and be denominated in the same currency. The separate sides of different swaps may also be ''matched'' subject to the same conditions. In addition:

i. For futures, offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical instruments and the instruments must mature within seven days of each other;

ii. For swaps and FRAs, the reference rate (for floating rate positions) must be identical and the coupon closely matched (i.e., within 15 basis points); and

iii. For swaps, FRAs and forwards, the next interest reset date, or for fixed coupon positions or forwards the remaining maturity, must correspond within the following limits: If the reset (remaining maturity) dates occur within one month, then the reset dates must be on the same day; if the reset dates occur between one month and one year later, then the reset dates must occur within seven days of each other, or if the reset dates occur over one year later, then the reset dates must occur within thirty days of each other.

g. Interest rate and currency swaps, FRAs, forward foreign exchange contracts and interest rate futures are not subject to a specific risk charge. This exemption also applies to futures on a short-term (e.g., LIBOR) interest rate index. However, in the case of futures contracts in which the underlying is a debt security, or an index representing a basket of debt securities, a specific risk charge will apply according to the category of the issuer as set out in paragraph A.2. of this section.

B. Equities

1. *Specific Risk.* The specific risk element of the measure for market risk is calculated on the basis of the bank's gross equity positions, that is, the absolute sum of all long equity positions and of all short equity positions at current market value. The risk measure is 8.0 percent of that sum, unless the portfolio is both liquid and well-diversified, in which case the specific risk measure is 4.0 percent of the gross equity position. A specific risk measure of 2.0 percent applies to the net long or short position in a broad, diversified equity index and is viewed as necessary to provide for risks associated with contract execution. A portfolio that is liquid and well-diversified is characterized by a limited sensitivity to price changes of any single equity issue or closely related group of equity issues held in the portfolio. The volatility of the portfolio's value should not be dominated by the volatility of any individual equity issue or by equity issues from any single industry or economic sector. In general, such portfolios should be characterized by a large number of individual equity positions, with no single position representing a large portion of the portfolio's total market value. In addition, it would generally be the case that a sizeable proportion of the portfolio would be comprised of issues traded on organized exchanges or in well-established over-the-counter markets.

2. *General Market Risk.* The general market risk element of the measure for market risk is calculated on the difference between the sum of the long positions and the sum of the short positions (i.e., the overall net position in an equity market) at current market value. An overall net position must be separately calculated for each national market in which the bank holds equities. The general market risk element is 8.0 percent of the net position in each equity market.

3. *Matched Positions.* Matched positions in each identical equity in each national market may be treated as offsetting and excluded from the capital calculation, with any remaining position included in the calculations for specific and general market risk. For example, a future in a given equity may be offset against an opposite cash position in the same equity.

4. *Equity Derivatives.* a. Equity derivatives and other off-balance-sheet positions that are affected by changes in equity prices are included in the measurement system under this section IV.B. (except for equity options, equity index options, and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix C).[30] This includes futures and swaps on both individual equities and on equity indices. Equity derivatives should be converted into notional equity positions in the relevant underlying. A summary of the rules for equity derivatives is set out in attachment III to this appendix C.

b. Futures and forward contracts relating to individual equities should be reported at current market prices of the underlying. Futures relating to equity indices should be reported as the marked-to-market value of the notional underlying equity portfolio. Equity swaps are treated as two notional positions, with the receiving side as the long position and the paying side as the short position.[31] If one of the legs involves receiving/paying a fixed or floating interest rate, the exposure should be allocated into the appropriate repricing maturity band for debt securities.

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[28] For example, a long position in a June three-month interest rate future (taken in April) is reported as a long position in a government security with a maturity of five months and a short position in a government security with a maturity of two months.

[29] For example, an interest rate swap under which a bank is receiving floating-rate interest and paying fixed is treated as a long position in a floating rate instrument with a maturity equivalent to the period until the next interest reset date and a short position in a fixed-rate instrument with a maturity equivalent to the remaining life of the swap.

[30] If equities are part of a forward contract (either equities to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be appropriately included in sections IV.A. and IV.C. of this appendix C.

[31] For example, an equity swap in which a bank is receiving an amount based on the change in value of one particular equity or equity index and paying a different index will be treated as a long position in the former and a short position in the latter.

The stock index is covered by the equity treatment.

c. In the case of futures-related arbitrage strategies, the 2.0 percent specific risk charge applicable to broad diversified equity indices may be applied to only one index. The opposite position is exempt from a specific risk charge. The strategies qualifying for this treatment are:

i. When the bank takes an opposite position in exactly the same index at different dates; or

ii. When the bank has an opposite position in different but similar indices at the same date, subject to FDIC review.

d. If a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broad diversified equity index matches a basket of securities, it may exclude both positions from the standardized approach on condition that the trade has been deliberately entered into and separately controlled and the composition of the basket of stocks represents at least 90 percent of the market value of the index. In such a case, the minimum measure for market risk is 4.0 percent (that is, 2.0 percent of the gross value of the positions on each side) to reflect risk associated with executing the transaction. This applies even if all of the securities comprising the index are held in identical proportions. Any excess value of the securities comprising the basket over the value of the futures contract or excess value of the futures contract over the value of the basket is treated as an open long or short position.

e. If a bank takes a position in depository receipts [32] against an opposite position in the underlying equity, it may offset the position.

C. Foreign Exchange Risk

1. The measure for market risk in foreign exchange covers the risk of holding or taking positions in foreign currencies, including gold, whether or not those positions are in the trading portfolio.[33] The measure is calculated as 8.0 percent of the sum of the greater of a bank's total net open long positions or net open short positions in each currency and the net open position in gold.

2. When calculating a bank's net open position in each currency and gold, positions in composite currencies, such as the ECU, may be either treated as a currency in their own right or split into their component parts on a consistent basis. Positions in gold (including futures and forwards) should be converted to U.S. currency at current spot rates. The bank's net open position in each currency is the sum of:

a. The net spot position (i.e., all asset items less all liability items, including accrued interest earned but not yet received and accrued expenses, denominated in the currency in question);

b. The net forward position.[34] All foreign exchange derivative instruments and other off-balance-sheet positions that are affected by changes in exchange rates are included in the measurement system under this section IV.C. (except for options and their associated underlyings, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix C). Forward currency positions should be valued at current spot market exchange rates, but for a bank in which the basis of its normal management accounting is to use net present values, forward positions may be discounted to net present values as an acceptable way of measuring currency positions for regulatory capital purposes;

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

d. At the discretion of the bank, net future income/expenses not yet accrued but already fully hedged. A bank that includes future income and expenses must do so on a consistent basis without selecting expected future flows in order to reduce the bank's position; and

e. Any other item representing a profit or loss in foreign currencies.

3. The measure for market risk of foreign exchange is determined by converting the net open position in each foreign currency at spot rates into U.S. currency. The risk measure is 8.0 percent of the overall net open foreign exchange position, which is determined by summing:

a. The greater of the sum of the net long open positions or, the sum of the net short open positions; and

b. The absolute value (that is, regardless of whether it is long or short) of the net open position in gold.[35]

4. If a bank is assessing its foreign exchange risk on a consolidated basis, it may be technically impractical in the case of some marginal operations to include the currency positions of a foreign branch or subsidiary of the bank. In such cases, the branch or subsidiary's internal limit in each currency may be used as a proxy for the positions, provided there is adequate *ex post* monitoring of actual positions complying with such limits. In these circumstances, the absolute value of the limits should be added to the net open position in each currency.

D. Commodities Risk

1. *Measurement Methods.* The measure for market risk in commodities is calculated by either the simplified method or the maturity method. These methods are only appropriate for banks that conduct a limited amount of commodities business. All other banks must adopt an internal model measurement system conforming to the criteria in section III. of this appendix C.

2. *Base Measure.* Under both the simplified and maturity methods, each long and short commodity position (spot or forward) is expressed in terms of the standard unit of measurement (such as barrels, kilos, or ounces). The positions are then converted at current spot rates into U.S. currency, with long and short positions in each category of commodities offset to arrive at the net open position in each commodity. Positions in different categories of commodities may not, generally, be offset. However, offsetting is permitted between different sub-categories of the same commodity if the sub-categories are deliverable against each other. Under the simplified or maturity method, the base measure for market risk is 15.0 percent of the absolute value (i.e., neither long nor short) of the net open position in each commodity.[36]

3. *Simplified Method.* To protect a bank against basis risk, interest rate risk, and forward gap risk, the measure of market risk under the simplified method includes an additional 3.0 percent of the bank's gross positions, long plus short, in each commodity. In valuing gross positions in commodity derivatives for this purpose, a bank should use the current spot price. The total measure for commodities risk is thus the sum of the 15.0 percent base charges for each net commodity position and the 3.0 percent requirements on the gross commodity positions.

4. *Maturity Method.* a. Under this method, a bank must allocate each long and short commodity position (converted into U.S. currency at current spot rates) into a maturity ladder with time bands as set out in table 4. A separate maturity ladder is used for each category of commodity. Physical commodities are allocated to the first time band:

TABLE 4.—COMMODITY TIME BANDS

Time Bands
0–1 month
1–3 months
3–6 months
6–12 months
1–2 years
2–3 years
Over 3 years

b. In order to capture forward gap and interest rate risk within a time band (together sometimes referred to as curvature/spread risk), offsetting long and short positions in each time band are subject to an additional charge. Beginning with the shortest-term time band and continuing with subsequent time bands, the amount of the matched short

[32] Generally, depository receipts are instruments issued by a trust company or other depository institution evidencing the deposit of foreign securities and facilitating trading in such instruments on U.S. stock exchanges.

[33] Gold is treated as a foreign exchange position rather than a commodity because its volatility is more in line with foreign currencies and banks manage it in a manner similar to foreign currencies.

[34] Where gold is part of a forward contract (quantity of gold to be received or to be delivered), any interest rate or foreign currency exposure from the other side of the contract should be reported as set out in section IV.A. (treating gold as a zero-coupon instrument) and this section.

[35] For example, a bank has the following net currency positions: Yen=+50, DM=+100, GB=+150, FFR=+−20, US$=−180, and gold=−35. The bank would sum its long positions (total=+300) and sum its short positions (total=−200). The bank's capital requirement for foreign exchange market risk would be: (300 (the larger of the summed long and short positions)+35 (gold))×8.0%=$26.80.

[36] When the funding of a commodity position opens a bank to interest rate or foreign exchange exposure the relevant positions should be included in the measures of interest rate and foreign exchange risk described in sections IV.A. and IV.C. of this appendix C. When a commodity is part of a forward contract, any interest or foreign currency exposure from the other side of the contract should be appropriately included in sections IV.A. and IV.C. of this appendix C.

positions plus the amount of the matched long position is multiplied by a spread rate of 1.5 percent.

c. The unmatched net position from shorter-term time bands must be carried forward to offset exposures in longer-term time bands. A charge of 0.6 percent of the net position carried forward is added for each time band that the net position is carried forward.[37] The total measure for commodities risk is the sum of the 15.0 percent base measurement for each net commodity position and the additional charges for matched positions and for unmatched positions carried forward. An example of this calculation is in attachment IV to this appendix C.

5. Commodity derivatives and other off-balance-sheet positions that are affected by changes in commodity prices are included in the measurement system under this section IV.D. (except for options and the associated underlying, which are included in the measurement system under the treatment discussed in section IV.E. of this appendix C). Commodity derivatives are converted into notional commodity positions. Under the maturity method, the positions are allocated in maturity time bands as follows:

a. Futures and forward contracts relating to individual commodities are incorporated in the measurement system as notional amounts (of, for example, barrels or kilos) that are converted to U.S. currency at current spot rates and are assigned a maturity according to expiration date;

b. Commodity swaps in which one side of the contract is a fixed price and the other side is the current market price are incorporated as a series of positions equal to the notional amount of the contract at current spot rates, with one position corresponding to each payment on the swap and allocated in the maturity ladder accordingly. The positions are long positions if the bank is paying a fixed price and receiving a floating price, and short positions if the bank is receiving a fixed price and paying a floating price; [38] and

c. Commodity swaps in which the sides of the transaction are in different commodities are included in the relevant reporting ladder. No offsetting is allowed unless the commodities are in the same sub-category.

E. Options

1. Three alternatives are available for a bank to use in measuring its market risk for options activities under the standardized approach. A bank that only has purchased options may use the simplified method set forth in paragraph E.2 of this section. A bank that also writes options may use the scenario method described in section IV.E.3., or the delta-plus method set forth in paragraph E.4. of this section.[39] These methods may only be used by banks which, in relative terms, have limited options activities. Banks with more significant options business are expected to adopt an internal measurement system conforming to the criteria in section III of this appendix C. Regardless of the method used, specific risk related to the issuer of an instrument still applies to options positions for equities, equity indices and corporate debt securities as set forth in sections IV.A. and IV.B. of this appendix C. Options remain an element of risk-weighted assets under section II of appendix A of this part.

2. Under the simplified and scenario methods, the positions for the options and the associated underlying, cash or forward, are not included in the measurement framework for debt securities, equities, foreign exchange or commodities risk as set forth in sections IV.A. through IV.D. of this appendix C. Rather, they are subject to the measure of market risk as calculated in this section. The risk measures calculated under this section should then be added to the risk measures for debt securities, equities, foreign exchange and commodities risk as appropriate. Under the delta-plus method, the delta equivalent position [40] for each option is included in the measurement frameworks set forth in sections IV.A. through IV.D. of this appendix C.

3. A bank that has only a limited amount and range of purchased options may use the following simplified approach to measure its market risk exposure.

a. For a bank with a long cash position and a long put or with a short cash position and a long call, the measure for market risk is the market value of the underlying instrument multiplied by the sum of the specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this appendix C [41]), less the amount the option is in the money (if any) bounded at zero.[42]

b. For a bank with a long call or a long put, the measure for market risk is the lesser of:

i. The market value of the underlying security multiplied by the sum of specific and general market risk requirements for the underlying (that is, the specific and general market risk requirements that would have applied to the underlying directly under sections IV.A. through IV.D. of this appendix C) [43]; or

ii. The market value of the option.

4. Under the scenario approach, a bank revalues its options and related hedging positions by changing the underlying rate or price over a specified range and by assuming different levels of volatility for that rate or price.

a. For each of its option portfolios, a bank constructs a grid based on a fixed range of changes in the portfolio's risk factors and calculates changes in the value of the option portfolio at each point within the grid. For this purpose, an option portfolio consists of an option and any related hedging positions or multiple options and related hedging positions that are grouped together according to their remaining maturity or the type of underlying.

b. Options based on interest rates and debt instruments are grouped into portfolios according to the maturity zones that are set forth in section IV.A. of this appendix C. (Zone 1 instruments have a remaining maturity of up to 1 year, zone 2 instruments have a remaining maturity from 1 year up to 4 years, and zone 3 instruments have a remaining maturity of 4 years or more.) These options and the associated hedging positions should be evaluated under the assumption that the relevant interest rates move simultaneously. For options based on equities, separate grids are constructed for each individual equity issue and index. For options based on exchange rates, separate grids are constructed for individual exchange rates. For options based on commodities, separate grids are constructed for each category of commodity (as defined in section IV.D. of this appendix C).

c. For option portfolios with options based on equities, exchange rates, and commodities, the first dimension of the grid consists of rate or price changes within a specified range above and below the current market value of the underlying. For equities, the range is ±12.0 percent (or in the case of an index ±8.0 percent); for exchange rates the range is ±8.0 percent; and for commodities the range is ±15.0 percent. For option portfolios with options based on interest rates, the range for the first dimension of the grid depends on the remaining maturity zone. The range for zone 1 is ±100 basis points, the range for zone 2 is ±90 basis points; and the range for zone 3 is ±75 basis points. For all option portfolios, the range is divided into at least ten equally spaced intervals. The second dimension of each grid is a shift in the volatility of the underlying rate or price equal to ±25.0 percent of the current volatility.[44]

d. For each assumed volatility and rate or price change (a scenario), the bank revalues

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[37] For example, if $200 short is carried forward from the 3–6 month time band to the 1–2 year time band, the capital charge would be $200×.006×2=$2.40.

[38] If one of the sides of the transaction involves receiving/paying a fixed or floating interest rate, that exposure should be allocated into the appropriate repricing maturity band in section IV.A. of this appendix C.

[39] Unless all their written option positions are hedged by perfectly matched long positions in exactly the same options, in which case there is no measure for market risk.

[40] The delta equivalent of an option is the option's delta value multiplied by its principal or notional value. The delta value of an option represents the expected change in the option's price as a proportion of a small change in the price of the underlying instrument. For example, an option whose price changes $1 for every $2 dollar change in the price of the underlying instrument has a delta of 0.50.

[41] Because some underlying instruments are not subject to a specific risk charge under sections IV.A through IV.D of this appendix C, such instruments will only be multiplied by the general market risk charge in making this calculation.

[42] For example, if a holder of 100 shares currently valued at $10 each has an equivalent put option with a strike price of $11, the risk measure would be: $1,000×16.0 percent (e.g., 8.0 percent specific plus 8.0 percent general market risk)=$160, less the amount the option is in the money ($11–$10)×100=$100, i.e., the measure for market risk would be $60. A similar methodology applies for options for which the underlying is a foreign currency, a debt security or a commodity.

[43] See footnote 41 in section IV.E.3.a. of this appendix C.

[44] For example, if the underlying in an equity instrument with a current market value of $100 and a volatility of 20 percent, the first dimension of the grid would range from $88 to $112, divided into ten intervals of $2.40 and the second dimension would assume volatilities of 15 percent, 20 percent, and 25 percent.

each option portfolio. The measure for market risk for the portfolio is the largest loss in value from among the scenario revaluations. The total measure for market risk for all option portfolios is the sum of the individual option portfolio measures.

e. The FDIC will review the application of the scenario approach, particularly regarding the precise way the analysis is constructed. A bank using the scenario approach should meet the appropriate qualitative criteria set forth in section III.B. of this appendix C.

5. Under the delta-plus method, a bank that writes options may include delta-weighted options positions within each measurement framework as set forth in sections IV.A. through IV.D. of this appendix C.

a. Options positions should be measured as a position equal to the market value of the underlying instrument multiplied by the delta. In addition, a bank must measure the sensitivities of the option's gamma (the change of the delta for a given change in the price of the underlying) and vega (the sensitivity of the option price with respect to a change in volatility) to calculate the measure for market risk. These sensitivities may be calculated according to an exchange model approved by the FDIC or to the bank's own options pricing model, subject to review by the FDIC.

b. For options with debt instruments or interest rates as the underlying instrument, delta-weighted options positions should be allocated into the debt instrument time bands in section IV.A. of this appendix C using a two-legged approach (as is used for other derivatives), requiring one entry at the time the underlying contract takes effect and one at the time the underlying contract matures.[45] Floating rate instruments with caps or floors should be treated as a combination of floating rate securities and a series of European-style options.[46] A bank must also calculate the gamma and vega for each such option position (including hedge positions). The results should be allocated into separate maturity ladders by currency. For interest rate options such as caps and floors, the delta and gamma should be expressed in terms of a hypothetical underlying security. Subsequently:

i. For gamma risk, for each time band, net gammas on short positions are multiplied by the risk weights set out in table 5 and by the square of the market value of the underlying instrument (net gammas on long positions may be disregarded);

ii. For volatility risk, a bank calculates the risk measure for vega in each time band assuming a proportional shift in volatility of ±25.0 percent;

iii. The measure for market risk is the absolute value of the sum of the individual measures for net gammas on short positions plus the absolute value of the sum of the individual measures for vega risk for each time band; and

iv. The delta plus method risk weights are:

TABLE 5.—DELTA PLUS METHOD RISK WEIGHTS

Time-band	Modified duration (average assumed for time band)	Assumed interest rate change (%)	Risk-weight for gamma[1]
Under 1 month	0.00	1.00	0.00000
1 up to 3 months	0.20	1.00	0.00020
3 up to 6 months	0.40	1.00	0.00080
6 up to 12 months	0.70	1.00	0.00245
1 up to 2 years	1.40	0.90	0.00794
2 up to 3 years	2.20	0.80	0.01549
3 up to 4 years	3.00	0.75	0.02531
4 up to 5 years	3.65	0.75	0.03747
5 up to 7 years	4.65	0.70	0.05298
7 up to 10 years	5.80	0.65	0.07106
10 up to 15 years	7.50	0.60	0.10125
15 up to 20 years	8.75	0.60	0.13781
Over 20 years	10.00	0.60	0.18000

[1] According to the Taylor expansion, the risk weights are calculated as ½ (modified duration x assumed interest rate change) [2]100.

c. For options with equities as the underlying, delta-weighted option positions should be incorporated in the measure of market risk set forth in section IV.B. of this appendix C. Individual equity issues and indices should be treated as separate underlyings. In addition to the measure for delta risk, a bank should apply a further charge for gamma and vega risk:

i. For gamma risk, the net gammas on short positions for each underlying are multiplied by 0.72 percent (in the case of an individual equity) or 0.32 percent (in the case of an index as the underlying) and by the square of the market value of the underlying;

ii. For volatility risk, a bank calculates the risk measure for vega for each underlying, assuming a proportional shift in volatility of ±25.0 percent; and

iii. The measure for market risk is the absolute value of the sum of the individual measures for net gammas on short positions plus the absolute value of the individual measures for vega risk.

d. For options on foreign exchange and gold positions, the net delta (or delta-based) equivalent of the total book of foreign currency and gold options is incorporated into the measurement of the exposure in a net open position in each currency as set forth in section IV.C. of this appendix C. The gamma and vega risks should be measured as follows:

i. For gamma risk, for each underlying exchange rate, net gammas on short positions are multiplied by 0.32 percent and by the square of the market value of the positions;

ii. For volatility risk, a bank calculates the risk measure for vega for each currency pair and gold assuming a proportional shift in volatility of ±25.0 percent; and

iii. The measure for market risk is the absolute value of the sum of the individual measures for net gammas on short positions plus the absolute value of the sum of the individual measures for vega risk.

e. For options on commodities, the delta-weighted positions are incorporated in one of the measures described in section IV.D. of this appendix C. In addition, a bank must apply a capital requirement for gamma and vega risk:

i. For gamma risk, net gammas on short positions for each underlying are multiplied by 1.125 percent and by the square of the market value of the commodity;

ii. For volatility risk, a bank calculates the risk measures for vega for each commodity assuming a proportional shift in volatility of ±25.0 percent; and

iii. The measure for market risk is the absolute value of the sum of the individual

[45] For example, in April a purchased call option on a June three-month interest-rate future would be considered on the basis of its delta-equivalent value to a long position with a maturity of five months and a short position with a maturity of two months. The written option would be allocated as a long position with a maturity of two months and a short position with a maturity of five months.

[46] For example, the holder of a three-year floating rate bond indexed to six-month LIBOR with a cap of 15 percent would treat the bond as a debt security that reprices in six months, and a series of five written call options on a FRA with a strike rate of 15 percent, each allocated as a short position at the expiration date of the option and as a long position at the time the FRA matures.

measures for net gammas on short positions plus the absolute value of the sum of the individual measures for vega risk.

f. Under certain conditions and to a limited extent, the FDIC may permit banks that are significant traders in options with debt securities or interest rates as the underlying to net gammas on long and short positions and vegas across time bands. Such netting must be based on prudent and conservative assumptions and the bank must materially meet the qualitative standards set forth in section III.B. of this appendix C.

g. A bank may base the calculation of vega risk on a volatility ladder in which the implied change in volatility varies with the maturity of the option. The assumed proportional shift in volatility must be at least ±25.0 percent at the short end of the maturity spectrum. The proportional shift for longer maturities must be at least as stringent in statistical terms as the 25.0 percent shift at the short end.

h. A bank should also monitor the risks of rho (the rate of change of the value of the option with respect to the interest rate) and theta (the rate of change of the value of the option with respect to time).

Attachments to Appendix C

Attachment I—Sample Calculation of Eligible Tier 1, Tier 2, and Tier 3 Capital for the Risk-Based Capital Ratio Adjusted for Market Risk

a. In each example the weighted-risk assets are $8000 and the market risk-adjusted assets are $625 (capital requirement for market risk=$50 $50×12.5=$625):

Example 1: A bank has the following qualifying capital: Tier 1=$600, Tier 2=$100, Tier 3=$1000.

(1) The minimum capital requirement for credit risk is $640 ($8000×8.0%). This requirement could be satisfied with $540 of Tier 1 capital and $100 of Tier 2 capital.

(2) The remaining capital available for market risk would be: Tier 1=$60, Tier 2=0, and Tier 3=$1000. The minimum capital requirement for market risk is $50 ($625×8.0%). Eligible Tier 3 capital would be limited to $125 ($50×2.5).

(3) The Tier 1 capital required to support market risk could be satisfied by allocating $14 ($50×.285), with eligible Tier 3 capital used for market risk being $36 ($50×$14).

(4) Total qualifying and eligible capital would be: $540 (Tier 1)+$100 (Tier 2)+$60 (Tier 1, comprising $14 allocated for market risk and $46 unallocated)+$36 (Tier 3)=$736. The bank's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $736/$8,625)=8.5%.

Example 2: A bank has the following qualifying capital: Tier 1=$500, Tier 2=$140, Tier 3=$600.

(1) The minimum capital requirement for credit risk is $640 ($8000×8.0%). This requirement could be satisfied with $500 of Tier 1 capital and $140 of Tier 2 capital.

(2) The remaining capital available for market risk would be: Tier 1=0, Tier 2=$0, and Tier 3=$600. Eligible Tier 3 capital would be limited to $0 (0×2.5). Because there is no Tier 1 capital required to support market risk, no eligible Tier 3 capital may be used for market risk.

(3) Total qualifying and eligible capital would be: $500 (Tier 1)+$140 (Tier 2)=$640. The bank's ratio of qualifying and eligible capital to weighted-risk assets adjusted for market risk would be: $640/$8,625)=7.4%

b. In both of the examples described in paragraph a. of this attachment the total of Tier 2 and Tier 3 capital for credit and market risk is not greater than 100 percent of Tier 1 capital for credit and market risk and the total of Tier 2 capital for credit risk is not greater than 100 percent of Tier 1 capital for credit risk.

Attachment II—Sample Calculation of General Market Risk for Debt Instruments Using the Maturity Method

a. A bank with the following positions would allocate them into a maturity ladder as shown below:

i. Qualifying bond, $13.33mn market value, remaining maturity 8 years, coupon 8%;

ii. Government bond, $75mn market value, remaining maturity 2 months, coupon 7%;

iii. Interest rate swap, $150mn, bank receives floating rate interest and pays fixed, next interest reset after 12 months, remaining life of swap is 8 years (assumes the current interest rate is identical to the one the swap is based on); and

iv. Long position in interest rate future, $50mn, delivery date after 6 months, life of underlying government security is 3.5 years (assumes the current interest rate is identical to the one the swap is based on).

Zone	Time band and position	Risk weight [%]	Risk-weighted position	Net time-band positions	Net zone positions
1	0–1 Month	0.00			
	1–3 Months	0.20	Long 0.15	Long 0.15	Long 1.00
	Long 75 Gov. Bond.				
	3–6 Months	0.40	Short 0.20	Short 0.20.	
	Short 50 Future.				
	6–12 Months	0.70	Long 1.05	Long 1.05.	
	Long 150 Swap.				
2	1–2 yrs	1.25			
	2–3 yrs	1.75			
	3–4 yrs	2.25	Long 1.125	Long 1.125	Long 1.125
	Long 50 Future.				
3	4–5 yrs	2.75			
	5–7 yrs	3.25			
	7–10 yrs	3.75	Short 5.625	Short 5.125	Short 5.125
	Short 150 Swap.				
	Long 13.33		Long 0.50.		
	Qual. Bond.				
	10–15 yrs	4.50			
	15–20 yrs	5.25			
	Over 20 yrs	6.00			

b. A vertical disallowance would be calculated for time band 7–10 years. It would be 10 percent of the positions eliminated by netting in the time band—10.0 x 0.5 = 0.05 ($50,000).

c. A horizontal disallowance would be calculated for zone 1. It would be 40 percent of the positions eliminated by netting in the zone—40.0 x 0.20 = 0.80 ($80,000). The remaining net position in zone 1 would be long 1.00.

d. A horizontal disallowance would be calculated for adjacent zones 2 and 3. It would be 40 percent of the positions eliminated by netting between the zones—40.0 x 1.125 = 0.45 ($450,000). The remaining position in zone 3 would be short 4.00.

e. A horizontal disallowance would be calculated between zones 1 and 3. It would be 100 percent of the positions eliminated by netting between the zones—100 x 1.00 = 1.00 ($1,000,000).

f. The remaining net open position for the bank would be 3.00 ($3,000,000). The total capital requirement for general market risk for this portfolio would be:

The vertical disallowance	$50,000
Horizontal disallowance in zone 1	80,000

The horizontal disallowance between zones 2 and 3	450,000
The horizontal disallowance between zones 1 and 3	1,000,000
The overall net open position	3,000,000
Total requirement for general market risk	$4,580,000

Attachment III—Summary of Treatment for Interest Rate and Equity Derivatives

SUMMARY OF TREATMENT FOR INTEREST RATE DERIVATIVES

Instrument	Specific risk charge	General market risk charge
Exchange-Traded Future:		
Government security	No	Yes, as two positions.
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates (e.g. LIBOR)	No	Yes, as two positions.
OTC Forward:		
Government security	No	Yes, as two positions.
Corporate debt security	Yes	Yes, as two positions.
Index on short-term interest rates	No	Yes, as two positions.
FRAs, Swaps	No	Yes, as two positions.
Forward foreign exchange	No	Yes, as one position in each currency.
Options:		
Government security	No	For each type of transaction, either:
Corporate debt security	Yes	(a) Carve out together with the associated hedging positions
Index on short-term interest rates	No	—simplified method —scenario analysis —internal models, or (b) General market risk charge according to the Delta-plus method (gamma and vega receive separate capital charges).

NOTE: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

SUMMARY OF TREATMENT FOR EQUITY DERIVATIVES

Instrument	Specific risk charge	General market risk charge
Exchange-Traded or OTC Future:		
Individual equity	Yes	Yes, as underlying.
Index	2.0%	Yes, as underlying.
Options:		
Individual equity	Yes	For each type of transactions either:
Index	2.0%	(a) Carve out together with the associated hedging positions —simplified method —scenario approach —internal models, or (b) General market risk requirement according to the Delta-plus method (gamma and vega receive separate capital charges).

NOTE: Specific risk charges relate to the issuer of the instrument. There remains a separate capital requirement for counterparty credit risk.

Attachment IV—Sample Calculation of Standardized Approach for Commodities Risk

Time-band	Position	Spread rate	Capital calculation	Capital charge
0 up to 1 month	None			
1 up to 3 months	None			
3 up to 6 months	Long 800	1.5%	800 long + 800 short (matched) × 1.5%=	24
	Short 1000		200 short carried forward to 1–2 yrs, capital charge: 200×2×0.6%=.	2.4
6 up to 12 months	None			
1 up to 2 yrs	Long 600		200 long + 200 short (matched) × 1.5%=	6
			400 long carried forward to over 3 yrs capital charge: 400×2×0.6%=.	4.8
2 up to 3 yrs	None			
Over 3 years	Short 600		400 long + 400 short (matched) × 1.5%=	12
			Net position: 200 capital charge: 200×15.0%=	30

NOTE: Assume all positions are in the same commodity and converted at current spot rates into U.S. dollars. The total capital requirement would be $79.2.

Attachment V—Sample Calculation for Delta-Plus Method for Options

a. Assume a bank has a European short call option on a commodity with an exercise price of 490 and a market value of the underlying 12 months from the expiration of the option at 500; a risk-free interest rate at 8% per annum, and the volatility at 20 percent. The current delta for this position is according to the Black-Scholes formula −0.721 (that is, the price of the option changes by −0.721 if the price of the underlying moves by 1). The gamma is −0.0034 (that is, the delta changes by

−0.0034 from −0.721 to −0.7244 if the price of the underlying moves by 1). The current value of the option is 65.48.

b. The first step under the delta-plus method is to multiply the market value of the commodity by the absolute value of the delta. 500×0.721=360.5. The delta-weighted position is then incorporated into the measure described in section IV.D. of this appendix C E. If the bank uses the maturity approach and no other positions exist, the delta-weighted position is multiplied by 0.15 to calculate the capital requirement for delta. 360.5×0.15=54.075.

c. The capital requirement for gamma is calculated according to the Taylor expansion by multiplying the absolute value of the assumed gamma of −0.0034 by 1.125% and by the square of the market value of the underlying. $0.0034 \times 0.0125 \times 500^2 = 10.625$.

d. The capital requirement for vega is calculated next. The assumed current (implied) volatility is 20%. Since only an increase in volatility carries a risk of loss for a short call option, the volatility has to be increased by a relative shift of 25%. This means that the vega capital requirement has to be calculated on the basis of a change in volatility of 5 percentage points from 20% to 25% in this example. According to the Black-Scholes formula used here, the vega equals 168. Thus, a 1% or 0.01 increase in volatility increases the value of the option by 1.68. Accordingly, a change in volatility of 5 percentage points increases the value of 5×1.68=8.4. This is the capital requirement for vega risk. The total capital requirement would be $73.10 (54.075+10.625+8.4).

By Order of the Board of Directors.

Dated at Washington, DC, this 11th day of July 1995.

Jerry L. Langley,

Executive Secretary.

[FR Doc. 95–17542 Filed 7–24–95; 8:45 am]

BILLING CODES 4810–33–P; 6210–01–P; 6714–01–P

FEDERAL RESERVE SYSTEM

12 CFR Chapter II

[Docket No. R–0886]

Capital Requirements for Market Risk

AGENCY: Board of Governors of the Federal Reserve System.

ACTION: Request for comments.

SUMMARY: The Board is requesting comment on a possible approach to setting capital requirements for market risk, which, if feasible, might form the basis for future enhancements to supervisory procedures. The approach would require a bank to specify the amount of capital it chose to allocate to support market risks. If cumulative losses over some subsequent trading interval exceeded the commitment, the bank would be subject to regulatory penalties, such as fines, higher capital requirements, or restrictions on trading activities. In theory, the penalties could be calibrated to ensure that capital allocations were consistent with supervisory objectives.

DATES: Comments must be submitted on or before November 1, 1995.

ADDRESSES: Comments should refer to Docket No. R–0886, and may be mailed to William W. Wiles, Secretary, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue, NW., Washington, D.C. 20551. Comments also may be delivered to Room B–2222 of the Eccles Building between 8:45 a.m. and 5:15 p.m. weekdays, or to the guard station in the Eccles Building courtyard on 20th Street NW. (between Constitution Avenue and C Street) at any time. Comments received will be available for inspection in Room MP–500 of the Martin Building between 9 a.m. and 5 p.m. weekdays, except as provided in 12 CFR 261.8 of the Board's rules regarding availability of information.

FOR FURTHER INFORMATION CONTACT: Patrick Parkinson, Associate Director (202–452–3526), or Paul Kupiec, Senior Economist (202–452–3723), or James O'Brien, Senior Economist (202–452–2384), Division of Research and Statistics; for users of the Telecommunications Device for the Deaf (TDD) only, Dorothea Thompson (202–452–3544); Board of Governors of the Federal Reserve System, Washington, D.C. 20551.

SUPPLEMENTARY INFORMATION: The Board is requesting comment on a proposed rulemaking that would amend its risk-based capital requirements to incorporate measures of market risk that have been developed by the Basle Committee on Banking Supervision. This proposed rule is published elsewhere in today's **Federal Register**, under Docket No. R–0884. The Board's publication of this proposed rulemaking reflects its judgment that the Basle proposal, especially the internal models option, constitutes a very significant improvement in supervisory methods for assessing capital adequacy.

Nonetheless, the Board believes that further evolution of supervisory approaches to assessing capital adequacy will be necessary over time. Techniques for measuring and managing market risk have been progressing rapidly in recent years, and further advances can be expected in the future. It is important that capital requirements provide incentives for such advances and that these requirements remain compatible with best practices as they evolve.

Recognizing the need for further evolution in supervisory approaches to capital adequacy, the Board is requesting comment on a novel approach, which has been termed the ''pre-commitment'' approach. While in theory this approach might offer significant advantages over existing alternatives, many of the practical details have not yet been worked out. The Board believes that public comments would be of great assistance in evaluating the overall feasibility of the approach and in identifying the most practical and effective means of implementing it. Public comments would also be of value in assessing whether future implementation of the proposal might have unintended consequences on banks or on financial markets.

I. Description of the Pre-Commitment Approach

The pre-commitment approach draws its inspiration from the economic literature on ''incentive-compatible'' regulatory schemes.[1] As in the internal models approach to market risk capital requirements that the Board has proposed, the regulatory objective is to require a bank to maintain sufficient capital to cover potential losses in its trading activities from all but the most extreme price movements.[2] The internal models approach seeks to ensure compliance with this objective by standardizing the parameters under which a bank would calculate the value at risk (VaR) of its trading portfolio and then applying a multiplication factor to each bank's calculated VaR, in part to cover potential losses over longer horizons. By contrast, the pre-commitment approach would seek to induce banks to meet the regulatory objective by providing them with a common set of economic incentives.

Specifically, in the pre-commitment approach a bank would specify its desired amount of capital for supporting market risks and would commit to manage its trading portfolio so as to limit any cumulative trading losses over some subsequent interval to an amount less than that capital allocation. The length of the interval would be established by the bank's regulator, based on the regulator's ability to

[1] The theory underlying the pre-commitment approach is presented in Paul H. Kupiec and James M. O'Brien, ''A Pre-Commitment Approach to Capital Requirements for Market Risk.'' Board of Governors of the Federal Reserve System, Division of Research and Statistics, staff memorandum, June 1995. This paper can be obtained from the Board's Freedom of Information Office.

[2] The scope of activities and banks that would be covered under a pre-commitment approach presumably would be the same as the scope of the proposed rulemaking on market risk that was referenced above.