

# **THE SUPERVISORY TREATMENT OF BANKS' MARKET RISK**

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## **ABSTRACT**

In April 1993, the Basle Committee on Banking Supervision released a series of consultative papers relating to the supervisory treatment of market risk within banks' trading portfolios. The papers proposed a method of allocating capital to cover risk from banks' trading positions in debt securities and equities, as well as exposure to foreign exchange risk across the entire bank. This study assesses the efficacy of the proposed methods for measuring risk and allocating capital to exposures from traded debt securities, traded equities and foreign exchange. The analysis draws on actual portfolio data from banks, as well as random hypothetical portfolios, measured against historical movements in debt and equity prices and exchange rates. The conclusions drawn are broadly that the capital charges generated under the proposed methods are conservative, when measured against historical changes in portfolio values. In the case of the debt securities and foreign exchange proposals, the capital charges are reasonably well correlated with risk in portfolios; higher risk portfolios attract higher capital charges. However, in the case of the equity risk proposal, this relationship is not as strong.

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## **1. INTRODUCTION**

The 1988 International Accord on Banking Supervision - the Basle Accord - introduced a new regime for defining, measuring and determining minimum levels of capital within the international banking system. The Accord was founded on the principle that banks should hold a minimum level of capital which should be linked directly to the risks faced by banks in their operations. The Accord was the product of the Committee on Banking Regulations and Supervisory Practices, a group formed in the early 1970s by the supervisory authorities of the G10 countries. Its risk-based capital adequacy standards subsequently became the model for supervisory structures, not only for member countries of the G10, but in a range of other countries, including Australia.

The scope of the Accord was limited in the sense that it addressed only one aspect of risk facing banks; credit risk or the risk of loss associated with counterparty failure. The focus on credit did not deny the presence of other types of risks and it was acknowledged explicitly that market-related risks arising from the effects of changing prices (interest rates, exchange rates and equity prices) should also be taken into account by supervisors in framing prudential policy for banks.

Over recent years, the Basle Committee has conducted work on formally including market risk in the capital adequacy framework. The first stage of that work was completed in early 1993 and a series of 'consultative' papers were released for discussion and comment. The market-risk proposals<sup>1</sup> consisted of three separate proposals to measure risks arising from banks' trading activities in debt securities and equities markets, and in relation to their foreign exchange exposures. The

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<sup>1</sup> Basle Committee on Banking Supervision (1993), The Supervisory Treatment of Market Risk, Basle, April.

proposals set out procedures for applying capital charges commensurate with those risks.<sup>2</sup> The Reserve Bank prepared a detailed submission to the Committee, drawing on analysis and empirical work and on comments from Australian banks. The Basle Committee is reviewing the proposals in the light of all comments received.

This paper summarises the three proposals and describes some simple empirical work to test their efficacy in covering potential losses from banks' market-related portfolios.

Section 2 provides some background to the development of the market-risk proposals while Section 3 considers some of the main structural features of the proposals. Sections 4, 5 and 6 deal with the traded-debt proposals, the traded equity proposals and the foreign exchange proposal respectively. A brief conclusion, in Section 7, touches on some of the main policy issues raised by the proposals.

## **2. BACKGROUND**

Deregulation of international financial systems over the 1980s was accompanied by a period of high price volatility in financial markets. Increased volatility in the prices of financial instruments and other financial assets opened new opportunities for profit for financial institutions from the trading of those instruments. With those new opportunities, however, came the potential for losses. While banks' market-related exposures remained relatively small and actual losses minimal, the case for the formal recognition of market risk within the supervisory structure did not seem strong. The growth in market-related exposures began to accelerate, however, especially over the latter half of the 1980s. The nature of banks' exposures to the market also changed; the traditional risks associated with large holdings of fixed-interest securities remained but were supplemented by additional risk associated with the rapid growth in off-balance sheet and derivative markets. While banks were becoming increasingly large players in those markets, the risks were still small

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<sup>2</sup> At the same time as the release of the market risk proposals, the Basle Committee released a proposal covering the treatment of bilateral netting for capital adequacy purposes and a discussion paper on the measurement of interest rate risk across the whole of a bank's operations.

when measured against credit risk arising from their traditional lending activities. Concerns, however, were focused more on future developments, and the possibility that banks' exposures in these areas would continue to expand.

It was against that background that work on the prudential treatment of market risk began. As it progressed in the final years of the 1980s and into the 1990s, three separate, though related, themes emerged as the main factors driving the market-risk exercise internationally.

1. *A desire to see the existing capital adequacy framework generally expanded and strengthened;*
2. *A desire to remove distortions within the banking sector that may have arisen from the focus of capital standards on credit as opposed to other forms of risk; and*
3. *A desire to achieve greater consistency in supervisory treatment between international banking and securities regulators.*

The first of these themes was a direct consequence of the market developments noted above. The case for expanding the capital framework grew stronger with growth in market exposures faced by banks. Increasing complexity of market-related instruments added to problems in identifying and assessing exposures.

The second reflected a growing recognition of the possible consequences of focusing supervisory effort on one aspect of risk; namely, the encouragement of alternative forms of risk taking by banks. It can be argued that the existing capital standards, by focusing largely on credit risk, provided a strong incentive for banks to turn their attention towards activities where credit risk was deemed low from a regulatory perspective, but where non-credit-related risks may be greater. Many have pointed to the growth in banks' off-balance-sheet/derivative business as evidence of that process. A strong case can be made that inconsistencies in supervisory arrangements should not bias banks' activities in particular directions.

The third motivation was broader in concept and concerned the desirability of applying consistent supervisory standards to institutions doing similar forms of business. While few would argue the case for equal supervisory treatment across all financial institutions, it is the case that competitive inequalities can arise when one

set of institutions doing similar, or in some cases identical business, is supervised more rigorously than others. Internationally, that debate on competitive inequality focused on the regulatory treatment of the international securities houses *vis-a-vis* the banks; in particular, the concern that differing supervisory treatment carried the potential for a significant shifting of business towards the unregulated or less regulated group. These concerns, while always present to some degree, increased as the distinctions between banking and non-banking activities blurred and as banks' market activities came to mirror, more and more, the activities of the international securities houses. An important catalyst to the work on market risk was the desire to develop consistent supervisory guidelines for these two groups of institutions.

One consequence was that in developing the market-risk proposals, the Basle Committee sought assistance from IOSCO (International Organization of Securities Commissions). IOSCO was represented on the various technical working parties whose task it was to develop the details of the market-risk proposals. The intention was that the regulatory guidelines that emerged would represent a joint product of the banking and securities regulators and would be applied equally to banks and securities houses. For a variety of reasons, those joint arrangements broke down in early 1993. However, the structure of the proposals as they were released still reflects the input of the securities regulators.

Having determined that some form of regulatory arrangement was necessary to supervise banks' market-related activities, debate turned to the issue of how that objective could be achieved. Two difficulties emerged; one philosophical, one practical in nature.

At the broadest level was the issue of how to reconcile the introduction of new regulatory arrangements with the objective of improving market efficiency, one of the main goals of financial deregulation. It was broadly accepted that with financial deregulation came a greater emphasis on, and need for, prudential supervision. The question at hand, however, was the form that any expansion in the supervisory net to capture market risk should take. Over the latter part of the 1980s, for example, many financial institutions invested heavily in the development of tailored risk-management systems to handle their growing levels of market risk. An important issue that arose in the development of the proposals was the extent to which banks' own risk-management structures should be taken into account or recognised in extending the supervisory structure. To what extent, for example, would any

separate supervisory guidelines on market risk represent a duplication of what financial institutions had already put into effect on a voluntary basis? That issue remains current and is one of the key issues examined by the Basle Committee.

The more practical and immediate problem was how to translate the objectives of the market-risk exercise into a workable set of guidelines with applicability across a range of countries. The credit standards introduced in 1988 were able to achieve that by adopting a very simple approach involving a regime of risk weights applied to different credit exposures. While the assumptions on which that model was devised have been heavily criticised, the willingness of countries to implement the credit based standard over recent years has been assisted by their relative simplicity. It is doubtful that highly complicated credit standards would have enjoyed the same degree of international support that the current standards have had since their inception. The market-risk guidelines had the potential for much greater complexity than those covering credit risk.

The Committee tried to address the conflict between the inherent complexity of capturing market risk and the practical need for simplicity by taking a two-step approach. It involved:

- development of a 'standard' approach towards the treatment of market risk which was relatively simple in scope. The standard model formed the basis of the proposals; and
- introduction of some alternatives, within the standard approach, which would allow sophisticated banks to use more elaborate techniques in calculating the risks associated with their market activities, for example breaking down swap positions into cash flows from each interest payment.

Irrespective of which approach was adopted, it was emphasised that none of the techniques proposed to identify or measure market risk (either in the standard model or the more sophisticated options) was intended as a substitute for banks' own internal risk management systems. The objective was solely the creation of a structure to permit the calculation of a capital charge that provided a reasonably accurate assessment of banks' actual market-related exposures.

The main focus of this paper is on the standard methodologies proposed for calculating the capital charges and whether those simple methodologies are

sufficient to provide an estimate of the risks associated with market-related instruments. For the foreign exchange proposal, an alternative simulation method proposed by the Basle Committee is assessed and compared to the standard method.

### **3. STRUCTURE OF THE PROPOSALS**

While the three proposals vary in terms of structure and complexity, they share some common features. In particular:

- *they all focus on the need for capital to cover market risk.*  
Other methods of risk control, such as use of internal limit systems (without explicit capital coverage) were considered as alternatives to an arrangement requiring dedicated capital for market risk. Supervisors in some countries already have such arrangements in place. These alternative approaches were dismissed on the grounds that:
  - only physical holdings of capital can, in the final resort, provide an institution with a buffer against losses. Limit-based systems, although generally linked to capital, only set an upper bound on the losses that might be experienced by an institution; and
  - only a structure based on holdings of capital could be viewed as consistent with the current capital adequacy standards.
- *the focus of the proposals is on the market risks found in a bank's 'trading book'.*

As structured, the proposals were not intended to cover all market-related risks faced by banks. While the proposals cover all foreign exchange risk incurred by a bank, only positions in debt instruments or equities held for short-term trading purposes are captured. The proposal does not define the trading book precisely; the implicit assumption however, is that it covers those instruments which are held for trading, as opposed to longer-term investment and which are marked to market at regular intervals. The focus on the trading book as the basis for measuring and applying a capital charge to market risk reflected two factors. The first was the technical difficulty in estimating the market risk associated with traditional banking activities i.e. borrowing and lending. The treatment of market risk across the whole bank was considered as an issue to

be addressed in the longer term. The second factor was that by concentrating on risk in the trading book, it captured the sorts of activities carried out within dedicated securities firms, and was therefore consistent with the objective of creating a regulatory structure applicable to both banks and securities firms.

- *the proposals assume, implicitly, that risks are additive.*

It is assumed that the individual market risks associated with changes in exchange rates and interest rates, and arising from variations in equity prices, can be summed and added to the associated credit risks to form an overall risk position. This methodology is referred to in Basle literature as the 'building block' approach. The proposals do not approach risk from a portfolio perspective; that is, they do not seek to identify and take into account the presence of inter-relationships between various types of risk (for example, relationships between exchange rate movements and changes in security yields) and build those empirical linkages into the risk measurement system.

The following sections look at each of the three proposals, covering traded-debt instruments, foreign exchange and equities.

#### **4. TRADED-DEBT SECURITIES**

The first of the proposals, and the most complex, covers market risk on traded-debt securities and related instruments. Although banks carry interest rate risk on many of their assets, the impact of changing interest rates is most obvious, and quantifiable, when looking at traded-debt instruments and debt-derivative products.

Under the proposed arrangements, the capital requirement for securities in the trading book consists of two separately calculated charges:

- the first relates to credit risk (and is termed '*specific risk.*') It is defined as the risk that the price of a particular security will rise and fall with changes in the creditworthiness of the issuer. The capital charge arising from specific risk is intended to replace that levied under the present credit based capital requirements. However, as shown below, the basis of calculating the capital requirement for credit risk varies from that adopted under current capital adequacy arrangements; and

- the second capital charge will cover the '*general market risk*', of the portfolio; that is, the risk of price movements arising from changes in the general level of interest rates.

#### 4.1 Specific Risk

Specific risk applies to *all* long and short trading positions in debt instruments and in related derivatives. This differs from the current capital adequacy arrangements where only long positions in debt instruments (i.e. assets actually held) are subject to a capital charge. The broadening of the arrangements to include short positions recognises that the creditworthiness of an issuer can improve or deteriorate over time, and therefore the price of those particular securities can rise and fall relative to those of other issuers.<sup>3</sup>

Under the proposals, the following capital charges are applied to cover specific risk:

Commonwealth Government securities	0.00%
Qualifying securities:	
less than 6 months residual maturity;	0.25%
between 6 and 24 months residual maturity; and	1.00%
greater than 24 months residual maturity.	1.60%
All other securities	8.00%

The 'qualifying' category includes debt and related instruments of local and state government authorities, other public sector entities, banks and high-quality corporates.

A corporate security will be deemed qualifying if it is:

- rated investment grade<sup>4</sup> by at least two credit rating agencies specified by the supervisor;
- rated investment grade by one credit agency and not less than investment grade by any other agency specified by the supervisor; or

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<sup>3</sup> For the purposes of the calculation, offsetting positions in identical security issues are excluded.

<sup>4</sup> For example, rated Baa or higher by Moodys and BBB or higher by Standard and Poors.

- unrated, but deemed comparable to investment grade by the bank *and* the issuer has securities listed on a recognised stock exchange.

The specific risk charges outlined in this proposal differ in key respects from those applied under the capital adequacy guidelines; the most significant being the introduction of a concessional risk weighting for 'qualifying' debt. In the Australian market, this would mainly cover debt issues of high-quality corporates which, under the present standards, attract a uniform 8 per cent capital charge. The capital charges proposed for such issues would, therefore, be considerably lower than those levied under the present system. It would also open a large gap between capital charges applying to banks' holdings of debt securities of high-quality corporates and loans made to them by banks. This may provide incentives for banks to facilitate lending via the issue of debt, rather than lend directly to these companies or institutions. That approach, if adopted, would represent an important change in supervisory practice, carrying implications for the pattern of financing within the banking system.

## 4.2 General Market Risk

General market risk refers to the risk associated with changes in the level of interest rates.

The method proposed to calculate capital charges to cover general market risk requires that instruments<sup>5</sup> be slotted into a maturity ladder made up of thirteen maturity bands. A capital requirement is then determined based on the concept of potential change in the value of the portfolio.

For each position within a given time band, a calculation is performed to estimate potential change in value. The change in value of any particular position will reflect three factors:

- *the size of the position itself.*
- *the change/s in yield assumed for the purposes of the calculation.*

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<sup>5</sup> Instruments which are included are: long and short positions in physical debt securities; notional underlying positions of derivative instruments such as futures, forwards and swaps (both legs of the swaps are included, each in their appropriate time band); and options on the basis of the probability of their being exercised (delta equivalent basis).

The larger the interest rate variation built into the calculation, the larger the potential loss, and therefore the more conservative any resulting capital charge will be. For the purposes of determining the capital charge, the standard method assumes that the change in yield should be sufficient to cover two standard deviations of historical movements in yields over a one-month period; and

- *the price sensitivity of the position to changes in yield.*

The sensitivity of the underlying securities which make up a position to changes in rates is technically more complicated to calculate. Here a relatively simple modified-duration methodology is adopted.<sup>6</sup> Rather than calculate the actual duration of each security using individual cash flows, the standard method estimates the modified duration for each separate time band, based on an assumption that all securities carry an 8 per cent coupon rate, an 8 per cent yield and a maturity equal to the mid point of their time band.<sup>7</sup>

The assumed change in yield and the modified duration can then be combined to produce a single 'market-risk weight' for each time band. Current market values of individual positions are multiplied by the market-risk weight appropriate to their time band. These are summed within each time band to give a net open position which represents the potential change in the value of all positions in the time band.

Potential changes in value for each time band must then be combined in some way to provide a measure of the overall change in value of the portfolio. The simplest way to achieve this would be to simply net, within and across time bands, all of the measured potential changes in value. That simple netting approach is only appropriate if actual yield curve movements follow the yield curve movement assumed in the risk-weighting process. Underlying the risk-weighting process is an assumed yield curve shift ranging from 100 basis points at the short end to 60 basis

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<sup>6</sup> Duration is a technique used to measure the price sensitivity (i.e. risk) of a security or a portfolio. Price sensitivity is greater for securities (or portfolios) with longer maturities and/or lower coupon rates. Duration provides a useful measure of this price sensitivity by taking both factors into account. In mathematical terms, the concept of 'modified duration' measures the price sensitivity of a bond to a small change in interest rates.

<sup>7</sup> The proposals allow banks with sophisticated risk management systems to calculate the exact duration for all individual positions, and use these more accurate measurements in calculating risk-weighted positions.

points at the long end.<sup>8</sup> This assumes that when the yield curve shifts as a result, say, of a shift in short-term interest rates, the movement of the curve is always the same. That assumption can rarely be justified. The shape of the yield curve will tend to change with changing short-term yields. Further, securities within the same time band may not exhibit the same price changes due to factors such as small maturity differences and the liquidity of different issues.

To take these complexities into account, so-called 'disallowance factors' are introduced to cover:

- imperfect correlation of price between different securities within a given time band ('basis risk'); and
- imperfect correlation of price across different time bands ('yield curve risk').

The following two sections describe these disallowances in some detail, and illustrate how they would impact on the calculation of the total capital charge.

#### 4.2.1 Vertical Disallowances to Cover Basis Risk

Within any particular time band, long and short risk weighted positions are offset, leaving a net open position. However, in recognition of the fact that each time band will include positions whose maturities are not identical, a 10 per cent vertical disallowance is applied to one side of the matched positions in each time band.

To illustrate, consider a bank which held the following positions in the 6 to 12 month maturity band<sup>9</sup> on January 1, 1994:

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<sup>8</sup> These assumed volatilities are based on empirical work performed by the Basle Committee using data from different international interest rate environments.

<sup>9</sup> The risk-weighted position of securities within the 6 to 12 month time band is calculated as 0.7 per cent of market value. This represents the product of the duration weight of 0.7 and the assumed change in yield of 100 basis points.

**Example 1**

	<b>Coupon %</b>	<b>Maturity</b>	<b>Market value \$m</b>	<b>Market risk weight %</b>	<b>Risk-weighted position \$m</b>
			<i>a</i>	<i>b</i>	<i>a x b</i>
Treasury bonds	12.5	30/09/94	3,571	0.70	25
Telecom bonds	13.0	15/11/94	-571 <sup>10</sup>	0.70	-4
Bank bills	7.5	15/11/94	-1,429	0.70	-10

Diagrammatically, this 'portfolio' can be considered as below.

**Figure 1**

<b>Long (Asset)</b>	<b>Short (Liability)</b>
<b>14</b>	<b>14</b>
<b>11</b>	<b>Net</b>

In this portfolio the sum of the weighted long positions in the time bands is \$25 million and the sum of the weighted shorts is \$14 million. The net open position in the time band is therefore a long position of \$11 million. That amount is then carried forward to be used in the calculation of the horizontal disallowances covering yield curve risk (as described below.) The amount which has been offset attracts a capital penalty of 10 per cent. In this time band, \$14 million of long and short positions have been offset against each other. The vertical disallowance of 10 per cent is applied, resulting in a capital charge of \$1.4 million.

<sup>10</sup> Negative numbers represent liabilities, or short positions.

#### 4.2.2 Horizontal Disallowances to Cover Yield Curve Risk

To cover yield curve risk, the standard method aggregates the thirteen time bands into three time zones and applies horizontal disallowances to cover opposite positions in different time bands and zones. The concept of capital charges based on offsetting positions in different time bands is analogous to that described above for vertical disallowances for offsetting positions within time bands. For example, where a bank has a net long risk-weighted position in the first time band (0-1 month maturity) and a net short position in the second time band (1-3 month maturity), the two positions may not be offset without taking into consideration the lack of price correlation between positions in the two time bands. As the differences in maturity are greater between time bands than within time bands, the disallowances factors applied are correspondingly higher.

The horizontal disallowance structure is summarised below.

**Table 1: Horizontal Disallowance Structure Offsetting Within and Across Time Zones**

	<b>Time band</b>	<b>Within the zone %</b>	<b>Between adjacent zones %</b>	<b>Between zones 1 and 3 %</b>
Zone 1	up to 1 month			
	1 to 3 months	40		
	3 to 6 months			
	6 to 12 months		40	
Zone 2	1 to 2 years			
	2 to 3 years	30		150
	3 to 4 years		40	
Zone 3	4 to 5 years			
	5 to 7 years			
	7 to 10 years	30		
	10 to 15 years			
	15 to 20 years			
	over 20 years			

To illustrate, if the bank has net open positions in each time band as follows:

**Example 2**

	<b>Time band</b>	<b>Market value \$m</b>	<b>Market-risk weight %</b>	<b>Risk-weighted position \$m</b>	<b>Net position in zone \$m</b>
Zone 1	up to 1 month	100	0.00	-	
	1 to 3 months	500	0.20	1	(3)
	3 to 6 months	(3,750)	0.40	(15)	
	6 to 12 months	1,570	0.70	11	
Zone 2	1 to 2 years	1429	1.40	20	
	2 to 3 years	(1364)	2.20	(30)	(15)
	3 to 4 years	(167)	3.00	(5)	
Zone 3	4 to 5 years	685	3.65	25	
	5 to 7 years	559	4.65	26	
	7 to 10 years	(172)	5.80	(10)	40
	10 to 15 years	(133)	7.50	(10)	
	15 to 20 years	103	8.75	9	
	over 20 years		10.00	-	
	<b>Total</b>			<b>22</b>	<b>(a)</b>

The capital charges within time zones will be:

Zone 1	(0.4 x 12)	4.8	
Zone 2	(0.3 x 20)	6.0	
Zone 3	(0.3 x 20)	6.0	
		<b>16.8</b>	<b>(b)</b>

The capital charges between time zones:

Zone 1/2		nil	
Zone 2/3	(0.4 x 15)	6.0	
Zone 1/3	(1.5 x 3)	4.5	
		<b>10.5</b>	<b>(c)</b>

The capital charge against general market risk in this case will be \$49.3 million; the sum of the totals at (a), (b) and (c) above.

The capital charge calculated for the net open portfolio position, plus the vertical and horizontal disallowance factors calculated within and across time bands, can be added to yield a figure, measured in dollar terms, of the capital charge for general market risk. To that total is added the separately calculated capital charge for specific risk to give the full capital requirement for the trading book of debt instruments.

### **4.3 Underlying Assumptions**

The previous sections describe the calculation of the capital charges under the standard method proposed by the Basle Committee. The calculation of capital charges on general market risk in the debt securities proposal relies on assumptions relating to:

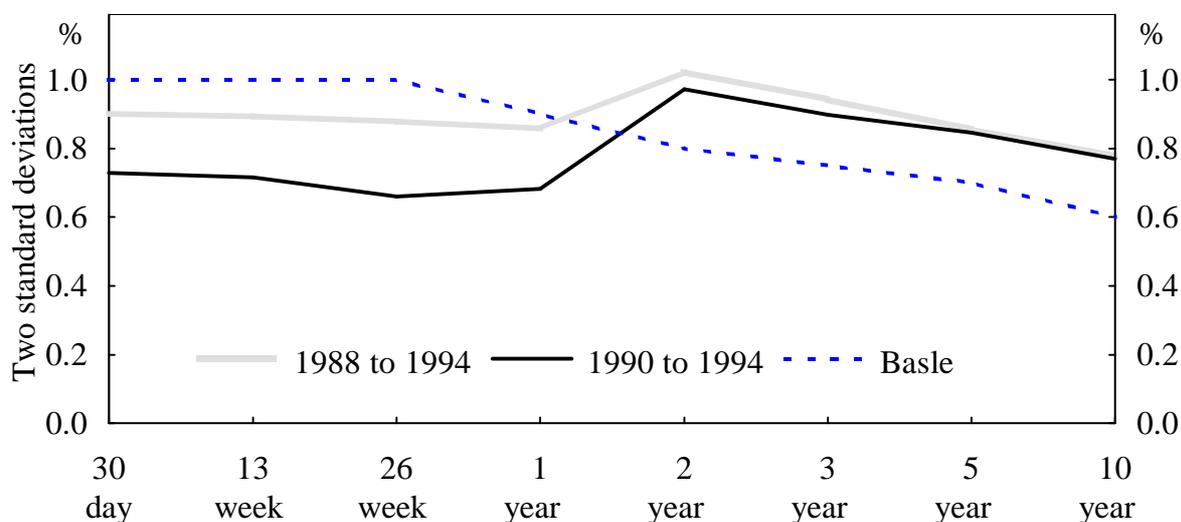
- the volatility of interest rates;
- the structure of disallowance factors; and
- holding periods.

The following three sections consider the appropriateness of these assumptions in the context of the Australian market.

#### **4.3.1 Volatility Assumptions**

The proposal specifies interest rate (yield) shocks across the maturity profile of between 100 basis points for debt with maturities up to a year, to 60 basis points for instruments with maturities of 10 years or more. The appropriateness of capital charges generated by the model will depend therefore, on whether those changes in yield are representative of the volatility observed in the local market. If volatility is less than assumed, the resulting capital charge will be too high. Conversely, if volatility is greater than assumed, capital charges would be insufficient to cover the required proportion of losses.

To test the plausibility of the assumptions, they were measured against actual volatility of interest rates in the Australian market over recent years. Figure 2 shows the results of that analysis.

**Figure 2: Monthly Volatility of Yields - Australian Experience**

Levels of interest rate volatility vary depending upon the time period examined. Australian volatility has declined since 1990, especially at the short end of the yield curve. While the volatilities assumed in the proposal involve some overstatement at the short end of the yield curve, there was a tendency for some understatement of volatility at the medium to longer end. Those differences will lead to some misspecification of the capital charges. However, in a well-diversified portfolio, it may be that the effects of these departures from the Basle assumptions balance one another out.

#### 4.3.2 Vertical and Horizontal Disallowances

A system of disallowances can be viewed as a means of improving the accuracy of the standard model. However, to be effective, the disallowance factors should bear a direct relationship to the price correlation between securities of different maturities; a factor which will also vary according to local market conditions. The appropriateness of both the horizontal and vertical disallowances can be assessed by looking directly at the correlations between the prices of different securities.

Table 2 sets out actual price variations of securities across different points of the yield curve based on an analysis of five years of actual data. It shows that the degree of correlation of monthly price changes is relatively high across securities of different maturities. For the Australian market, the proposed horizontal

disallowances would appear to overstate significantly the true degree of price variation across the maturity spectrum.

**Table 2: Correlation of Prices of Debt Securities Across Time Bands**

	<b>30 day</b>	<b>13 week</b>	<b>26 week</b>	<b>1 year</b>	<b>2 year</b>	<b>3 year</b>	<b>5 year</b>	<b>10 year</b>	<b>15 year</b>	
30 day	1.00									Zone 1
13 week	0.81	1.00								
26 week	0.76	0.96	1.00							
1 year	0.66	0.86	0.92	1.00						Zone 2
2 year	0.53	0.72	0.80	0.92	1.00					
3 year	0.47	0.68	0.76	0.89	0.97	1.00				
5 year	0.43	0.63	0.72	0.85	0.95	0.98	1.00			Zone 3
10 year	0.31	0.49	0.57	0.69	0.80	0.86	0.90	1.00		
15 year	0.28	0.51	0.51	0.61	0.80	0.85	0.90	1.00	1.00	

### 4.3.3 Holding Periods

The modified duration methodology applies interest rate movements to the portfolio based on two standard deviations of monthly volatility of interest rates at various points along the yield curve. Potential losses are based on monthly movements in interest rates (yields). Implicit in this approach is the assumption that a banks will suffer losses incurred over a month before acting to close out positions or taking other action to minimise losses. Market practitioners have argued that this assumption is unrealistic and not representative of actual behaviour. Banks tend to liquidate unfavourable positions much more rapidly than assumed. If this were the case, the effect of this assumption would be an unduly harsh capital penalty.<sup>11</sup> The counter argument to this is that in many instances, traders do not close out unfavourable positions if they believe that the movement in market yields is merely an aberration.

<sup>11</sup> It should be noted also that the monthly holding period is inconsistent with the traded equity and foreign exchange proposals which only assume a two-week holding period.

#### **4.4 Empirical Analysis of the Traded-Debt Securities Proposal**

Two sets of tests were performed to assess the efficacy and coverage achieved by the capital charges generated under this proposal. The first involved testing the proposal against a small number of actual bank portfolios of debt instruments against actual interest rate movements. Comparisons were then made between losses that would theoretically have been recorded and the level of capital that would have been required under the proposal.

Because of the limited number of actual portfolios available, a second set of tests were conducted based on a series of randomly generated portfolios. These portfolios were created by assuming that the size of banks' long and short positions in time band followed a uniform distribution between \$0 million and \$100 million. Three hundred separate portfolios were generated by that method.

The portfolios were revalued at monthly intervals using actual yields from the Australian market over the period June 1988 to June 1993. Losses and gains are then calculated from the differences in the value of the portfolio, from month to month, over the five-year period. Two standard deviations of changes in the value of each portfolio form the benchmark against which the capital charges are compared.

Based on the sample of actual portfolios, the capital charge from the standard method proved to be very conservative when compared to the monthly gains and losses experienced by the portfolio. On average, the capital charge covered 99 per cent of all losses. If the portfolio is assumed to be held for a period less than the four weeks specified in the proposal, say for two weeks, then the coverage achieved by the capital charge increases dramatically. The capital charge is sufficient to cover all losses in the period examined (100 per cent coverage) and a considerable buffer of capital above the worst loss is maintained. Given that a shorter holding period for securities within a trading book is not an unreasonable assumption, the level of capital proposed by Basle, therefore, appears conservative.

The results from the simulation analysis on the hypothetical portfolios supports these results. On average, the capital charge covered 99 per cent of the simulated losses on these randomly generated portfolios. The 95 percentile losses (those corresponding to two standard deviations of movements in the value of the

portfolio) were compared with the standard capital charge. In no case was the capital charge inadequate to cover two standard deviations of losses, and in most cases, excess capital above this level of loss remained. The conservatism is further emphasised by the fact that the portfolios generated did not take into account the interest rate environment and the fact that actual portfolios will reflect the shape of the yield curve.

An appropriate capital charge is required to do more, however, than to 'cover' all, or most losses. The ideal capital charge is one which tracks risk well. Put another way, there should be a strong relationship between the capital charge and the risk in the portfolio. (In this study, the proxy for risk is two standard deviations of movements in the value of the portfolio; or, in other words, the 95 percentile loss.) The analysis indicates that such a relationship exists between the capital charge proposed by Basle and the losses incurred by the portfolios. The Basle method was tested against several alternatives to assess its relative performance. An  $R^2$  statistic was used to quantify the 'fit' of the losses to the capital charge.

The equations below detail the results of regression analysis of the linear relationship between the 95 percentile losses ( $L_{95}$ ) and three capital charges, including that proposed by Basle. These capital charges are those derived from:

- the standard method proposed by Basle (BAP);
- a simplified version of the Basle model, using only 5 time bands and 2 time zones and a correspondingly simplified horizontal disallowances structure, (ALT); and
- an even simpler model (NET) which is the Basle model *excluding* the vertical and horizontal disallowances.

Regression results for debt securities capital charges:

$$L_{95} = 0.59^{\#} BAP \quad R^2 = 0.86_{12} \quad (1)$$

(0.01)

$$L_{95} = 0.61^{\#} ALT \quad R^2 = 0.84 \quad (2)$$

(0.01)

$$L_{95} = 0.81^{\#} NET \quad R^2 = 0.91 \quad (3)$$

(0.01)

# indicates that the variable is significant at the 1 per cent level. Standard errors are shown in brackets.

Equation 1 indicates that there is a strong relationship between the Basle capital charge and 95 percentile losses. It is interesting, however, that the Basle capital charge is out-performed by the much simpler net model. This implies that the horizontal disallowances do not improve the ability of the Basle capital charge to measure risk.<sup>13</sup> The Basle Committee justifies the additional complexity of the horizontal disallowance structure on the added accuracy it provides to the measurement of risk. The results obtained here question that argument, and suggest that even simpler measures are equally effective.

The coefficients on the capital charge variables in equations are shown to be all less than unity. This implies that, on average, the capital charge overstates the risk associated with the portfolio; less capital would be required to cover the losses observed. In the case of the standard capital charge (BAP), approximately 60 per cent of the proposed capital charge would be sufficient to cover 95 per cent of all changes in the portfolio value.

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<sup>12</sup> Note that where regression equations are estimated without the inclusion of a constant, it is possible to obtain negative  $R^2$  values.

<sup>13</sup> The same cannot be said regarding vertical disallowances as the simulation process only includes one type of security per time band - therefore basis risk between offsetting securities in the same time band is not observed.

The debt securities proposal is the most complex of the three market-risk proposals; the concept of vertical and horizontal disallowances is unique to the debt securities proposal, as is the use of more sophisticated risk measurement techniques such as modified duration. Empirical analysis indicates that the capital charge generated is quite conservative; measured against a 95 per cent confidence interval; it is more than sufficient to cover most losses which would be faced by a bank over a one month period. However, data from the simulation analysis indicates that simpler versions of the Basle method perform equally well or better in covering losses.

## **5. FOREIGN EXCHANGE RISK**

Consistent with the proposal on traded-debt instruments, the foreign exchange proposal attempts to measure the risks associated with banks' foreign exchange positions and apply a capital charge to cover potential losses. The foreign exchange proposal differs from the debt instruments proposal, however, in three respects:

- it is a generally simpler proposal;
- it does not attempt to draw distinctions between trading and non-trading positions. All foreign exchange positions are captured under the proposals; and
- it provides a comprehensive alternative to the standard method, which is intended to meet the needs of more sophisticated players in the foreign exchange market.

### **5.1 The Standard Method**

The 'standard' method measures banks' foreign positions as the larger of its short and long positions measured in terms of the domestic currency. This approach is presently used in the UK to apply a capital charge to banks' foreign exchange positions and is used by the Reserve Bank in Australia to measure banks' foreign exchange positions.<sup>14</sup> This measure of foreign exchange exposure can be shown to be equivalent to the average of a banks' net and gross position in foreign

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<sup>14</sup> The Reserve Bank also applies overnight limits on banks' foreign currency exposures.

currencies.<sup>15</sup> The implicit assumption behind this approach is that there is some, but not perfect, correlation between currencies.

The calculation of the capital charge can be illustrated by the following example. Consider the portfolio:

### Example 3

Currency	Position \$m	
	Long	Short
USD	100	
YEN		100
CHF		75
STG		25
NZD	80	
<b>Total</b>	<b>180</b>	<b>200</b>

The net position of the portfolio in this example is \$20 million. The gross position is \$380 million. The larger of the sum of the long positions *or* the sum of the short positions is \$200 million. (Note that \$200 million is also the average of the net and gross positions of \$20 million and \$380 million.)

Having measured the foreign exchange position, the proposal recommends the application of an 8 per cent capital charge. The capital charge generated by the portfolio above would be \$16 million; 8 per cent of \$200 million.

An adjunct to the capital requirements under the standard method is a 'de minimis' exemption. This exempts banks with foreign exchange positions which are small relative to their overall capital base from holding any capital against foreign exchange risk. The stated purpose of this exemption is to avoid onerous administrative burdens on banks with small foreign exchange operations. The

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<sup>15</sup> The net position is defined as being the absolute difference between long and short positions; the gross position is the sum of all positions regardless of sign.

maximum exemption which would be permitted is 2 per cent of the bank's capital base. In our example above, the bank would not be required to hold capital against the foreign exchange exposure if its capital base exceeded \$10,000 million. If the bank's capital base is less than this amount (or its measured position larger), the bank will be required to hold capital against the entire exposure.

## **5.2 The Alternative, Simulation Method**

The more sophisticated approach is one that would allow banks' to use a more complex simulation model to measure foreign exchange positions and risk, provided they are able to satisfy their national supervisors that they have the necessary measurement and control systems to implement such an approach.

The advantage of the simulation method is that it uses actual variance and co-variance relationships of exchange rates to more accurately track risk.

The simulation method is conceptually simple. Past exchange rates movements are used to revalue the bank's present foreign exchange positions and calculate simulated profits and/or losses which would have arisen if those positions had been held for two-week periods over the past 5 years. The capital requirement is then set in relation to the simulated losses which would have arisen during that period.

The simulation method involves;

- calculating the net aggregate value of the bank's current foreign exchange portfolio for every working day of the last five years, using actual exchange rates. The result is a series of 1,300 daily observations (5 days by 52 weeks by 5 years);
- calculating the change in the value of the portfolio over rolling two-week periods. This provides a time series of two-week changes in the value of the portfolio; and
- the capital charge would be levied, equal to the 65th largest loss (5th percentile from 1,300 observations), that is it represents a 95 per cent confidence interval of losses from the portfolio.

Where the simulation method is adopted, a 'scaling factor' has been introduced; an additional capital charge, equal to 3 per cent of the foreign exchange position measured by the standard method. The purposes of the scaling factor are stated to be:

- to determine the 'toughness' of the capital requirement;
- to produce a capital charge equivalent to that delivered by the standard method; and
- to ensure that at least a minimum capital charge was applied to banks' foreign exchange exposures.

The addition of the scaling factor detracts from the accuracy of the simulation method as a means of tracking risk. Moreover, the objectives of the scaling factor could be achieved by other means without the loss of this accuracy. For example, a change in the parameters of the simulation method, increasing the holding period of the portfolio to 3 weeks or the level of confidence required to 99 per cent, would achieve the first two of the objectives noted above, while a floor imposed on the amount of capital required to be held, perhaps based on the standard method, would achieve the goal of ensuring a minimum capital requirement.

### **5.3 Empirical Analysis of the Foreign Exchange Risk Proposal**

The previous two sections described the proposed methodologies to calculate capital charges against foreign exchange risk. In this section, these methodologies are considered in the context of typical Australian bank exposures to foreign exchange and the exchange rate environment observed over recent years.

The data used in the statistical analysis are the weekly data on foreign exchange positions supplied by individual banks to the Reserve Bank. An 'overall' foreign exchange position, in terms of long and short positions in each currency, was calculated by summing the net open cash positions and foreign currency options

positions<sup>16</sup> and consolidating across global operations. The foreign currency position information is categorised by currency, with nine major foreign currencies: US dollar, Canadian dollar, Japanese yen, Deutschemark, British pound sterling, New Zealand dollar, French franc and Swiss franc. Any residual foreign currency exposures, categorised as 'other currencies', were ignored in this analysis on the basis that they represented an insignificant proportion of the overall exposure.

Reported foreign exchange positions were assumed to be held for two weeks. The changes in the value of the portfolio over this fortnight were calculated on the basis of observed changes in exchange rates over the same period. The two-week convention, initiated by the Basle Committee in testing the proposal, is based on considerations of how rapidly bank portfolio losses due to exchange rate changes could be recognised and acted upon by banks. This is a conservative approach as it does not recognise that banks may change their positions rapidly in response to adverse changes in market conditions; hence a certain 'comfort level', whereby banks are assumed to have suffered greater losses than is probably the case, has been built into the study.

Losses and gains on all foreign exchange portfolio held between 1992 and 1994 were calculated for each reporting bank. It was possible therefore to calculate or isolate a loss consistent with coverage of two standard deviations of portfolio value movements (95 percentile losses). The 95 percentile losses are then used to assess the efficiency and coverage of each measure of foreign exchange risk. The relationship of the losses to the various measures of foreign exchange positions is calculated, and estimates of the optimal capital charge to be applied to each method found.<sup>17</sup>

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<sup>16</sup> The Reserve Bank of Australia has a two-tier system for monitoring banks' exposures from foreign currency options. Banks that have sound mathematical models to calculate a "cash equivalent" of their foreign currency exposures generated by options written or held may use these to calculate the extent of the exposure. Bank with less sophisticated systems calculate foreign exchange options positions at face value. Both tiers of banks were used in this analysis as a statistical homogeneity test established that the tiers were not significantly different.

<sup>17</sup> One of the most common problems encountered in cross sectional regression analysis of this type is heteroscedasticity, where the variance of the errors is not constant. In this case, it was found that variance increased with the size of the positions held. The heteroscedasticity was appropriately corrected for by performing weighted least squares estimation using the sum of Net and Gross positions as a scaling factor.

The following capital charges associated with each of the banks' 95 percentile losses ( $L_{95}$ ) were calculated:

- standard Basle calculation without any de minimis exemption (BAP);
- capital charge based on simulation method using 95 percentile losses from the simulation process, without the 3 per cent scaling factor (SIM); and
- capital charge based on the simulation method using the 95 percentile losses from the simulation process (SIM), with the 3 per cent scaling factor (based on the standard Basle calculation, BAP).

Efficiency requires that there be a strong linear relationship between the positions measured and the losses incurred. The closer the relationship is, the more efficient is the capital charge. The equations below summarise the results of linear regression analysis.

Regression results for foreign exchange capital charges:

$$L_{95} = 0.19^{\#} BAP \quad R^2 = 0.93 \quad (4)$$

(0.00)

$$L_{95} = 0.69^{\#} SIM \quad R^2 = 0.98 \quad (5)$$

(0.02)

$$L_{95} = -0.01^{\#} BAP + 0.97^{\#} SIM_{18} \quad R^2 = 0.98 \quad (6)$$

(0.00)          (0.12)

# indicates that the variable is significant at the 1 per cent level. Standard errors are shown in brackets.

The results indicate that the simulation method is a more efficient measure of risk than the standard method. The  $R^2$  statistic on the standard method is 0.93, lower than that obtained for the simulation method with or without the 3 per cent scaling

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<sup>18</sup> Strong collinearity exists between the two explanatory variables in equation 6. The lack of significance of the BAP variable is a reflection of this phenomena.

factor. The  $R^2$  statistic in equation 6 indicates that the scaling factor (BAP) has no impact on the ability of the simulation method to measure risk.

The coefficient on the variable SIM in equation 5 indicates that the simulation approach is also quite conservative - only about 70 per cent of the simulation capital charge is required to cover the 95 per cent losses incurred by the portfolios. These results are sensitive to the exchange rate environment against which they are tested. In a less volatile environment, such as that seen in recent years in Australia, the capital charges may appear even more conservative.

The coefficient on the variable BAP in equation 4 gives an indication of the size of the capital charge which should be applied under the standard method. Based on our data, the optimal charge to cover 95 per cent of all losses, is around 1.9 per cent. Doubling the losses from the data set and calculating the optimal weight for the standard method gave a result of 3.7 per cent, still well below the 8 per cent proposed by Basle. Put in other words, capital equal to around 4 per cent of the standard method would be adequate to cover twice the hypothetical losses in the data set.

This is considerably lower than the 8 per cent recommended charge. The Basle Committee have acknowledged the conservative nature of their 8 per cent capital charge. Their justification for the maintenance of 8 per cent includes the difficulty in monitoring reported positions, particularly intra-day exposures, and the difficulty in measuring risk associated with options and other derivative products.

In summary, the results indicate that for Australian conditions, an 8 per cent charge on the standard method of calculating foreign exchange exposures is very conservative. The results also show that the alternative simulation method is a more efficient measure of risk than the standard method and that there is little need for a minimum scaling factor.

## **6. EQUITY RISK**

The equity risk proposal envisages a capital standard to cover the risk of holding positions in traded equities and related derivative instruments. The requirements will also apply to all instruments which exhibit market behaviour similar to equities.

Equity instruments which can be treated as traded debt (some forms of preference shares for example) would be covered by the guidelines for interest rate risk.

Consistent with the building block philosophy, two areas of risk are identified as arising from traded equity positions:

- specific risk, which deals with the risk of a price movement confined to one particular equity or derivative product linked to it (credit-related risk); and
- general market risk, which concerns price movements that are unrelated to any specific equity.

### **6.1 Specific Risk**

It is proposed that the specific risk of a bank's portfolio under the proposal is measured against the gross equities position, that is, the sum of long and short equity positions. The approach assumes the specific risk associated with any single equity instrument is unrelated to the specific risk of any other equity.

The main focus of debate has been the appropriate level of capital to be applied against specific risk. The equities proposal recommends that a capital charge of 4 per cent be applied where diversified books of liquid portfolios are involved. Where less liquid equities or portfolios are concerned, an 8 per cent charge is recommended. This differs from similar market-risk guidelines put forward by the European Economic Community through the latest Capital Adequacy Directive<sup>19</sup> which regard a 2 per cent capital charge as sufficient where a liquid portfolio is concerned. As in the previous case, 8 per cent is viewed as the appropriate charge where less liquid equities or portfolios were concerned. It is viewed as the responsibility of the respective supervisor to determine which equities, or portfolios, would be deemed 'highly liquid.'

### **6.2 General Market Risk**

The general market risk of the portfolio is measured by the net equities position. That is, short positions in one set of equities can be used to offset the general market risk arising from long positions in other equities. The implicit assumption here is

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<sup>19</sup> These guidelines are due to be implemented by the EEC in 1996.

that there is perfect correlation between movements in equity prices. This assumption is acknowledged as unrealistic, but is adopted in the interests of simplicity.<sup>20</sup>

A capital charge of 8 per cent of the net position is proposed to cover market risk.

The capital charges applied to an equity portfolio may be illustrated by the following example:

#### Example 4

	Position	
	(\$m)	
	Long	Short
BHP ordinary shares	230	
GIO Australia	100	
Western Mining Corp		120
General Property Trust Income		75
Woolworths	50	
<b>TOTAL</b>	<b>330</b>	<b>195</b>

For this portfolio, the gross position is \$525 million and the net position, \$135 million. The total capital charge, assuming this is considered a liquid and diversified portfolio, would be \$31.8 million; \$21 million against specific risk and \$10.8 million against general market risk.

<sup>20</sup> It will be recalled that in the debt securities proposal, full offsetting was permitted as a means of calculating the general market risk of a portfolio but disallowance factors were introduced to modify the outcome. Effectively, only partial offsetting was allowed. No such disallowance factors are introduced in the equities proposal.

### **6.3 Empirical Analysis of the Equity Risk Proposals**

The previous sections discussed the proposed structure of the capital charge to cover equity position risk. In this section, the performance of that capital charge is measured against actual share price movements in the Australian equity market.

Australian banks' exposures to equity risk is not as significant as exposures to price risk on debt securities and foreign exchange risk, mainly as a consequence of regulatory restrictions on banks' equity holdings. As a result, data on typical equity portfolios are not readily available. However, a number of banks have stockbroking subsidiaries whose exposures will attract a capital charge. A small sample of actual portfolios was obtained from banks in that position. These actual portfolios were supplemented by a large number of randomly generated portfolios.

The randomly generated portfolios were created from a selection of around 60 shares traded on the Australian Stock Exchange. The equity portfolios were created assuming that the size of banks' long and short positions in each stock followed a uniform distribution between \$0 and \$100 million. Three hundred portfolios were generated in this way.

The portfolio was revalued at fortnightly intervals using actual prices for each of the stocks making up the portfolio. The losses and gains on the overall portfolio were calculated from the differences in the value of the portfolio over a five year period from January 1988 to February 1993. A change of two standard deviations in the value of these portfolios was used as a benchmark for evaluating the performance of the capital charge.

The capital charge associated with each hypothetical portfolio was calculated using each of the following three methods:

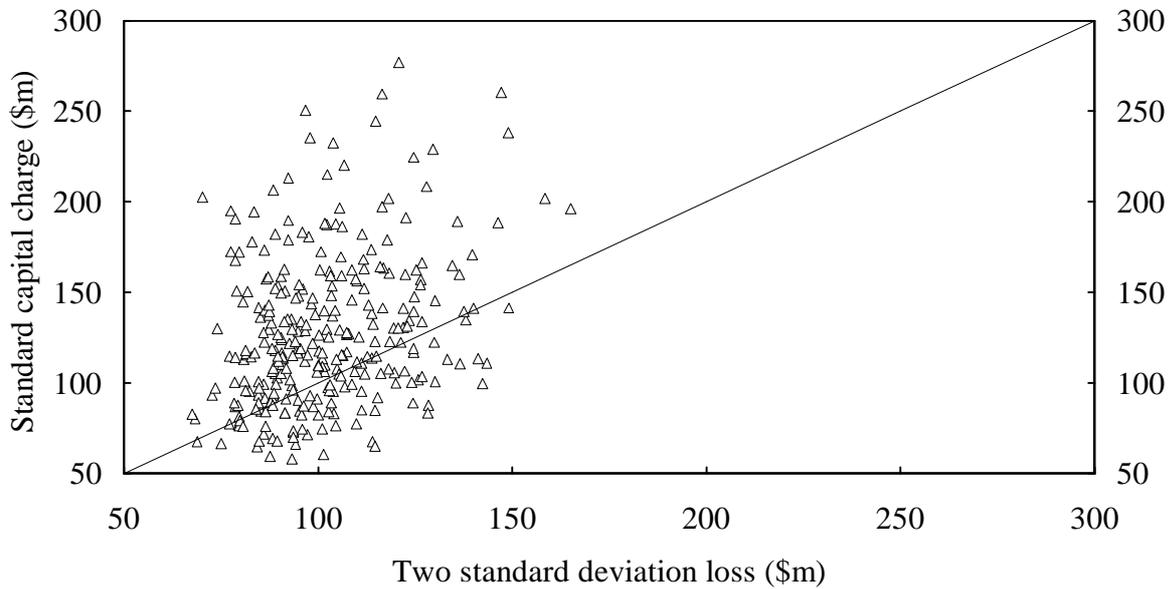
- the standard capital charge proposed by Basle; 4 per cent charge against specific risk and an 8 per cent charge against general market risk (BASLE);
- the alternative capital charge proposed by the Economic Community as part of their capital adequacy directive which sets 2 per cent against specific risk and 8 per cent against general market risk (CAD); and

- an alternative methodology used by the Securities Exchange Commission in the US which is different to both of the above (SEC). The SEC rules require that capital of 15 per cent be held against the gross position of the portfolio. Hedging of long or short positions is permitted to the extent of 25 per cent of the longer side of the portfolio, and is deducted from the capital charge on the gross position. The SEC approach does not attempt to separate risks into specific and general market risk.

The coverage of the capital charges on the actual portfolios over the simulated losses were not as conservative as the results from the debt or foreign exchange proposals. The standard method covered around 85 per cent of *all* portfolio movements (i.e. both positive and negative movements). In other words, around 30 per cent of *losses* were not covered by the capital charge. The SEC comprehensive method performed somewhat better covering about 94 per cent of all changes in portfolio value while the E.C. approach covered only 79 per cent of all changes.

The results from the simulation analysis were consistent with the results from the actual portfolios. Coverage of the standard method was 91 per cent of all changes, while coverage of the SEC and E.C. methods were 99 per cent and 79 per cent respectively. Figure 3 below indicates that there is no strong linear relationship between the losses incurred and the capital charge obtained under the standard method. This is confirmed by the results of the linear regression analysis.

**Figure 3: Relationship Between Standard Equity Capital Charge and Observed Losses**



Regression results for equity capital charges:

$$L_{95} = 1.24^{\#} \text{BASLE} \quad R^2 = 0.05 \quad (7)$$

(0.02)

$$L_{95} = 2.00^{\#} \text{CAD} \quad R^2 = -0.16 \quad (8)$$

(0.04)

$$L_{95} = 0.49^{\#} \text{SEC} \quad R^2 = -0.01 \quad (9)$$

(0.01)

# indicates that the variable is significant at the 1 per cent level. Standard errors are shown in brackets.

The results show that the capital charges have a highly significant regression coefficient but a very low coverage of potential losses. The  $R^2$  statistic shows that none of the three methods are satisfactory in tracking the losses. Further, the coefficients on the dependant variables which may be interpreted as the 'amount' of the capital charge which should be applied, indicate that the standard approach recommended by Basle and the approach recommended by the European Economic

Community are not adequate to cover two standard deviations in changes in portfolio values. In the case of the CAD method, the regression results indicate that twice as much capital is required, on average, to cover the losses observed.

The performance of the capital charges can be shown to change with different assumptions regarding the distribution of long and short positions held in the portfolio. The assumption underlying the results described above is that a bank is equally likely to hold a long position as a short position; that is in a diverse portfolio the average net position is zero. Altering these assumptions, to bias the portfolio towards long positions, significantly affects the efficiency of the capital charge.

Regression results for equity capital charges - bias towards long positions:

$$L_{95} = 1.19^{\#} \text{BASLE} \quad R^2 = 0.48 \quad (10)$$

(0.01)

$$L_{95} = 1.50^{\#} \text{CAD} \quad R^2 = 0.48 \quad (11)$$

(0.01)

$$L_{95} = 0.91^{\#} \text{SEC} \quad R^2 = 0.46 \quad (12)$$

(0.01)

# indicates that the variable is significant at the 1 per cent level. Standard errors are shown in brackets.

The difference in explanatory power between the two sets of results can be interpreted as follows. When portfolios are constructed to have an average net position of zero, capital charges are too low, since the capital charge is a function of the net position. These capital charges are not well correlated with actual loss experience. When portfolios take on non-zero net positions, thus generating larger capital charges, the linkage between the capital charge and the losses improves. In other words, the use of net positions to measure general market risk is unsatisfactory. Risk does not appear to decline as net positions take on smaller values. The assumption that equity prices are perfectly correlated does not hold, and has a significant impact on the ability of the capital charge to predict losses.

Results from this analysis indicate that the proposed capital charge for equities does not cover as large a proportion of losses as the capital charges covering foreign exchange or debt securities. However, the problem is not that the size of the capital charge is not sufficiently high, but rather that the method used to measure the risk is not sufficiently accurate. An inefficient method of achieving greater coverage of losses would be to merely increase the amount of capital which is required to be held. Alternatively, the simple approach to measuring equity risk could be replaced by a more sophisticated method which tracked risk more closely. However, this latter approach would be at odds with the Committee's objective of keeping calculation of the capital charge as simple as possible.

## **7. CONCLUSION**

The greatest impact of the new requirements will fall on those banks which are active in the equities, debt securities and foreign exchange markets. However, despite growth in banks' market-related activities, the size of banks' market exposures appears to be very small relative to traditional credit-related exposures. The size of any additional capital requirements to cover market risk is, therefore, likely to be correspondingly small. Further, with capital ratios of Australian banks currently averaging around 12 per cent, there would appear to be a large buffer of excess capital to meet any additional capital charges arising from market risk exposures.

However, there are two qualifications which should be made to that conclusion:

- as the size of market-related exposures increases relative to traditional credit-related risks, the important issue becomes not how much capital is generated by the proposals but whether these simple proposals represent an accurate measurement of the risks involved. In cases where banks conduct a wide range of market-related transactions, risk may be better measured by techniques which take into account correlations across products and currencies. Such complexities have not been introduced into this set of proposals. An additional factor to be considered is the extent to which the risk associated with more complex or exotic financial instruments can be captured within the relatively simple framework set out in the proposal; and

- interpretation of the empirical results has suggested that the proposed capital charges are conservative. This conclusion should be assessed in terms of the benchmark against which the charges are tested; 95 per cent confidence intervals of two-weekly movements (monthly for debt securities) in portfolio values based on historical market rates. The losses which would be incurred under exceptional market conditions (equivalent to the 1987 stockmarket crash) fall outside the 95 per cent confidence band. The proposed capital charges may be inadequate to cover such extreme market movements.