AMENDMENT TO THE

CAPITAL ACCORD TO INCORPORATE

MARKET RISKS

Basle Committee on Banking Supervision

January 1996

Table of contents

Amendment to the Capital Accord[1] to incorporate market risks

INTRODUCTION

I. The risk measurement framework

1. As from the end of 1997, or earlier if their supervisory authority so prescribes, banks will be required to measure and apply capital charges in respect of their market risks in addition to their credit risks. Market risk is defined as the risk of losses in on and off-balance-sheet positions arising from movements in market prices. The risks subject to this requirement are:

- the risks pertaining to *interest rate related instruments* and *equities* in the trading book;

- *foreign exchange risk* and *commodities risk* throughout the bank.

(a) Scope and coverage of the capital charges

2. The capital charges for *interest rate related instruments* and *equities* will apply to the current market value of items in banks' trading books. The trading book means the bank's proprietary positions in financial instruments[2] which are intentionally held for short-term resale and/or which are taken on by the bank with the intention of benefiting in the short-term from actual and/or expected differences between their buying and selling prices, or from other price or interest-rate variations, and positions in financial instruments arising from matched principal brokering and market making, or positions taken in order to hedge other elements of the trading book.[3]

3. In many banks the trading activities are carried out in quite separate units from the normal banking activities and so it is possible to identify the business which falls within the trading book. Even where this is not the case, the trading activities tend to be readily identifiable because of their intent. In order, however, to obtain an accurate and fair measure of market risk, it will be necessary to allow banks some freedom (subject to close supervisory monitoring as defined in the paragraph below) to include within the market risk measure certain non-trading instruments on- or off-balance sheet, which are deliberately used to hedge the trading activities. These instruments as any other financial instruments which are not

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1   International Convergence of Capital Measurement and Capital Standards, July 1988.

2   Including positions in derivative products and off-balance-sheet instruments.

3   Committee members who are also members of the European Union regard this definition as being consistent, albeit in less detail, with the definition of the trading book in the EU's Capital Adequacy Directive.

integral to the trading book will, however, not be subject to the specific risk capital charges as set out in section A.1 but will remain subject to the credit risk capital requirements set out in the Capital Accord. On the other hand, there are often circumstances in which banks use, for example, derivative products such as swaps to hedge positions in their banking book. Such instruments qualifying in their own right normally to be a component of the trading book are, however, not part of the trading book and should, therefore, be excluded from the market risk measure but become subject to the credit risk capital requirements.

4.   The member countries of the Committee intend to monitor carefully the way in which banks allocate financial instruments between the trading book and other accounts and will seek to ensure consistent implementation through the examination process or other means. In particular, they will seek to ensure that no abusive switching designed to minimise capital charges occurs and will be vigilant in seeking to prevent "gains trading" in respect of securities which are not marked to market. This will also apply to the allocation of hedging instruments referred to in the previous paragraph, which may be either with external counterparties or as the result of internal transactions between the banking and trading books. In both cases, there must be a clear audit trail created at the time such transactions were entered into to enable supervisory authorities to monitor the bank's compliance with its established criteria by which items are allocated to the trading or banking book.

5.   To establish a relevant base for measuring the market risk in the trading book, all items should first be marked to market. In many countries, marking to market will be synonymous with the trading book; in these countries, therefore, the trading book may be defined as comprising all securities and associated derivatives that are marked to market. In some countries, however, accepted accounting procedures oblige banks to value at market prices some instruments that do not fall within the trading book. In others, even trading activities may be accounted for at book value or lower of cost and market, although for the purposes of measuring market risk they would be evaluated at market value.

6.   The capital charges for *foreign exchange risk* and for *commodities risk* will apply to banks' total currency and commodity positions, subject to some discretion to exclude structural foreign exchange positions. It is understood that some of these positions will be reported and hence evaluated at market value, but some may be reported and evaluated at book value.

7.   For the time being, the Committee does not believe that it is necessary to allow any de minimis exemptions from the capital requirements for market risk, except for those for foreign exchange risk set out in paragraph 13 of A.3, because the Capital Accord applies only to internationally active banks, and then essentially on a consolidated basis; all of these are likely to be involved in trading to some extent.

8.   In the same way as for credit risk, the capital requirements for market risk are to apply on a worldwide consolidated basis. Where appropriate, national authorities may permit banking and financial entities in a group which is running a global consolidated book and

whose capital is being assessed on a global basis to report short and long positions in exactly the same instrument (e.g., currencies, commodities, equities or bonds), on a net basis, no matter where they are booked.[4] Moreover, the offsetting rules as set out in the remainder of this Amendment may also be applied on a consolidated basis. Nonetheless, there will be circumstances in which supervisory authorities demand that the individual positions be taken into the measurement system *without* any offsetting or netting against positions in the remainder of the group. This may be needed, for example, where there are obstacles to the quick repatriation of profits from a foreign subsidiary or where there are legal and procedural difficulties in carrying out the timely management of risks on a consolidated basis. Moreover, all national authorities will retain the right to continue to monitor the market risks of individual entities on a non-consolidated basis to ensure that significant imbalances within a group do not escape supervision. Supervisory authorities will be especially vigilant in ensuring that banks do not pass positions on reporting dates in such a way as to escape measurement.

(b) Methods of measuring market risks

9.   In measuring their market risks, a choice between two broad methodologies (described in Parts A and B) will be permitted, subject to the approval of the national authorities. One alternative will be to measure the risks in a standardised manner, using the measurement frameworks described in Part A. The first four sections of Part A (A.1-4) deal with the four risks addressed by this Amendment, i.e., interest rate, equity position, foreign exchange and commodities risk. A fifth section (A.5) sets out a number of possible methods for measuring the price risk in options of all kinds. The capital charge under the standardised measurement method will be the measures of risk obtained from A.1-5, summed arithmetically.

10.   The alternative methodology, which is subject to the fulfilment of certain conditions and the use of which is therefore conditional upon the explicit approval of the bank's supervisory authority, is set out in Part B. This method allows banks to use risk measures derived from their own internal risk management models, subject to seven sets of conditions, namely:

- certain general criteria concerning the adequacy of the risk management system;
- qualitative standards for internal oversight of the use of models, notably by management;
- guidelines for specifying an appropriate set of market risk factors (i.e., the market rates and prices that affect the value of banks' positions);

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4   The positions of less than wholly-owned subsidiaries would be subject to the generally accepted accounting principles in the country where the parent company is supervised.

- quantitative standards setting out the use of common minimum statistical parameters for measuring risk;
- guidelines for stress testing;
- validation procedures for external oversight of the use of models;
- rules for banks which use a mixture of models and the standardised approach.

11.   The standardised methodology uses a "building-block" approach in which specific risk and the general market risk arising from debt and equity positions are calculated separately. The focus of most internal models is a bank's general market risk exposure, typically leaving specific risk (i.e., exposures to specific issuers of debt securities or equities[5]) to be measured largely through separate credit risk measurement systems. Banks using models should be subject to capital charges for the specific risk not captured by their models. Accordingly, a separate capital charge for specific risk will apply to each bank using a model to the extent that the model does not capture specific risk. However, for banks using models, the total specific risk charge applied to debt securities or to equities should in no case be less than half the specific risk charges calculated according to the standardised methodology.

12.   In measuring the price risk in options under the standardised approach, where a number of alternatives with varying degrees of sophistication are provided (see A.5), supervisory authorities will apply the rule that the more a bank is engaged in writing options, the more sophisticated its measurement method needs to be. In the longer term, banks which are significant traders in options will be expected to move to comprehensive value-at-risk models and become subject to the full range of quantitative and qualitative standards set out in Part B.

13.   Each bank subject to this Amendment will be expected to monitor and report the level of risk against which a capital requirement is to be applied. The bank's overall minimum capital requirement will be:

(a)   the credit risk requirements laid down in the present Accord, **excluding** debt and equity securities in the trading book and all positions in commodities, but **including** the credit counterparty risk on all over-the-counter derivatives whether in the trading or the banking books; **plus**

(b)   **either** the capital charges for market risks described in A.1-5, summed arithmetically; **or**

(c)   the measure of market risk derived from the models approach set out in Part B; **or**

(d)   a mixture of (b) and (c) summed arithmetically.

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5   Specific risk includes the risk that an individual debt or equity security moves by more or less than the general market in day-to-day trading (including periods when the whole market is volatile) and event risk (where the price of an individual debt or equity security moves precipitously relative to the general market, e.g., on a take-over bid or some other shock event; such events would also include the risk of "default").

14.   All transactions, including forward sales and purchases, shall be included in the calculation of capital requirements as from the date on which they were entered into. Although regular reporting will in principle take place only at intervals (in most countries quarterly), banks are expected to manage the market risk in their trading book in such a way that the capital requirements are being met on a continuous basis, i.e., at the close of each business day. Supervisory authorities have at their disposal a number of effective measures to ensure that banks do not "window-dress" by showing significantly lower market risk positions on reporting dates. Banks will also, of course, be expected to maintain strict risk management systems to ensure that intra-day exposures are not excessive. If a bank fails to meet the capital requirements, the national authority shall ensure that the bank takes immediate measures to rectify the situation.

(c)   Transitional arrangements

15.   The Committee permits a transition period until the end of 1997, starting from the final release of this Amendment, before the standardised approach and the internal models approach will become effective for calculating market risk capital. However, national authorities will have the right to implement the Amendment earlier. Banks that wish to use their internal models will be required, during the transition period, to adapt their models to incorporate the general criteria and to use the parameters specified in this Amendment when calculating their regulatory capital requirements. They should also be able to participate in a testing exercise which would provide supervisory authorities with additional information and comfort with the results produced. Until such time as the national authority chooses to implement the capital charges for market risk, the risks from positions covered by the market risk package will continue to be subject to the present capital charges laid down in the 1988 Accord.

16.   Banks will on a transitional basis be free to use a combination of the standardised measurement method and the internal models approach to measure their market risks. As a general rule, any such "partial" models should cover a complete risk category (e.g., interest rate risk or foreign exchange risk), i.e., a combination of the two methods will not be permitted within the same risk category.[6] However, as most banks are at present still implementing or further improving their risk management models, the Committee believes that banks should be given - even within risk categories - some flexibility in including all their operations on a worldwide basis; this flexibility will be subject to approval by the national authority and reviewed by the Committee in the future (supervisory authorities will take precautions against "cherry-picking" between the standardised approach and the models approach within a risk factor category). Banks which adopt the modelling alternative for any

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6   This does not, however, apply to pre-processing techniques which are used to simplify the calculation and whose results become subject to the standardised methodology.

single risk category will be expected over time to include all their operations subject to the exceptions mentioned below and to move towards a comprehensive model (i.e., one which captures all market risk categories). Banks which adopt a model will not be permitted, save in exceptional circumstances, to revert to the standardised approach. Notwithstanding these general principles, even banks using comprehensive models to measure their market risk may still incur risks in positions which are not captured by their internal trading risk management models,[7] for example, in remote locations, in minor currencies or in negligible business areas.[8] Any such risks that are not included in a model should be separately measured and reported using the methodologies described in A.1-5.

17.   At the present juncture, at least, the Committee has not set a time limit for the transition to comprehensive models although individual member countries may decide to do so. In the meantime, banks whose models do not capture all their market risks will be subject to the standardised measurement method for the risks not captured and the Committee will monitor the situation to prevent possible regulatory arbitrage that may arise from using a combination of the standardised and internal models approaches. Moreover, the supervisory authorities of banks moving towards the models approach will wish to be reassured that those banks are progressively improving their risk management practices to the extent that they will be in a position to meet all the standards once they are applying a fully-fledged model for any risk category.

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7   Banks may also incur interest rate and equity risks outside of their trading activities. However, the Committee has not, at this time, proposed explicit capital charges for the price risk in such positions.

8   For example, if a bank is hardly at all engaged in commodities it would not necessarily be expected to model its commodities risk.

II.   The capital requirement

   (a)   Definition of capital

1.   The principal form of eligible capital to cover market risks consists of shareholders' equity and retained earnings (tier 1 capital) and supplementary capital (tier 2 capital) as defined in the 1988 Accord. But banks may also, at the discretion of their national authority, employ a third tier of capital ("tier 3"), consisting of short-term subordinated debt as defined in paragraph 2 below for the *sole* purpose of meeting a proportion of the capital requirements for market risks, subject to the following conditions:

   - banks will be entitled to use tier 3 capital solely to support market risks as defined in Parts A and B. This means that any capital requirement arising in respect of credit and counterparty risk in the terms of the 1988 Accord, including the credit counterparty risk in respect of derivatives in both trading and banking books, needs to be met by the existing definition of capital in the 1988 Accord (i.e., tiers 1 and 2);

   - tier 3 capital will be limited to 250% of a bank's tier 1 capital that is required to support market risks. This means that a minimum of about 28½% of market risks needs to be supported by tier 1 capital that is not required to support risks in the remainder of the book;

   - tier 2 elements may be substituted for tier 3 up to the same limit of 250% in so far as the overall limits in the 1988 Accord are not breached, that is to say eligible tier 2 capital may not exceed total tier 1 capital, and long-term subordinated debt may not exceed 50% of tier 1 capital;

   - in addition, since the Committee believes that tier 3 capital is only appropriate to meet market risk, a significant number of member countries are in favour of retaining the principle in the present Accord that tier 1 capital should represent at least half of total eligible capital, i.e., that the sum total of tier 2 plus tier 3 capital should not exceed total tier 1. However, the Committee has decided that any decision whether or not to apply such a rule should be a matter for national discretion. Some member countries may keep the constraint, except in cases where banking activities are proportionately very small. Additionally, national authorities will have discretion to refuse the use of short-term subordinated debt for individual banks or for their banking systems generally.

2.   For short-term subordinated debt to be eligible as tier 3 capital, it needs, if circumstances demand, to be capable of becoming part of a bank's permanent capital and thus be available to absorb losses in the event of insolvency. It must, therefore, at a minimum:

   - be unsecured, subordinated and fully paid up;
   - have an original maturity of at least two years;

-   not be repayable before the agreed repayment date unless the supervisory authority agrees;

-   be subject to a lock-in clause which stipulates that neither interest nor principal may be paid (even at maturity) if such payment means that the bank falls below or remains below its minimum capital requirement.

(b)   Calculation of the capital ratio

3.   In order to ensure consistency in the calculation of the capital requirements for credit and market risks, an explicit numerical link will be created by multiplying the measure of market risk by 12.5 (i.e., the reciprocal of the minimum capital ratio of 8%) and adding the resulting figure to the sum of risk-weighted assets compiled for credit risk purposes. The ratio will then be calculated in relation to the sum of the two, using as the numerator only eligible capital.

4.   In calculating eligible capital, it will be necessary first to calculate the bank's minimum capital requirement for credit risk, and only afterwards its market risk requirement, to establish how much tier 1 and tier 2 capital is available to support market risk. Eligible capital will be the sum of the whole of the bank's tier 1 capital, plus all of its tier 2 capital under the limits imposed in the 1988 Accord. Tier 3 capital will be regarded as eligible only if it can be used to support market risks under the conditions set out in paragraphs 1 and 2 above. The quoted capital ratio will thus represent capital that is available to meet both credit risk and market risk. Where a bank has tier 3 capital, within the limits set out in paragraph 1, which is not at present supporting market risks, it may report that excess as unused but eligible tier 3 alongside its standard ratio. An example of how this works is set out in Part C of the paper, together with other worked examples.

P A R T   A

T H E   S T A N D A R D I S E D   M E A S U R E M E N T   M E T H O D

A.1   INTEREST RATE RISK

1.   This section describes the standard framework for measuring the risk of holding or taking positions in debt securities and other interest rate related instruments in the trading book. The instruments covered include all fixed-rate and floating-rate debt securities and instruments that behave like them, including non-convertible preference shares.[9] Convertible bonds, i.e., debt issues or preference shares that are convertible, at a stated price, into common shares of the issuer, will be treated as debt securities if they trade like debt securities and as equities if they trade like equities. The basis for dealing with derivative products is considered in III below.

2.   The minimum capital requirement is expressed in terms of two separately calculated charges, one applying to the "*specific risk*" of each security, whether it is a short or a long position, and the other to the interest rate risk in the portfolio (termed "*general market risk*") where long and short positions in different securities or instruments can be offset. An example of how general market risk is to be calculated is set out in C.2.

I.   Specific risk

3.   The capital charge for specific risk is designed to protect against an adverse movement in the price of an individual security owing to factors related to the individual issuer. In measuring the risk, offsetting will be restricted to matched positions in the identical *issue* (including positions in derivatives). Even if the *issuer* is the same, no offsetting will be permitted between different issues since differences in coupon rates, liquidity, call features, etc. mean that prices may diverge in the short run.

4.   The specific risk charge is graduated in five broad categories as follows:

government	0.00%
qualifying	0.25% (residual term to final maturity 6 months or less)
	1.00% (residual term to final maturity between 6 and 24 months)
	1.60% (residual term to final maturity exceeding 24 months)
other	8.00%

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9   Traded mortgage securities and mortgage derivative products possess unique characteristics because of the risk of pre-payment. Accordingly, for the time being, no common treatment will apply to these securities, which will be dealt with at national discretion. A security which is the subject of a repurchase or securities lending agreement will be treated as if it were still owned by the lender of the security, i.e., it will be treated in the same manner as other securities positions.

5.   The category "government" will include all forms of government[10] paper including bonds, Treasury bills and other short-term instruments, but national authorities reserve the right to apply a specific risk weight to securities issued by certain foreign governments, especially to securities denominated in a currency other than that of the issuing government.

6.   The "*qualifying*" category includes securities issued by public sector entities and multilateral development banks, plus other securities that are:

- rated investment-grade[11] by at least two credit rating agencies specified by the national authority; or
- rated investment-grade by one rating agency and not less than investment-grade by any other rating agency specified by the national authority (subject to supervisory oversight); or
- subject to supervisory approval, unrated, but deemed to be of comparable investment quality by the reporting bank, *and* the issuer has securities listed on a recognised stock exchange.

Each supervisory authority will be responsible for monitoring the application of these qualifying criteria, particularly in relation to the last criterion where the initial classification is essentially left to the reporting banks. National authorities will also have discretion to include within the qualifying category debt securities issued by banks in countries which have implemented the present Accord, subject to the express understanding that supervisory authorities in such countries undertake prompt remedial action if a bank fails to meet the capital standards set forth in the Accord. Similarly, national authorities will have discretion to include within the qualifying category debt securities issued by securities firms that are subject to equivalent rules.

7.   The "*other*" category will receive the same specific risk charge as a private-sector borrower under the credit risk requirements, i.e., 8%. However, since this may in certain cases considerably underestimate the specific risk for debt securities which have a high yield to redemption relative to government debt securities, each member country will have the discretion:

- to apply a specific risk charge higher than 8% to such securities; and/or
- to disallow offsetting for the purposes of defining the extent of general market risk (see paragraph 13 below) between such securities and any other debt securities.

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10   Including, at national discretion, local and regional governments subject to a zero credit risk weight in the present Accord.

11   e.g., rated Baa or higher by Moodys and BBB or higher by Standard and Poors.

II. General market risk

8.   The capital requirements for general market risk are designed to capture the risk of loss arising from changes in market interest rates. A choice between two principal methods of measuring the risk is permitted, a "maturity" method and a "duration" method. In each method, the capital charge is the sum of four components:

- the net short or long position in the whole trading book;
- a small proportion of the matched positions in each time-band (the "*vertical disallowance*");
- a larger proportion of the matched positions across different time-bands (the "*horizontal disallowance*");
- a net charge for positions in options, where appropriate (see A.5).

9.   Separate maturity ladders should be used for each currency and capital charges should be calculated for each currency separately and then summed with no offsetting between positions of opposite sign. In the case of those currencies in which business is insignificant, separate maturity ladders for each currency are not required. Rather, the bank may construct a single maturity ladder and slot, within each appropriate time-band, the net long or short position for each currency. However, these individual net positions are to be summed within each time-band, irrespective of whether they are long or short positions, to produce a gross position figure.

10.   In the **maturity method** (see paragraph 14 for the duration method), long or short positions in debt securities and other sources of interest rate exposures including derivative instruments are slotted into a maturity ladder comprising thirteen time-bands (or fifteen time-bands in case of low coupon instruments). Fixed rate instruments should be allocated according to the residual term to maturity and floating-rate instruments according to the residual term to the next repricing date. Opposite positions of the same amount in the same issues (but not different issues by the same issuer), whether actual or notional, can be omitted from the interest rate maturity framework, as well as closely matched swaps, forwards, futures and FRAs which meet the conditions set out in paragraphs 20 and 21 below.

11.   The first step in the calculation is to weight the positions in each time-band by a factor designed to reflect the price sensitivity of those positions to assumed changes in interest rates. The weights for each time-band are set out in Table 1 below. Zero-coupon bonds and deep-discount bonds (defined as bonds with a coupon of less than 3%) should be slotted according to the time-bands set out in the second column of the table.

12.   The next step in the calculation is to offset the weighted longs and shorts in each time-band, resulting in a single short or long position for each band. Since, however, each band would include different instruments and different maturities, a 10% capital charge to reflect basis risk and gap risk will be levied on the smaller of the offsetting positions, be it long or short. Thus, if the sum of the weighted longs in a time-band is $100 million and the

sum of the weighted shorts $90 million, the so-called "vertical disallowance" for that time-band would be 10% of $90 million (i.e., $9.0 million).

Table 1
Maturity method: time-bands and weights

Coupon 3% or more	Coupon less than 3%	Risk weight	Assumed changes in yield
1 month or less	1 month or less	0.00%	1.00
1 to 3 months	1 to 3 months	0.20%	1.00
3 to 6 months	3 to 6 months	0.40%	1.00
6 to 12 months	6 to 12 months	0.70%	1.00
1 to 2 years	1.0 to 1.9 years	1.25%	0.90
2 to 3 years	1.9 to 2.8 years	1.75%	0.80
3 to 4 years	2.8 to 3.6 years	2.25%	0.75
4 to 5 years	3.6 to 4.3 years	2.75%	0.75
5 to 7 years	4.3 to 5.7 years	3.25%	0.70
7 to 10 years	5.7 to 7.3 years	3.75%	0.65
10 to 15 years	7.3 to 9.3 years	4.50%	0.60
15 to 20 years	9.3 to 10.6 years	5.25%	0.60
over 20 years	10.6 to 12 years	6.00%	0.60
	12 to 20 years	8.00%	0.60
	over 20 years	12.50%	0.60

13.   The result of the above calculations is to produce two sets of weighted positions, the net long or short positions in each time-band ($10 million long in the example above) and the vertical disallowances, which have no sign. In addition, however, banks will be allowed to conduct two rounds of "horizontal offsetting", first between the net positions in each of three zones (zero to one year, one year to four years and four years and over),[12] and subsequently between the net positions in the three different zones. The offsetting will be subject to a scale of disallowances expressed as a fraction of the matched positions, as set out in Table 2 below. The weighted long and short positions in each of three zones may be offset, subject to the matched portion attracting a disallowance factor that is part of the capital charge. The residual

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12   The zones for coupons less than 3% are 0 to 1 year, 1 to 3.6 years, and 3.6 years and over.

net position in each zone may be carried over and offset against opposite positions in other zones, subject to a second set of disallowance factors.

Table 2
Horizontal disallowances

Zones[13]	Time-band	within the zone	between adjacent zones	between zones 1 and 3
Zone 1	0 - 1 month 1 - 3 months 3 - 6 months 6 - 12 months	40%	40%	100%
Zone 2	1 - 2 years 2 - 3 years 3 - 4 years	30%		
Zone 3	4 - 5 years 5 - 7 years 7 - 10 years 10 - 15 years 15 - 20 years over 20 years	30%	40%	

14.   Under the alternative **duration method**, banks with the necessary capability may, with their supervisors' consent, use a more accurate method of measuring all of their general market risk by calculating the price sensitivity of each position separately. Banks must elect and use the method on a continuous basis (unless a change in method is approved by the national authority) and will be subject to supervisory monitoring of the systems used. The mechanics of this method are as follows:

- first calculate the price sensitivity of each instrument in terms of a change in interest rates of between 0.6 and 1.0 percentage points depending on the maturity of the instrument (see Table 3 below);
- slot the resulting sensitivity measures into a duration-based ladder with the fifteen time-bands set out in Table 3;

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13   The zones for coupons less than 3% are 0 to 1 year, 1 to 3.6 years, and 3.6 years and over.

- subject long and short positions in each time-band to a 5% vertical disallowance designed to capture basis risk;
- carry forward the net positions in each time-band for horizontal offsetting subject to the disallowances set out in Table 2.

Table 3

Duration method: time-bands and assumed changes in yield

	Assumed change in yield		Assumed change in yield
Zone 1		**Zone 3**	
1 month or less	1.00	3.6 to 4.3 years	0.75
1 to 3 months	1.00	4.3 to 5.7 years	0.70
3 to 6 months	1.00	5.7 to 7.3 years	0.65
6 to 12 months	1.00	7.3 to 9.3 years	0.60
		9.3 to 10.6 years	0.60
Zone 2		10.6 to 12 years	0.60
1.0 to 1.9 years	0.90	12 to 20 years	0.60
1.9 to 2.8 years	0.80	over 20 years	0.60
2.8 to 3.6 years	0.75		

15.   In the case of **residual currencies** (see paragraph 9 above) the gross positions in each time-band will be subject to either the risk weightings set out in Table 1, if positions are reported using the maturity method, or the assumed change in yield set out in Table 3, if positions are reported using the duration method, with no further offsets.

III.   Interest rate derivatives

16.   The measurement system should include all interest rate derivatives and off-balance-sheet instruments in the trading book which react to changes in interest rates, (e.g., forward rate agreements (FRAs), other forward contracts, bond futures, interest rate and cross-currency swaps and forward foreign exchange positions). Options can be treated in a variety of ways as described in A.5. A summary of the rules for dealing with interest rate derivatives is set out in Table 4 at the end of this section.

1.   Calculation of positions

17.   The derivatives should be converted into positions in the relevant underlying and become subject to specific and general market risk charges as described above. In order to

calculate the standard formula described above, the amounts reported should be the market value of the principal amount of the underlying or of the notional underlying.[14]

(a)   Futures and forward contracts, including forward rate agreements

18.   These instruments are treated as a combination of a long and a short position in a notional government security. The maturity of a future or a FRA will be the period until delivery or exercise of the contract, plus - where applicable - the life of the underlying instrument. For example, a long position in a June three month interest rate future (taken in April) is to be 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. Where a range of deliverable instruments may be delivered to fulfil the contract, the bank has flexibility to elect which deliverable security goes into the maturity or duration ladder but should take account of any conversion factor defined by the exchange. In the case of a future on a corporate bond index, positions will be included at the market value of the notional underlying portfolio of securities.

(b)   Swaps

19.   Swaps will be treated as two notional positions in government securities with relevant maturities. For example, an interest rate swap under which a bank is receiving floating rate interest and paying fixed will be treated as a long position in a floating rate instrument of maturity equivalent to the period until the next interest fixing and a short position in a fixed-rate instrument of maturity equivalent to the residual life of the swap. For swaps that pay or receive a fixed or floating interest rate against some other reference price, e.g., a stock index, the interest rate component should be slotted into the appropriate repricing maturity category, with the equity component being included in the equity framework. The separate legs of cross-currency swaps are to be reported in the relevant maturity ladders for the currencies concerned.

2.   Calculation of capital charges for derivatives under the standardised methodology

(a)   Allowable offsetting of matched positions

20.   Banks may exclude from the interest rate maturity framework altogether (for both specific and general market risk) long and short positions (both actual and notional) in identical instruments with exactly the same issuer, coupon, currency and maturity. A matched position in a future or forward and its corresponding underlying may also be fully offset,[15] and thus excluded from the calculation. When the future or the forward comprises a range of

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14   For instruments where the apparent notional amount differs from the effective notional amount, banks must use the effective notional amount.

15   The leg representing the time to expiry of the future should, however, be reported.

deliverable instruments offsetting of positions in the future or forward contract and its underlying is only permissible in cases where there is a readily identifiable underlying security which is most profitable for the trader with a short position to deliver. The price of this security, sometimes called the "cheapest-to-deliver", and the price of the future or forward contract should in such cases move in close alignment. No offsetting will be allowed between positions in different currencies; the separate legs of cross-currency swaps or forward foreign exchange deals are to be treated as notional positions in the relevant instruments and included in the appropriate calculation for each currency.

21.　　　　In addition, opposite positions in the same category of instruments[16] can in certain circumstances be regarded as matched and allowed to offset fully. To qualify for this treatment the positions must relate to the same underlying instruments, be of the same nominal value and be denominated in the same currency.[17] In addition:

  (i) **for futures**: offsetting positions in the notional or underlying instruments to which the futures contract relates must be for identical products and 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 fixing date or, for fixed coupon positions or forwards, the residual maturity must correspond within the following limits:

  - less than one month hence: same day;
  - between one month and one year hence: within seven days;
  - over one year hence: within thirty days.

22.　　　　Banks with large swap books may use alternative formulae for these swaps to calculate the positions to be included in the maturity or duration ladder. One method would be to first convert the payments required by the swap into their present values. For that purpose, each payment should be discounted using zero coupon yields, and a single net figure for the present value of the cash flows entered into the appropriate time-band using procedures that apply to zero (or low) coupon bonds; these figures should be slotted into the general market risk framework as set out earlier. An alternative method would be to calculate the sensitivity of the net present value implied by the change in yield used in the maturity or duration method and allocate these sensitivities into the time-bands set out in Table 1 or

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16　　This includes the delta-equivalent value of options. The delta equivalent of the legs arising out of the treatment of caps and floors as set out in paragraph 5 of A.5 can also be offset against each other under the rules laid down in this paragraph.

17　　The separate legs of different swaps may also be "matched" subject to the same conditions.

Table 3. Other methods which produce similar results could also be used. Such alternative treatments will, however, only be allowed if:
- the supervisory authority is fully satisfied with the accuracy of the systems being used;
- the positions calculated fully reflect the sensitivity of the cash flows to interest rate changes and are entered into the appropriate time-bands;
- the positions are denominated in the same currency.

(b) Specific risk

23. Interest rate and currency swaps, FRAs, forward foreign exchange contracts and interest rate futures will not be subject to a specific risk charge. This exemption also applies to futures on an interest rate index (e.g., LIBOR). 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 credit risk of the issuer as set out in paragraphs 3-7 above.

(c) General market risk

24. General market risk applies to positions in all derivative products in the same manner as for cash positions, subject only to an exemption for fully or very closely matched positions in identical instruments as defined in paragraphs 20 and 21. The various categories of instruments should be slotted into the maturity ladder and treated according to the rules identified earlier.

Table 4

Summary of treatment of interest rate derivatives

Instrument	Specific risk charge[18]	General market risk charge
Exchange-traded future		
- Government debt security	No	Yes, as two positions
- Corporate debt security	Yes	Yes, as two positions
- Index on interest rates (e.g., LIBOR)	No	Yes, as two positions
OTC forward		
- Government debt security	No	Yes, as two positions
- Corporate debt security	Yes	Yes, as two positions
- Index on 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		Either
- Government debt security	No	(a) Carve out together with the associated hedging positions - simplified approach - scenario analysis - internal models (Part B)
- Corporate debt security	Yes	(b) General market risk charge according to the delta-plus method (gamma and vega should receive separate capital charges)
- Index on interest rates	No	
- FRAs, Swaps	No	

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18 This is the specific risk charge relating to the issuer of the instrument. Under the existing credit risk rules, there remains a separate capital charge for the counterparty risk.

A.2 EQUITY POSITION RISK

1.   This section sets out a minimum capital standard to cover the risk of holding or taking positions in equities in the trading book. It applies to long and short positions in all instruments that exhibit market behaviour similar to equities, but not to non-convertible preference shares (which are covered by the interest rate risk requirements described in A.1). Long and short positions in the same issue may be reported on a net basis. 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. The treatment of derivative products, stock indices and index arbitrage is described in II below.

I.   Specific and general market risk

2.   As with debt securities, the minimum capital standard for equities is expressed in terms of two separately calculated charges for the "specific risk" of holding a long or short position in an individual equity and for the "general market risk" of holding a long or short position in the market as a whole. Specific risk is defined as the bank's gross equity positions (i.e., the sum of all long equity positions and of all short equity positions) and general market risk as the difference between the sum of the longs and the sum of the shorts (i.e., the overall net position in an equity market).The long or short position in the market must be calculated on a market-by-market basis, i.e., a separate calculation has to be carried out for each national market in which the bank holds equities.

3.   The capital charge for *specific* risk will be 8%, unless the portfolio is both liquid and well-diversified, in which case the charge will be 4%. Given the different characteristics of national markets in terms of marketability and concentration, national authorities will have discretion to determine the criteria for liquid and diversified portfolios. The *general market risk* charge will be 8%.

II.   Equity derivatives

4.   Except for options, which are dealt with in A.5, equity derivatives and off-balance-sheet positions which are affected by changes in equity prices should be included in the measurement system.[19] This includes futures and swaps on both individual equities and on stock indices. The derivatives are to be converted into positions in the relevant underlying. The treatment of equity derivatives is summarised in Table 5 at the end of this section.

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19   Where equities are part of a forward contract, a future or an option (quantity of equities to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract should be reported as set out in A.1 and A.3.

1.   Calculation of positions

5.   In order to calculate the standard formula for specific and general market risk, positions in derivatives should be converted into notional equity positions:

- futures and forward contracts relating to individual equities should in principle be reported at current market prices;
- futures relating to stock indices should be reported as the marked-to-market value of the notional underlying equity portfolio;
- equity swaps are to be treated as two notional positions;[20]
- equity options and stock index options should be either "carved out" together with the associated underlyings or be incorporated in the measure of general market risk described in this section according to the delta-plus method.

2.   Calculation of capital charges

(a)   Measurement of specific and general market risk

6.   Matched positions in each identical equity or stock index in each market may be fully offset, resulting in a single net short or long position to which the specific and general market risk charges will apply. For example, a future in a given equity may be offset against an opposite cash position in the same equity.[21]

(b)   Risk in relation to an index

7.   Besides general market risk, a further capital charge of 2% will apply to the net long or short position in an index contract comprising a diversified portfolio of equities. This capital charge is intended to cover factors such as execution risk. National supervisory authorities will take care to ensure that this 2% risk weight applies only to well-diversified indices and not, for example, to sectoral indices.

(c)   Arbitrage

8.   In the case of the futures-related arbitrage strategies described below, the additional 2% capital charge described above may be applied to only one index with the opposite position exempt from a capital charge. The strategies are:

- when the bank takes an opposite position in exactly the same index at different dates or in different market centres;

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20   For example, an equity swap in which a bank is receiving an amount based on the change in value of one particular equity or stock index and paying a different index will be treated as a long position in the former and a short position in the latter. Where one of the legs involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing time-band for interest rate related instruments as set out in A.1. The stock index should be covered by the equity treatment.

21   The interest rate risk arising out of the future, however, should be reported as set out in A.1.

- when the bank has an opposite position in contracts at the same date in different but similar indices, subject to supervisory oversight that the two indices contain sufficient common components to justify offsetting.

9.   Where a bank engages in a deliberate arbitrage strategy, in which a futures contract on a broadly-based index matches a basket of stocks, it will be allowed to carve out both positions from the standardised methodology on condition that:

- the trade has been deliberately entered into and separately controlled;
- the composition of the basket of stocks represents at least 90% of the index when broken down into its notional components.

In such a case the minimum capital requirement will be 4% (i.e., 2% of the gross value of the positions on each side) to reflect divergence and execution risks. This applies even if all of the stocks comprising the index are held in identical proportions. Any excess value of the stocks comprising the basket over the value of the futures contract or excess value of the futures contract over the value of the basket is to be treated as an open long or short position.

10.   If a bank takes a position in depository receipts against an opposite position in the underlying equity or identical equities in different markets, it may offset the position (i.e., bear no capital charge) but only on condition that any costs on conversion are fully taken into account.[22]

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22   Any foreign exchange risk arising out of these positions has to be reported as set out in A.3.

Table 5

Summary of treatment of equity derivatives

Instrument	Specific risk[23]	General market risk
Exchange-traded or OTC-Future		
- Individual equity	Yes	Yes, as underlying
- Index	2%	Yes, as underlying
Options		
- Individual equity	Yes	Either
		(a) Carve out together with the associated hedging positions - simplified approach - scenario analysis - internal models (Part B)
- Index	2%	(b) General market risk charge according to the delta-plus method (gamma and vega should receive separate capital charges)

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23   This is the specific risk charge relating to the issuer of the instrument. Under the existing credit risk rules, there remains a separate capital charge for the counterparty risk.

A.3   FOREIGN EXCHANGE RISK

1.   This section sets out a minimum capital standard to cover the risk of holding or taking positions in foreign currencies, including gold.[24]

2.   Two processes are needed to calculate the capital requirement for foreign exchange risk. The first is to measure the exposure in a single currency position. The second is to measure the risks inherent in a bank's mix of long and short positions in different currencies.

I.   Measuring the exposure in a single currency

3.   The bank's net open position in each currency should be calculated by summing:
- the net spot position (i.e., all asset items less all liability items, including accrued interest, denominated in the currency in question);
- the net forward position (i.e., all amounts to be received less all amounts to be paid under forward foreign exchange transactions, including currency futures and the principal on currency swaps not included in the spot position);
- guarantees (and similar instruments) that are certain to be called and are likely to be irrecoverable;
- net future income/expenses not yet accrued but already fully hedged (at the discretion of the reporting bank);
- depending on particular accounting conventions in different countries, any other item representing a profit or loss in foreign currencies;
- the net delta-based equivalent of the total book of foreign currency options.[25]

4.   Positions in composite currencies, such as the ECU, need to be separately reported but, for measuring banks' open positions, may be either treated as a currency in their own right or split into their component parts on a consistent basis. Positions in gold should be measured in the same manner as described in paragraph 7 of A.4.[26]

5.   Three aspects call for more specific comment: the treatment of interest, other income and expenses; the measurement of forward currency positions and gold; and the treatment of "structural" positions.

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24   Gold is to be dealt with 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 similar manner to foreign currencies.

25   Subject to a separately calculated capital charge for gamma and vega as described in section II (a) of A.5; alternatively, options and their associated underlyings are subject to one of the other methods described in A.5.

26   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 leg of the contract should be reported as set out in A.1 and in paragraph 3 above.

(a) The treatment of interest, other income and expenses

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

(b) The measurement of forward currency and gold positions

7.   Forward currency and gold positions will normally be valued at current spot market exchange rates. Using forward exchange rates would be inappropriate since it would result in the measured positions reflecting current interest rate differentials to some extent. However, banks which base their normal management accounting on net present values are expected to use the net present values of each position, discounted using current interest rates and valued at current spot rates, for measuring their forward currency and gold positions.

(c) The treatment of structural positions

8.   A matched currency position will protect a bank against loss from movements in exchange rates, but will not necessarily protect its capital adequacy ratio. If a bank has its capital denominated in its domestic currency and has a portfolio of foreign currency assets and liabilities that is completely matched, its capital/asset ratio will fall if the domestic currency depreciates. By running a short position in the domestic currency the bank can protect its capital adequacy ratio, although the position would lead to a loss if the domestic currency were to appreciate.

9.   Supervisory authorities are free to allow banks to protect their capital adequacy ratio in this way. Thus, any positions which a bank has deliberately taken in order to hedge partially or totally against the adverse effect of the exchange rate on its capital ratio may be excluded from the calculation of net open currency positions, subject to each of the following conditions being met:

- such positions need to be of a "structural", i.e., of a non-dealing, nature (the precise definition to be set by national authorities according to national accounting standards and practices);
- the national authority needs to be satisfied that the "structural" position excluded does no more than protect the bank's capital adequacy ratio;
- any exclusion of the position needs to be applied consistently, with the treatment of the hedge remaining the same for the life of the assets or other items.

10.   No capital charge need apply to positions related to items that are deducted from a bank's capital when calculating its capital base, such as investments in non-consolidated subsidiaries, nor to other long-term participations denominated in foreign currencies which

are reported in the published accounts at historic cost. These may also be treated as structural positions.

II. Measuring the foreign exchange risk in a portfolio of foreign currency positions and gold

11.   Banks will have a choice between two alternative measures at supervisory discretion; a "shorthand" method which treats all currencies equally; and the use of internal models which takes account of the actual degree of risk dependent on the composition of the bank's portfolio. The conditions for the use of internal models are set out in Part B.

12.   Under the shorthand method, the nominal amount (or net present value) of the net position in each foreign currency and in gold is converted at spot rates into the reporting currency.[27] The overall net open position is measured by aggregating:

- the sum of the net short positions or the sum of the net long positions, whichever is the greater;[28] plus
- the net position (short or long) in gold, regardless of sign.

The capital charge will be 8% of the overall net open position (see example below).

Table 6

Example of the shorthand measure of foreign exchange risk

YEN	DM	GB£	FFR	US$	GOLD
+ 50	+ 100	+ 150	- 20	- 180	- 35
+ 300			- 200		35

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

13.   A bank doing negligible business in foreign currency and which does not take foreign exchange positions for its own account may, at the discretion of its national authority, be exempted from capital requirements on these positions provided that:

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27   Where the 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 against such limits, the limits should be added, without regard to sign, to the net open position in each currency.

28   An alternative calculation, which produces an identical result, is to include the reporting currency as a residual and to take the sum of all the short (or long) positions.

- 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% of eligible capital as defined on pages 7 and 8; **and**
- its overall net open position as defined in the paragraph above does not exceed 2% of its eligible capital as defined on pages 7 and 8.

A.4   COMMODITIES RISK

1.   This section establishes a minimum capital standard to cover the risk of holding or taking positions in commodities, including precious metals, but excluding gold (which is treated as a foreign currency according to the methodology set out in A.3). A commodity is defined as a physical product which is or can be traded on a secondary market, e.g., agricultural products, minerals (including oil) and precious metals.

2.   The price risk in commodities is often more complex and volatile than that associated with currencies and interest rates. Commodity markets may also be less liquid than those for interest rates and currencies and, as a result, changes in supply and demand can have a more dramatic effect on price and volatility.[29] These market characteristics can make price transparency and the effective hedging of commodities risk more difficult.

3.   For spot or physical trading, the directional risk arising from a change in the spot price is the most important risk. However, banks using portfolio strategies involving forward and derivative contracts are exposed to a variety of additional risks, which may well be larger than the risk of a change in spot prices. These include:

- basis risk (the risk that the relationship between the prices of similar commodities alters through time);
- interest rate risk (the risk of a change in the cost of carry for forward positions and options);
- forward gap risk (the risk that the forward price may change for reasons other than a change in interest rates);

In addition banks may face credit counterparty risk on over-the-counter derivatives, but this is captured by the 1988 Capital Accord. The funding of commodities positions may well open a bank to interest rate or foreign exchange exposure and if that is so the relevant positions should be included in the measures of interest rate and foreign exchange risk described in A.1 and A.3.[30]

4.   There are three alternatives for measuring commodities position risk which are described in Sections I to III below. As with other categories of market risk, banks may use models subject to the conditions set out in Part B. Commodities risk can also be measured in

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[29]   Banks need also to guard against the risk that arises when the short position falls due before the long position. Owing to a shortage of liquidity in some markets it might be difficult to close the short position and the bank might be squeezed by the market.

[30]   Where a commodity is part of a forward contract (quantity of commodities to be received or to be delivered), any interest rate or foreign currency exposure from the other leg of the contract should be reported as set out in A.1 and A.3. Positions which are purely stock financing (i.e., a physical stock has been sold forward and the cost of funding has been locked in until the date of the forward sale) may be omitted from the commodities risk calculation although they will be subject to interest rate and counterparty risk requirements.

a standardised manner, using either a very simple framework (Section III) or a measurement system which captures forward gap and interest rate risk separately by basing the methodology on seven time-bands (Section II). Both the simplified approach and the maturity ladder approach are appropriate only for banks which, in relative terms, conduct only a limited amount of commodities business. Major traders would be expected over time to adopt a models approach subject to the safeguards set out in Part B.

5.   For the maturity ladder approach and the simplified approach, long and short positions in each commodity may be reported on a net basis for the purposes of calculating open positions. However, positions in different commodities will as a general rule not be offsettable in this fashion. Nevertheless, national authorities will have discretion to permit netting between different sub-categories[31] of the same commodity in cases where the sub-categories are deliverable against each other. They can also be considered as offsettable if they are close substitutes against each other and a minimum correlation of 0.9 between the price movements can be clearly established over a minimum period of one year. However, a bank wishing to base its calculation of capital charges for commodities on correlations would have to satisfy the relevant supervisory authority of the accuracy of the method which has been chosen and obtain its prior approval. Where banks use the models approach they can offset long and short positions in different commodities to a degree which is determined by empirical correlations, in the same way as a limited degree of offsetting is allowed, for instance, between interest rates in different currencies.

I.   Models for measuring commodities risk

6.   Banks may choose to adopt the models approach as set out in Part B. It is essential that the methodology used encompasses:

- directional risk, to capture the exposure from changes in spot prices arising from net open positions;
- forward gap and interest rate risk, to capture the exposure to changes in forward prices arising from maturity mismatches; and
- basis risk, to capture the exposure to changes in the price relationships between two similar, but not identical, commodities.

It is also particularly important that models take proper account of market characteristics - notably delivery dates and the scope provided to traders to close out positions.

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31   Commodities can be grouped into clans, families, sub-groups and individual commodities. For example, a clan might be Energy Commodities, within which Hydro-Carbons are a family with Crude Oil being a sub-group and West Texas Intermediate, Arabian Light and Brent being individual commodities.

II.   Maturity ladder approach

7.   In calculating the capital charges under this approach banks will first have to express each commodity position (spot plus forward) in terms of the standard unit of measurement (barrels, kilos, grams etc.). The net position in each commodity will then be converted at current spot rates into the national currency.

8.   Secondly, in order to capture forward gap and interest rate risk within a time-band (which, together, are sometimes referred to as curvature/spread risk), matched long and short positions in each time-band will carry a capital charge. The methodology will be rather similar to that used for interest rate related instruments as set out in A.1. Positions in the separate commodities (expressed in terms of the standard unit of measurement) will first be entered into a maturity ladder while physical stocks should be allocated to the first time-band. A separate maturity ladder will be used for each commodity as defined in paragraph 5 above.[32] For each time-band, the sum of short and long positions which are matched will be multiplied first by the spot price for the commodity, and then by the appropriate spread rate for that band (as set out in Table 7 below).

9.   The residual net positions from nearer time-bands may then be carried forward to offset exposures in time-bands that are further out. However, recognising that such hedging of positions among different time-bands is imprecise, a surcharge equal to 0.6% of the net position carried forward will be added in respect of each time-band that the net position is carried forward. The capital charge for each matched amount created by carrying net positions forward will be calculated as in paragraph 8 above. At the end of this process a bank will have either only long or only short positions, to which a capital charge of 15% will apply. An example of how the maturity ladder approach works is set out in C.3.

10.   Even though the Committee is aware that there are differences in volatility between different commodities, it has decided in the interest of simplicity, and given the fact that banks normally run rather small open positions in commodities, that one uniform capital charge for open positions in all commodities should apply. Those banks which desire to be more precise in this area may choose to adopt the models approach.

11.   All commodity derivatives and off-balance-sheet positions which are affected by changes in commodity prices should be included in this measurement framework. This includes commodity futures, commodity swaps, and options where the "delta plus" method[33]

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32   For markets which have daily delivery dates, any contracts maturing within ten days of one another may be offset.

33   For banks using other approaches to measure options risk, all options and the associated underlyings should be excluded from both the maturity ladder approach and the simplified approach.

Table 7
Time-bands and spread rates

Time-band	Spread rate
0 - 1 month	1.5%
1 - 3 months	1.5%
3 - 6 months	1.5%
6 - 12 months	1.5%
1 - 2 years	1.5%
2 - 3 years	1.5%
over 3 years	1.5%

is used (see A.5). In order to calculate the risk, commodity derivatives should be converted into notional commodities positions and assigned to maturities as follows:

- *futures and forward contracts relating to individual commodities* should be incorporated in the measurement system as notional amounts of barrels, kilos etc. and should be assigned a maturity with reference to expiry date;

- *commodity swaps* where one leg is a fixed price and the other the current market price should be incorporated as a series of positions equal to the notional amount of the contract, with one position corresponding with each payment on the swap and slotted into the maturity ladder accordingly. The positions would be long positions if the bank is paying fixed and receiving floating, and short positions if the bank is receiving fixed and paying floating;[34]

- *commodity swaps* where the legs are in different commodities are to be incorporated in the relevant maturity ladder. No offsetting will be allowed in this regard except where the commodities belong to the same sub-category as defined in paragraph 5 above.

III. Simplified approach

12.   In calculating the capital charge for directional risk, the same procedure will be adopted as in the maturity ladder approach above (see paragraphs 7 and 11). Once again, all commodity derivatives and off-balance-sheet positions which are affected by changes in

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[34] If one of the legs involves receiving/paying a fixed or floating interest rate, that exposure should be slotted into the appropriate repricing maturity band in the maturity ladder covering interest rate related instruments.

commodity prices should be included. The capital charge will equal 15% of the net position, long or short, in each commodity.

13.   In order to protect the bank against basis risk, interest rate risk and forward gap risk, the capital charge for each commodity as described in paragraphs 7 and 11 above will be subject to an additional capital charge equivalent to 3% of the bank's gross positions, long plus short, in that particular commodity. In valuing the gross positions in commodity derivatives for this purpose, banks should use the current spot price.

A.5   TREATMENT OF OPTIONS

1.   In recognition of the wide diversity of banks' activities in options and the difficulties of measuring price risk for options, several alternative approaches will be permissible at the discretion of the national authority:

-    those banks which solely use purchased options[35] will be free to use the simplified approach described in Section I below;

-    those banks which also write options will be expected to use one of the intermediate approaches as set out in Section II or a comprehensive risk management model under the terms of Part B of this paper. The more significant its trading, the more the bank will be expected to use a sophisticated approach.

2.   In the *simplified approach*, the positions for the options and the associated underlying, cash or forward, are not subject to the standardised methodology but rather are "carved-out" and subject to separately calculated capital charges that incorporate both general market risk and specific risk. The risk numbers thus generated are then added to the capital charges for the relevant category, i.e., interest rate related instruments, equities, foreign exchange and commodities as described in A.1-4. The *delta-plus method* uses the sensitivity parameters or "Greek letters" associated with options to measure their market risk and capital requirements. Under this method, the delta-equivalent position of each option becomes part of the standardised methodology set out in A.1-4 with the delta-equivalent amount subject to the applicable general market risk charges. Separate capital charges are then applied to the gamma and vega risks of the option positions. The *scenario approach* uses simulation techniques to calculate changes in the value of an options portfolio for changes in the level and volatility of its associated underlyings. Under this approach, the general market risk charge is determined by the scenario "grid" (i.e., the specified combination of underlying and volatility changes) that produces the largest loss. For the delta-plus method and the scenario approach the specific risk capital charges are determined separately by multiplying the delta-equivalent of each option by the specific risk weights set out in A.1 and A.2.

I.   Simplified approach

3.   Banks which handle a limited range of purchased options only will be free to use the simplified approach set out in Table 8 for particular trades. As an example of how the calculation would work, if a holder of 100 shares currently valued at $10 each holds an equivalent put option with a strike price of $11, the capital charge would be: $1,000 x 16% (i.e., 8% specific plus 8% general market risk) = $160, less the amount the option is in the

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35   Unless all their written option positions are hedged by perfectly matched long positions in exactly the same options, in which case no capital charge for market risk is required.

money ($11 - $10) x 100 = $100, i.e., the capital charge would be $60. A similar methodology applies for options whose underlying is a foreign currency, an interest rate related instrument or a commodity.

Table 8

Simplified approach: capital charges

Position	Treatment
Long cash and Long put or Short cash and Long call	The capital charge will be the market value of the underlying security[36] multiplied by the sum of specific and general market risk charges[37] for the underlying less the amount the option is in the money (if any) bounded at zero[38]
Long call or Long put	The capital charge will be the lesser of: (i) the market value of the underlying security multiplied by the sum of specific and general market risk charges[37] for the underlying (ii) the market value of the option[39]

II.   Intermediate approaches

(a)   Delta-plus method

4.   Banks which write options will be allowed to include delta-weighted options positions within the standardised methodology set out in A.1-4. Such options should be reported as a position equal to the market value of the underlying multiplied by the delta.

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36   In some cases such as foreign exchange, it may be unclear which side is the "underlying security"; this should be taken to be the asset which would be received if the option were exercised. In addition the nominal value should be used for items where the market value of the underlying instrument could be zero, e.g., caps and floors, swaptions etc.

37   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 certain interest rate related instruments (e.g., options on a corporate debt security or corporate bond index; see A.1 for the relevant capital charges) and for options on equities and stock indices (see A.2). The charge under this measure for currency options will be 8% and for options on commodities 15%.

38   For options with a residual maturity of more than six months the strike price should be compared with the forward, not current, price. A bank unable to do this must take the in the money amount to be zero.

39   Where the position does not fall within the trading book (i.e., options on certain foreign exchange or commodities positions not belonging to the trading book), it may be acceptable to use the book value instead.

However, since delta does not sufficiently cover the risks associated with options positions, banks will also be required to measure gamma (which measures the rate of change of delta) and vega (which measures the sensitivity of the value of an option with respect to a change in volatility) sensitivities in order to calculate the total capital charge. These sensitivities will be calculated according to an approved exchange model or to the bank's proprietary options pricing model subject to oversight by the national authority.[40]

5.   Delta-weighted positions with *debt securities or interest rates as the underlying* will be slotted into the interest rate time-bands, as set out in A.1, under the following procedure. A two-legged approach should 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.[41] The written option will 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 will 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% will treat it as:

    (i)   a debt security that reprices in six months; and

    (ii)   a series of five written call options on a FRA with a reference rate of 15%, each with a negative sign at the time the underlying FRA takes effect and a positive sign at the time the underlying FRA matures.[42]

6.   The capital charge for *options with equities as the underlying* will also be based on the delta-weighted positions which will be incorporated in the measure of market risk described in A.2. For purposes of this calculation each national market is to be treated as a separate underlying. The capital charge for *options on foreign exchange and gold positions* will be based on the method set out in A.3. For delta risk, the net delta-based equivalent of the foreign currency and gold options will be incorporated into the measurement of the exposure for the respective currency (or gold) position. The capital charge for *options on*

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[40]   National authorities may wish to require banks doing business in certain classes of exotic options (e.g., barriers, digitals) or in options at the money that are close to expiry to use either the scenario approach or the internal models alternative, both of which can accommodate more detailed revaluation approaches.

[41]   A two months call option on a bond future where delivery of the bond takes place in September would be considered in April as being long the bond and short a five months deposit, both positions being delta-weighted.

[42]   The rules applying to closely matched positions set out in paragraph 21 of A.1 will also apply in this respect.

commodities will be based on the simplified or the maturity ladder approach set out in A.4. The delta-weighted positions will be incorporated in one of the measures described in that section.

7.   In addition to the above capital charges arising from delta risk, there will be further capital charges for *gamma* and for *vega risk*. Banks using the delta-plus method will be required to calculate the gamma and vega for each option position (including hedge positions) separately. The capital charges should be calculated in the following way:

(i)   for each individual option a "gamma impact" should be calculated according to a Taylor series expansion as:

$$\text{Gamma impact} = \tfrac{1}{2} \times \text{Gamma} \times VU^2$$

where VU = Variation of the underlying of the option.

(ii)   VU will be calculated as follows:
- for interest rate options if the underlying is a bond, the market value of the underlying should be multiplied by the risk weights set out in Table 1 of A.1. An equivalent calculation should be carried out where the underlying is an interest rate, again based on the assumed changes in the corresponding yield in Table 1 of A.1;
- for options on equities and equity indices: the market value of the underlying should be multiplied by 8%;[43]
- for foreign exchange and gold options: the market value of the underlying should be multiplied by 8%;
- for options on commodities: the market value of the underlying should be multiplied by 15%.

(iii)   For the purpose of this calculation the following positions should be treated as the same underlying:
- for interest rates,[44] each time-band as set out in Table 1 of A.1;[45]
- for equities and stock indices, each national market;
- for foreign currencies and gold, each currency pair and gold;

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43   The basic rules set out here for interest rate and equity options do not attempt to capture specific risk when calculating gamma capital charges. However, national authorities may wish to require specific banks to do so.

44   Positions have to be slotted into separate maturity ladders by currency.

45   Banks using the duration method should use the time-bands as set out in Table 3 of A.1.

- for commodities, each individual commodity as defined in paragraph 5 of A.4.

(iv) Each option on the same underlying will have a gamma impact that is either positive or negative. These individual gamma impacts will be summed, resulting in a net gamma impact for each underlying that is either positive or negative. Only those net gamma impacts that are negative will be included in the capital calculation.

(v) The total gamma capital charge will be the sum of the absolute value of the net negative gamma impacts as calculated above.

(vi) For <u>volatility risk</u>, banks will be required to calculate the capital charges by multiplying the sum of the vegas for all options on the same underlying, as defined above, by a proportional shift in volatility of ± 25%.

(vii) The <u>total capital charge</u> for vega risk will be the sum of the absolute value of the individual capital charges that have been calculated for vega risk.

(b) Scenario approach

8. More sophisticated banks will also have the right to base the market risk capital charge for options portfolios and associated hedging positions on *scenario matrix analysis*. This will be accomplished by specifying a fixed range of changes in the option portfolio's risk factors and calculating changes in the value of the option portfolio at various points along this "grid". For the purpose of calculating the capital charge, the bank will revalue the option portfolio using matrices for simultaneous changes in the option's underlying rate or price and in the volatility of that rate or price. A different matrix will be set up for each individual underlying as defined in paragraph 7 above. As an alternative, at the discretion of each national authority, banks which are significant traders in options will for interest rate options be permitted to base the calculation on a minimum of six sets of time-bands. When using this method, not more than three of the time-bands as defined in A.1 should be combined into any one set.

9. The options and related hedging positions will be evaluated over a specified range above and below the current value of the underlying. The range for interest rates is consistent with the assumed changes in yield in Table 1 of A.1. Those banks using the alternative method for interest rate options set out in paragraph 8 above should use, for each set of time-bands, the highest of the assumed changes in yield applicable to the group to which the time-bands belong.[46] The other ranges are ± 8% for equities[43], ± 8% for foreign exchange and gold, and ± 15% for commodities. For all risk categories, at least seven observations

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[46] If, for example, the time-bands 3 to 4 years, 4 to 5 years and 5 to 7 years are combined the highest assumed change in yield of these three bands would be 0.75.

(including the current observation) should be used to divide the range into equally spaced intervals.

10.   The second dimension of the matrix entails a change in the volatility of the underlying rate or price. A single change in the volatility of the underlying rate or price equal to a shift in volatility of + 25% and - 25% is expected to be sufficient in most cases. As circumstances warrant, however, the supervisory authority may choose to require that a different change in volatility be used and/or that intermediate points on the grid be calculated.

11.   After calculating the matrix each cell contains the net profit or loss of the option and the underlying hedge instrument. The capital charge for each underlying will then be calculated as the largest loss contained in the matrix.

12.   The application of the scenario analysis by any specific bank will be subject to supervisory consent, particularly as regards the precise way that the analysis is constructed. Banks' use of scenario analysis as part of the standardised methodology will also be subject to validation by the national authority, and to those of the qualitative standards listed in Part B which are appropriate given the nature of the business.

13.   In drawing up these intermediate approaches the Committee has sought to cover the major risks associated with options. In doing so, it is conscious that so far as specific risk is concerned, only the delta-related elements are captured; to capture other risks would necessitate a much more complex regime. On the other hand, in other areas the simplifying assumptions used have resulted in a relatively conservative treatment of certain options positions. For these reasons, the Committee intends to keep this area under close review.

14.   Besides the options risks mentioned above, the Committee is conscious of the other risks also associated with options, e.g., rho (rate of change of the value of the option with respect to the interest rate) and theta (rate of change of the value of the option with respect to time). While not proposing a measurement system for those risks at present, it expects banks undertaking significant options business at the very least to monitor such risks closely. Additionally, banks will be permitted to incorporate rho into their capital calculations for interest rate risk, if they wish to do so.

P A R T   B

USE OF INTERNAL MODELS TO MEASURE MARKET RISKS

B.1   GENERAL CRITERIA

1.   The use of an internal model will be conditional upon the explicit approval of the bank's supervisory authority. Home and host country supervisory authorities of banks that carry out material trading activities in multiple jurisdictions intend to work co-operatively to ensure an efficient approval process.

2.   The supervisory authority will only give its approval if at a minimum:
   - it is satisfied that the bank's risk management system is conceptually sound and is implemented with integrity;
   - the bank has in the supervisory authority's view sufficient numbers of staff skilled in the use of sophisticated models not only in the trading area but also in the risk control, audit, and if necessary, back office areas;
   - the bank's models have in the supervisory authority's judgement a proven track record of reasonable accuracy in measuring risk;
   - the bank regularly conducts stress tests along the lines discussed in B.5 below.

3.   Supervisory authorities will have the right to insist on a period of initial monitoring and live testing of a bank's internal model before it is used for supervisory capital purposes.

4.   In addition to these general criteria, banks using internal models for capital purposes will be subject to the requirements detailed in sections B.2 to B.7.

B.2   QUALITATIVE STANDARDS

It is important that supervisory authorities are able to assure themselves that banks using models have market risk management systems that are conceptually sound and implemented with integrity. Accordingly, the supervisory authority will specify a number of *qualitative criteria* that banks would have to meet before they are permitted to use a models-based approach. The extent to which banks meet the qualitative criteria may influence the level at which supervisory authorities will set the multiplication factor referred to in Section B.4 (j) below. Only those banks whose models are in full compliance with the qualitative criteria will be eligible for application of the minimum multiplication factor. The qualitative criteria include:

(a)   The bank should have an independent risk control unit that is responsible for the design and implementation of the bank's risk management system. The unit should produce and analyse daily reports on the output of the bank's risk measurement model, including an evaluation of the relationship between measures of risk exposure and trading limits. This unit must be independent from business trading units and should report directly to senior management of the bank.

(b)   The unit should conduct a regular back-testing programme, i.e., an ex-post comparison of the risk measure generated by the model against actual daily changes in portfolio value over longer periods of time, as well as hypothetical changes based on static positions.

(c)   Board of directors and senior management should be actively involved in the risk control process and must regard risk control as an essential aspect of the business to which significant resources need to be devoted.[47] In this regard, the daily reports prepared by the independent risk control unit must be reviewed by a level of management with sufficient seniority and authority to enforce both reductions of positions taken by individual traders and reductions in the bank's overall risk exposure.

(d)   The bank's internal risk measurement model must be closely integrated into the day-to-day risk management process of the bank. Its output should accordingly be an integral part of the process of planning, monitoring and controlling the bank's market risk profile.

(e)   The risk measurement system should be used in conjunction with internal trading and exposure limits. In this regard, trading limits should be related to the bank's

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47   The report, *Risk management guidelines for derivatives,* issued by the Basle Committee in July 1994 further discusses the responsibilities of the board of directors and senior management.

risk measurement model in a manner that is consistent over time and that is well-understood by both traders and senior management.

(f) A routine and rigorous programme of stress testing[48] should be in place as a supplement to the risk analysis based on the day-to-day output of the bank's risk measurement model. The results of stress testing should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Where stress tests reveal particular vulnerability to a given set of circumstances, prompt steps should be taken to manage those risks appropriately (e.g., by hedging against that outcome or reducing the size of the bank's exposures).

(g) Banks should have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the risk measurement system. The bank's risk measurement system must be well documented, for example, through a risk management manual that describes the basic principles of the risk management system and that provides an explanation of the empirical techniques used to measure market risk.

(h) An independent review of the risk measurement system should be carried out regularly in the bank's own internal auditing process. This review should include both the activities of the business trading units and of the independent risk control unit. A review of the overall risk management process should take place at regular intervals (ideally not less than once a year) and should specifically address, at a minimum:

- the adequacy of the documentation of the risk management system and process;
- the organisation of the risk control unit;
- the integration of market risk measures into daily risk management;
- the approval process for risk pricing models and valuation systems used by front and back-office personnel;
- the validation of any significant change in the risk measurement process;
- the scope of market risks captured by the risk measurement model;
- the integrity of the management information system;
- the accuracy and completeness of position data;
- the verification of the consistency, timeliness and reliability of data sources used to run internal models, including the independence of such data sources;
- the accuracy and appropriateness of volatility and correlation assumptions;

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48 Though banks will have some discretion as to how they conduct stress tests, their supervisory authorities will wish to see that they follow the general lines set out in Section B.5.

- the accuracy of valuation and risk transformation calculations;
- the verification of the model's accuracy through frequent back-testing as described in (b) above and in the accompanying document: *Supervisory framework for the use of backtesting in conjunction with the internal models approach to market risk capital requirements*.

B.3   SPECIFICATION OF MARKET RISK FACTORS

An important part of a bank's internal market risk measurement system is the specification of an appropriate set of market risk factors, i.e., the market rates and prices that affect the value of the bank's trading positions. The risk factors contained in a market risk measurement system should be sufficient to capture the risks inherent in the bank's portfolio of on- and off-balance sheet trading positions. Although banks will have some discretion in specifying the risk factors for their internal models, the following guidelines should be fulfilled.

(a)   For *interest rates*, there must be a set of risk factors corresponding to interest rates in each currency in which the bank has interest-rate-sensitive on- or off-balance sheet positions.

- The risk measurement system should model the yield curve using one of a number of generally accepted approaches, for example, by estimating forward rates of zero coupon yields. The yield curve should be divided into various maturity segments in order to capture variation in the volatility of rates along the yield curve; there will typically be one risk factor corresponding to each maturity segment. For material exposures to interest rate movements in the major currencies and markets, banks must model the yield curve using a minimum of six risk factors. However, the number of risk factors used should ultimately be driven by the nature of the bank's trading strategies. For instance, a bank with a portfolio of various types of securities across many points of the yield curve and that engages in complex arbitrage strategies would require a greater number of risk factors to capture interest rate risk accurately.

- The risk measurement system must incorporate separate risk factors to capture spread risk (e.g., between bonds and swaps). A variety of approaches may be used to capture the spread risk arising from less than perfectly correlated movements between government and other fixed-income interest rates, such as specifying a completely separate yield curve for non-government fixed-income instruments (for instance, swaps or municipal securities) or estimating the spread over government rates at various points along the yield curve.

(b)   For *exchange rates* (which may include gold), the risk measurement system should incorporate risk factors corresponding to the individual foreign currencies in which the bank's positions are denominated. Since the value-at-risk figure calculated by the risk measurement system will be expressed in the bank's domestic currency, any net position denominated in a foreign currency will introduce a foreign exchange risk. Thus, there must be risk factors corresponding

to the exchange rate between the domestic currency and each foreign currency in which the bank has a significant exposure.

(c) For *equity prices*, there should be risk factors corresponding to each of the equity markets in which the bank holds significant positions:

- at a minimum, there should be a risk factor that is designed to capture market-wide movements in equity prices (e.g., a market index). Positions in individual securities or in sector indices could be expressed in "beta-equivalents"[49] relative to this market-wide index;

- a somewhat more detailed approach would be to have risk factors corresponding to various sectors of the overall equity market (for instance, industry sectors or cyclical and non-cyclical sectors). As above, positions in individual stocks within each sector could be expressed in beta-equivalents[49] relative to the sector index;

- the most extensive approach would be to have risk factors corresponding to the volatility of individual equity issues.

The sophistication and nature of the modelling technique for a given market should correspond to the bank's exposure to the overall market as well as its concentration in individual equity issues in that market.

(d) For *commodity prices*, there should be risk factors corresponding to each of the commodity markets in which the bank holds significant positions (also see paragraph 6 of A.4):

- for banks with relatively limited positions in commodity-based instruments, a straightforward specification of risk factors would be acceptable. Such a specification would likely entail one risk factor for each commodity price to which the bank is exposed. In cases where the aggregate positions are quite small, it might be acceptable to use a single risk factor for a relatively broad sub-category of commodities (for instance, a single risk factor for all types of oil);

- for more active trading, the model must also take account of variation in the "convenience yield"[50] between derivatives positions such as forwards and swaps and cash positions in the commodity.

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49 A "beta-equivalent" position would be calculated from a market model of equity price returns (such as the CAPM model) by regressing the return on the individual stock or sector index on the risk-free rate of return and the return on the market index.

50 The convenience yield reflects the benefits from direct ownership of the physical commodity (for example, the ability to profit from temporary market shortages), and is affected both by market conditions and by factors such as physical storage costs.

B.4   QUANTITATIVE STANDARDS

Banks will have flexibility in devising the precise nature of their models, but the following minimum standards will apply for the purpose of calculating their capital charge. Individual banks or their supervisory authorities will have discretion to apply stricter standards.

(a) "*Value-at-risk*" must be computed on a daily basis.

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

(c) In calculating value-at-risk, an instantaneous price shock equivalent to a 10 day movement in prices is to be used, i.e., the minimum "*holding period*" will be ten trading days. Banks may use value-at-risk numbers calculated according to shorter holding periods scaled up to ten days by the square root of time (for the treatment of options, also see (h) below).

(d) The choice of *historical observation period* (sample period) for calculating value-at-risk will be constrained to a minimum length of one year. For banks that use a weighting scheme or other methods for the historical observation period, the "effective" observation period must be at least one year (that is, the weighted average time lag of the individual observations cannot be less than 6 months).

(e) Banks should update their *data sets* no less frequently than once every three months and should also reassess them whenever market prices are subject to material changes. The supervisory authority may also require a bank to calculate its value-at-risk using a shorter observation period if, in the supervisor's judgement, this is justified by a significant upsurge in price volatility.

(f) No particular *type of model* is prescribed. So long as each model used captures all the material risks run by the bank, as set out in B.3, banks will be free to use models based, for example, on variance-covariance matrices, historical simulations, or Monte Carlo simulations.

(g) Banks will have discretion to recognise empirical *correlations* within broad risk categories (e.g., interest rates, exchange rates, equity prices and commodity prices, including related options volatilities in each risk factor category). The supervisory authority may also recognise empirical correlations across broad risk factor categories, provided that the supervisory authority is satisfied that the bank's system for measuring correlations is sound and implemented with integrity.

(h) Banks' models must accurately capture the unique risks associated with *options* within each of the broad risk categories. The following criteria apply to the measurement of options risk:

- banks' models must capture the *non-linear price characteristics* of options positions;

- banks are expected to ultimately move towards the application of a full 10 day price shock to options positions or positions that display option-like characteristics. In the interim, national authorities may require banks to adjust their capital measure for options risk through other methods, e.g., periodic simulations or stress testing;

- each bank's risk measurement system must have a set of risk factors that captures the *volatilities of the rates and prices* underlying option positions, i.e., vega risk. Banks with relatively large and/or complex options portfolios should have detailed specifications of the relevant volatilities. This means that banks should measure the volatilities of options positions broken down by different maturities.

(i) Each bank must meet, on a daily basis, a *capital requirement* expressed as the higher of (i) its previous day's value-at-risk number measured according to the parameters specified in this section and (ii) an average of the daily value-at-risk measures on each of the preceding sixty business days, multiplied by a multiplication factor.

(j) The *multiplication factor* will be set by individual supervisory authorities on the basis of their assessment of the quality of the bank's risk management system, subject to an absolute minimum of 3. Banks will be required to add to this factor a "plus" directly related to the ex-post performance of the model, thereby introducing a built-in positive incentive to maintain the predictive quality of the model. The plus will range from 0 to 1 based on the outcome of so-called "backtesting." If the backtesting results are satisfactory and the bank meets all of the qualitative standards set out in B.2 above, the plus factor could be zero. The accompanying document, *Supervisory framework for the use of backtesting in conjunction with the internal models approach to market risk capital requirements*, presents in detail the approach to be applied for backtesting and the plus factor.

(k) Banks using models will be subject to a separate capital charge to cover the *specific risk* of interest rate related instruments and equity securities[51] as defined in the standardised approach to the extent that this risk is not incorporated into their models. However, for banks using models, the total specific risk charge applied to interest rate related instruments or to equities should in no case be less than half the specific risk charges calculated according to the standardised methodology.

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51 Including the additional requirements set out in the standardised approach for equity indices.

B.5   STRESS TESTING

1.   Banks that use the internal models approach for meeting market risk capital requirements must have in place a rigorous and comprehensive stress testing program. Stress testing to identify events or influences that could greatly impact banks is a key component of a bank's assessment of its capital position.

2.   Banks' stress scenarios need to cover a range of factors that can create extraordinary losses or gains in trading portfolios, or make the control of risk in those portfolios very difficult. These factors include low-probability events in all major types of risks, including the various components of market, credit, and operational risks. Stress scenarios need to shed light on the impact of such events on positions that display both linear and non-linear price characteristics (i.e., options and instruments that have options-like characteristics).

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

4.   Banks should combine the use of supervisory stress scenarios with stress tests developed by banks themselves to reflect their specific risk characteristics. Specifically, supervisory authorities may ask banks to provide information on stress testing in three broad areas, which are discussed in turn below.

(a)   Supervisory scenarios requiring no simulations by the bank

5.   Banks should have information on the largest losses experienced during the reporting period available for supervisory review. This loss information could be compared to the level of capital that results from a bank's internal measurement system. For example, it could provide supervisory authorities with a picture of how many days of peak day losses would have been covered by a given value-at-risk estimate.

(b)   Scenarios requiring a simulation by the bank

6.   Banks should subject their portfolios to a series of simulated stress scenarios and provide supervisory authorities with the results. These scenarios could include testing the current portfolio against past periods of significant disturbance, for example, the 1987 equity crash, the ERM crises of 1992 and 1993 or the fall in bond markets in the first quarter of 1994, incorporating both the large price movements and the sharp reduction in liquidity associated with these events. A second type of scenario would evaluate the sensitivity of the

bank's market risk exposure to changes in the assumptions about volatilities and correlations. Applying this test would require an evaluation of the historical range of variation for volatilities and correlations and evaluation of the bank's current positions against the extreme values of the historical range. Due consideration should be given to the sharp variation that at times has occurred in a matter of days in periods of significant market disturbance. The 1987 equity crash, the suspension of the ERM, or the fall in bond markets in the first quarter of 1994, for example, all involved correlations within risk factors approaching the extreme values of 1 or -1 for several days at the height of the disturbance.

(c)   Scenarios developed by the bank itself to capture the specific characteristics of its portfolio.

7.   In addition to the scenarios prescribed by supervisory authorities under (a) and (b) above, a bank should also develop its own stress tests which it identifies as most adverse based on the characteristics of its portfolio (e.g., problems in a key region of the world combined with a sharp move in oil prices). Banks should provide supervisory authorities with a description of the methodology used to identify and carry out the scenarios as well as with a description of the results derived from these scenarios.

8.   The results should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Moreover, if the testing reveals particular vulnerability to a given set of circumstances, the national authorities would expect the bank to take prompt steps to manage those risks appropriately (e.g., by hedging against that outcome or reducing the size of its exposures).

B.6   EXTERNAL VALIDATION

The validation of models' accuracy by external auditors and/or supervisory authorities should at a minimum include the following steps:

(a)   verifying that the *internal validation processes* described in B.2 (h) are operating in a satisfactory manner;

(b)   ensuring that the *formulae* used in the calculation process as well as for the pricing of options and other complex instruments are validated by a qualified unit, which in all cases should be independent from the trading area;

(c)   checking that the *structure* of internal models is adequate with respect to the bank's activities and geographical coverage;

(d)   checking the results of the banks' *back-testing* of its internal measurement system (i.e., comparing value-at-risk estimates with actual profits and losses) to ensure that the model provides a reliable measure of potential losses over time. This means that banks should make the results as well as the underlying inputs to their value-at-risk calculations available to their supervisory authorities and/or external auditors on request;

(e)   making sure that data flows and processes associated with the risk measurement system are *transparent and accessible*. In particular, it is necessary that auditors or supervisory authorities are in a position to have easy access, whenever they judge it necessary and under appropriate procedures, to the models' specifications and parameters.

B.7 COMBINATION OF INTERNAL MODELS AND THE STANDARDISED METHODOLOGY

Unless a bank's exposure to a particular risk factor, such as commodity prices, is insignificant, the internal models approach will in principle require banks to have an integrated risk measurement system that captures the broad risk factor categories (i.e., interest rates, exchange rates (which may include gold), equity prices and commodity prices, with related options volatilities being included in each risk factor category). Thus, banks which start to use models for one or more risk factor categories will, over time, be expected to extend the models to all their market risks. A bank which has developed one or more models will no longer be able to revert to measuring the risk measured by those models according to the standardised methodology (unless the supervisory authority withdraws approval for that model). However, pending further experience regarding the process of changing to a models-based approach, no specific time limit will be set for banks which use a combination of internal models and the standardised methodology to move to a comprehensive model.

The following conditions will apply to banks using such combinations:

(a) each broad risk factor category must be assessed using a single approach (either internal models or the standardised approach), i.e., no combination of the two methods will in principle be permitted within a risk category or across banks' different entities for the same type of risk (but see paragraph 16 of the introduction);[52]

(b) all the criteria laid down in Part B of this paper will apply to the models being used;

(c) banks may not modify the combination of the two approaches they use without justifying to their supervisory authority that they have a good reason for doing so;

(d) no element of market risk may escape measurement, i.e., the exposure for all the various risk factors, whether calculated according to the standardised approach or internal models, would have to be captured;

(e) the capital charges assessed under the standardised approach and under the models approach are to be aggregated according to the simple sum method.

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52 However, banks may incur risks in positions which are not captured by their models, for example, in remote locations, in minor currencies or in negligible business areas. Such risks should be measured according to the standardised methodology.

P A R T   C

W O R K E D   E X A M P L E S

C.1   CALCULATION OF THE CAPITAL RATIO
(SEE INTRODUCTION, SECTION II (b))

1.   If a bank has tier 1 capital of 700, tier 2 capital of 100, tier 3 capital of 600, weighted risk assets for credit risk of 7,500 and a market risk capital charge of 350, it first has to multiply the measure of market risk by 12.5 to create trading book notional risk weighted assets (see Table 9). By doing this the bank creates a numerical link between the calculation of the capital requirement for credit risk, where the capital charge is based on the risk-weighted assets, and the capital requirement for market risk, where instead the capital charge itself is calculated directly on the basis of the measurement systems in Parts A and B. After the calculation of the minimum capital charge, the amount of capital that is eligible for meeting those requirements must be computed, starting with credit risk, covered in this example by 500 tier 1 capital and 100 tier 2 capital. This leaves 200 tier 1 capital available to support the bank's market risk requirements, which - because of the 250% rule - means that only 500 of the tier 3 capital is eligible. Because this bank only needs to use 100 tier 1 capital and 250 tier 3 capital to meet its market risk capital requirement, the bank has 100 tier 1 capital and 250 tier 3 capital that is unused but eligible for future market risk requirements.

2.   For calculating the capital ratio, excess tier 1 capital should be taken into account as it can be used to meet credit and/or market risk requirements. Therefore, the capital ratio is calculated by dividing the eligible capital (excluding unused tier 3) by the total (notional) risk assets (1,050 / 11,875 = 8.8 %). Excess tier 3 capital which is unused but eligible can also be calculated as an excess tier 3 capital ratio (250 / 11,875 = 2.1%).

Table 9

Risk assets	Minimum capital charge	Available capital	Minimum capital for meeting requirement	Eligible capital (excluding unused tier 3)	Unused but eligible tier 3	Unused but not eligible tier 3
Credit risk 7,500	600	tier 1 700 tier 2 100	tier 1 500 tier 2 100	tier 1 700 tier 2 100		
Market risk 4,375 (i.e., 350 x 12.5)	350	tier 3 600	tier 1 100 tier 3 250	tier 3 250	tier 3 250	tier 3 100
				Capital ratio: 1,050/11,875 = 8.8 %	Excess tier 3 Capital ratio: 250/11,875 = 2.1 %	

C.2   CALCULATION OF GENERAL MARKET RISK FOR INTEREST RATE RELATED INSTRUMENTS (SECTION A.1)

1.   A bank may have the following positions:
   - Qualifying bond, $ 13.33 mn market value, residual maturity 8 years, coupon 8%;
   - Government bond, $ 75 mn market value, residual maturity 2 months, coupon 7%;
   - Interest rate swap, $ 150 mn,[53] bank receives floating rate interest and pays fixed, next interest fixing after 9 months, residual life of swap 8 years;
   - Long position in interest rate future, $ 50 mn[53] , delivery date after 6 months, life of underlying government security 3.5 years.

2.   Table 10 shows how these positions are slotted into the time-bands and are weighted according to the weights given in Table 1 of A.1. After weighting the positions the next steps in the calculation will be:

   (a)   The *vertical disallowance* in time-band 7-10 years has to be calculated: The matched position in this time-band is 0.5 (the lesser of the absolute values of the added (weighted) long and (weighted) short positions in the same time-band) which leads to a capital charge of 10% of 0.5 = 0.05 = $ 50,000. The remaining net (short) position is -5.125.

   (b)   The *horizontal disallowances within the zones* have to be calculated: As there is more than one position only in zone 1, a horizontal disallowance can only be calculated in this zone. In doing this, the matched position is calculated as 0.2 (the lesser of the absolute values of the added long and short positions in the same zone). The capital charge for the horizontal disallowance within zone 1 is 40% of 0.2 = 0.08 = $ 80,000. The remaining net (long) position in zone 1 is +1.00.

   (c)   The *horizontal disallowances between adjacent zones* have to be calculated: After calculating the net position within zone 1 the following positions remain: zone 1 +1.00, zone 2 +1.125, zone 3 -5.125. The matched position between zones 2 and 3 is 1.125 (the lesser of the absolute values of the long and short positions between adjacent zones) The capital charge in this case is 40% of 1.125 = 0.45 = $ 450,000.

   (d)   The *horizontal disallowance between zones 1 and 3* has to be calculated: The remaining net (long) position in zone 1 is +1.00, in zone 3 the net (short) position

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53   The position should be reported as the market value of the notional underlying. Depending on the current interest rate, the market value of each leg of the swap (i.e., the 8 year bond and the 9 months floater) can be either higher or lower than the notional amount. For sake of simplicity the example assumes that the current interest rate is identical with the one the swap is based on.

is -4.00. If there were no offsetting between zones 1 and 3 allowed the capital charge would be 5.00 = $ 5,000,000. However, the horizontal disallowance between the distant zones is 100% of the matched position which leads to a capital charge of 100% of 1.00 = 1.00 = $ 1,000,000.

(e) The overall net position is 3.00 leading to a capital charge of $ 3,000,000.

Table 10

($ mn)

Time-band	Zone 1				Zone 2			Zone 3					
	0-1	1-3	3-6	6-12	1-2	2-3	3-4	4-5	5-7	7-10	10-15	15-20	over 20
	Months				Years								
Position		+75 Gov.	-50 Fut.	+150 Swap			+50 Fut.			-150 Swap +13.33 Qual.			
Weight (%)	0.00	0.20	0.40	0.70	1.25	1.75	2.25	2.75	3.25	3.75	4.50	5.25	6.00
Position x Weight		+0.15	-0.20	+1.05			+1.125			-5.625 +0.5			
Vertical Disallow.										0.5 x 10% = 0.05			
Horizont. Disallow. 1	0.20 x 40% = 0.08												
Horizont. Disallow. 2					1.125 x 40% = 0.45								
Horizont. Disallow. 3	1.0 x 100% = 1.0												

3. The total capital charge in this example is:

- for the vertical disallowance	$	50,000
- for the horizontal disallowance in zone 1	$	80,000
- for the horizontal disallowance between adjacent zones	$	450,000
- for the horizontal disallowance between zones 1 and 3	$	1,000,000
- for the overall net open position	$	3,000,000
	$	**4,580,000**

C.3   MATURITY LADDER APPROACH FOR COMMODITIES RISK
(SECTION A.4)

Assume all positions are in the same commodity as defined in paragraph 5 of A.4 and converted at current spot rates into US $ as the national currency.

Table 11

Time band	Position	Spread rate	Capital calculation	
0 - 1 month		1.5%		
1 - 3 months		1.5%		
3 - 6 months	Long 800 US $ Short 1000 US $	1.5%	800 long + 800 short (matched) x 1.5% = 200 short carried forward to 1-2 years, capital charge: 200 x 2 x 0.6% =	24 2.4
6 - 12 months		1.5%		
1 - 2 years	Long 600 US $	1.5%	200 long + 200 short (matched) x 1.5% = 400 long carried forward to over 3 years, capital charge: 400 x 2 x 0.6% =	6 4.8
2 - 3 years		1.5%		
over 3 years	Short 600 US $	1.5%	400 long + 400 short (matched) x 1.5% = net position: 200 capital charge: 200 x 15% =	12 30

The total capital charge will be US $ 79.2.

C.4 DELTA-PLUS METHOD FOR OPTIONS (SECTION A.5)

1.   Assume a bank has an 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%. The current delta for this position is according to the Black-Scholes formula -0.721 (i.e., the price of the option changes by -0.721 if the price of the underlying moves by 1).The gamma is -0.0034 (i.e., 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.

2.   The following example shows how the capital charges will be calculated according to the delta-plus method:

(a)   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 then has to be incorporated into the measure described in A.4. If the bank uses the maturity ladder approach and no other positions exist the delta-weighted position has to be multiplied by 0.15 to calculate the capital charge for delta.
    360.5 x 0.15 = 54.075.

(b)   The capital charge for gamma has to be calculated according to the formula set out in paragraph 7 in A.5.
    1/2 x 0.0034 x (500 x 0.15)² = 9.5625

(c)   The capital charge for vega has to be calculated. The assumed current (implied) volatility is 20%. As 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 charge 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 by
    5 x 1.68 = 8.4
    which is the capital charge for vega risk.