Reserve Bank of New Zealand
Te Pūtea Matua

BPR140

Market Risk

Purpose of document

This document sets out the methodology a bank must use to calculate its total capital requirement for market risk exposure. The market risk capital requirement is a component in the calculation of capital ratios, as defined in BPR100, which a bank must carry out to determine its compliance with minimum regulatory capital requirements. This document applies to both standardised and **IRB banks**.

Document version history

1 July 2021	First issue date
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Conditions of registration

The Reserve Bank of New Zealand Act 1989 (the **Act**) permits the Reserve Bank to impose conditions of registration (conditions) on **registered banks**[1].

This document BPR140: Market Risk forms part of the requirements for the following conditions:*

- A New Zealand-incorporated **registered bank** is normally subject to a condition requiring it to maintain capital ratios above specified minimum levels, and also to a condition imposing restrictions on its dividend payments when its **prudential capital buffer ratio** falls below specified levels[2]. This document sets out the calculation framework for market risk capital requirements that will be needed by such a bank to allow it to calculate its day-to-day values for the capital ratios and the capital buffer ratio, and hence monitor its compliance with these capital adequacy conditions.

* All of the material set out in this document forms part of the requirements of the applicable condition, except material that is expressly identified as guidance by being included in a shaded box like this.

[1] The conditions can relate to any of the matters referred to in sections 73 – 73B, 78 and 81. The standard conditions are contained in Appendix 1 of document BS1: Statement of Principles.g

[2] These conditions of registration relate to the matter referred to in: section 78(1)(c) (capital in relation to the size and nature of the business).

BPR140: Market Risk

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Part A: Capital requirement for market risk

A1 Overview, definitions, and general requirements

A1.1 Overview

1. This document sets out the methodology a bank must use to calculate its **total capital** requirement for market risk exposure, which is needed to calculate the capital ratios defined in BPR100.

2. This methodology applies to every New Zealand-incorporated **registered bank** for the purpose of meeting its minimum capital ratio requirements, whether the bank uses the standardised or the **IRB approach** to capital adequacy.

> Guidance: The methodology measures a bank's potential exposure to economic loss arising from adverse movements in interest rates, **equity** prices and exchange rates.

3. The methodology must also be used for the information on end-point market risk exposure that is included in the **disclosure statements** that both New Zealand-incorporated banks and branches of overseas-incorporated banks are required to publish under the Reserve Bank's disclosure regime.

> Guidance: The **applicable OiC** also requires a bank to disclose the intra-period peak capital charge for market risk in its **disclosure statements**. To do this, the bank may derive its capital charge at the end of each day using the standard methodology set out in this document. Alternatively, the **applicable OiC** permits the bank to use its own internal models to derive the peak market risk capital charge, provided it is satisfied that the peak capital charge is not materially lower than that which would have been derived using the standard model.
>
> For **interest rate risk**, a common "own value-at-risk method" used for peak reporting is a scalar approach. Under this method, the end-of-period capital charge, as derived using the standard model, is scaled by the ratio of peak capital charge (using the bank's internal value-at-risk method) to end-of-period capital charge (using the internal value-at-risk method). Under this approach, bank directors would have to be satisfied of a number of factors including that the correlation between the internal method and the Reserve Bank's method is high and stable over time or, if it is not, that the bank's own internal model results in an upward error.

A1.2 Scope of market risk capital requirement

1. The market risk capital requirement captures changes in the economic value of **financial assets** and **financial liabilities** of a **banking group** arising from movements in interest rates, exchange rates, and **equity** prices.

2. However, the framework does not include fixed assets (including, for example, land and buildings), **commodity** instruments, and those **equity instruments** that constitute the **banking group's** own shareholders' **equity**.

Guidance: The values of fixed assets are influenced by movements in interest rates, exchange rates, and **equity** prices, but are not included in the framework, because of a desire to reduce complexity, and because fixed assets are generally not an important component of banks' asset holdings. Similarly, **commodity** risk (that is, economic losses arising from adverse movements in the price of commodity instruments) is not included in the market risk measurement framework, because **registered banks** in New Zealand generally do not have significant exposures to **commodity** risk.

Guidance: **Equity instruments** representing the shareholders' **equity** of the **banking group** are excluded from the market risk framework, since the potential for change in the value of these instruments due to market risk mirrors the potential for losses captured by the market risk capital requirements (because **equity** represents the difference between assets and liabilities). A bank's own **equity** represents its capacity to absorb losses arising from market risk exposures.

3. The framework captures end-of-day exposures only.

Guidance: This means that market risk exposures which arise in the course of a business day (intra-day exposures) are not covered.

The market risk capital methodology provided in this document is based on the Basel Committee's standardised approach set out in its January 1996 document Amendment to the Capital Accord to Incorporate Market Risks https://www.bis.org/publ/bcbs24.pdf ("BCBS24") and in its December 2019 version, https://www.bis.org/basel_framework/chapter/MAR/20.htm?inforce=20191215&published=20191215 ("MAR20"). Key differences between the Basel's approach and the Reserve Bank's approach are –

The Reserve Bank does not give **registered banks** the option of becoming approved to use their own internal models for market risk, as provided for in the Basel approach.

The Reserve Bank's approach does not include **commodity** risk.

The Basel approach only covers **interest rate risk** in a bank's trading book, whereas the Reserve Bank approach measures interest rate risk across the whole of a bank's business.

A1.3 Definitions

In this Part,

core rate-insensitive asset means a **rate-insensitive asset**, or part thereof, the amount of which does not temporarily increase and decrease with a regular seasonal pattern, and **core rate-insensitive liability** has the corresponding meaning

core rate-insensitive product means either or both of a **core rate-insensitive asset** or a **core rate-insensitive liability**

interest rate repricing date, as that term applies to a **financial instrument** or to a part of a **financial instrument**, means the earlier of–

a. the next interest rate reset date (being the date on which the rate of interest payable in respect of the **financial instrument** can or will alter); and

b. either–

i. the date on which the principal sum is due and payable; or

ii. if no principal sum is due and payable, the maturity date of the instrument

rate-insensitive asset means a **financial asset**, or part thereof, that the bank determines to be a **rate-insensitive asset** in accordance with section B3.2(1), and **rate-insensitive liability** has the corresponding meaning

rate-insensitive product means either or both of a **rate-insensitive asset** or a **rate-insensitive liability**.

seasonal rate-insensitive asset means a **rate-insensitive asset** the amount of which temporarily increases and decreases with a regular seasonal pattern, and **seasonal rate-insensitive liability** has the corresponding meaning

seasonal rate-insensitive product means either or both of a **seasonal rate-insensitive liability** or a **seasonal rate-insensitive liability**.

A2 Calculation of total capital for market risk

A2.1 Total capital charge for market risk

The total capital charge for market risk is the sum of–

a. the aggregate capital charge for **interest rate risk**, calculated in accordance with Part B; and

b. the aggregate capital charge for **currency risk**, calculated in accordance with Part C; and

c. the aggregate capital charge for **equity risk**, calculated in accordance with Part D.

Guidance: The methodology for **interest rate risk** directly produces a figure for the amount of capital at risk from interest rate exposure, and this is the capital charge. The capital charges for **currency risk** and **equity risk** are determined by first calculating the gross risk exposure and then multiplying that amount by 8%. This ensures that the measures of exposure to different forms of market risk are placed on a comparable scale: that is, the value at risk.

Part B: Capital requirement for interest rate risk

B1 Overview

B1.1 Aggregate capital charge for interest rate risk

The aggregate capital charge for **interest rate risk** is calculated by–

a. calculating the total interest rate exposure in each currency, including NZD, in which the bank has interest rate exposure, following the methodology set out in Subparts B2 to B6; then

b. summing the interest rate exposure figures across all currencies for which the figure calculated in accordance with subsection (a) is positive; then

c. summing the interest rate exposure figures across all currencies for which the figure calculated in accordance with subsection (a) is negative; and

d. taking the greater of the sum in subsection (b) and the absolute value of the sum in subsection (c).

Guidance: This aggregation rule accounts, at least in part, for correlations in interest rate movements across currencies, and is less conservative than the standard Basel model which requires the aggregation of the absolute positions across currencies.

B1.2 Steps in the calculation of interest rate exposure in each currency

To calculate the interest rate exposure in each currency a bank must–

a. in accordance with subpart B2, determine which matched long and short positions can be excluded from the exposure measurement; and

b. in accordance with subpart B3, for each instrument that is not excluded under subsection (a), –

   i. allocate the value of the instrument to the specified time band in the currency in which the instrument is denominated; or

   ii. where applicable, allocate portions of the value of the instrument to more than one of the specified time bands, and where also applicable, to more than one currency; and

Guidance: For example, a cross-currency interest rate swap is treated as separate asset and liability positions in the respective currencies (see section B1.4).

c. using the amounts allocated across time bands and currencies under subsection (b), calculate total interest rate exposure in each currency as the sum of–

   i. the net open **interest rate risk** position (directional **interest rate risk**), calculated as the sum of all asset values (positive) and liability values (negative)

in the currency, risk-weighted according to where they sit in the repricing schedule, as detailed in subpart B4; and

ii. the basis risk exposure within each time band for the currency, using the vertical disallowance methodology specified in subpart B5; and

iii. the yield curve risk exposure for the currency, using the methodology of horizontal disallowance across time bands specified in subpart B6.

Guidance: The net open position in each currency may be a positive or negative number, and the calculations of exposure to basis risk and yield curve risk includes a step to give each of those measures the same sign as the net open position in the currency. This means that there is no offsetting between directional **interest rate risk**, basis risk and yield curve risk, and the aggregate for each currency may be positive or negative.

B1.3 Scope and valuation

1. For the purpose of calculating the capital charge for **interest rate risk** in accordance with this part, the bank must include all **financial instruments** within the scope specified in section A1.2, other than long or short positions in **equity instruments**.

2. Derivatives other than options must be decomposed into corresponding notional instruments for inclusion in the calculation, as applicable, in accordance with section B1.4.

3. The value of a **financial instrument** to be included in the calculation must be expressed in NZD and is,–

   a. in the case of an unrecognised **financial instrument**, the face or contract amount of the **financial instrument**; and

   b. in the case of a **derivative** other than an option, the principal amount of the underlying or of the notional underlying instruments, updated in line with the current market valuation of corresponding actual instruments; and

   c. in the case of an option, the value determined under the methodology in section B1.5; and

   d. in the case of other recognised **financial instruments**, the principal amount of the instrument (or the underlying) or of the notional instruments (or the underlying instruments), updated in line with the current market valuation of corresponding instruments if applicable.

4. To obtain the NZD value of an instrument denominated in a foreign currency, for the purpose of this section, the bank must convert the relevant foreign currency amount to NZD at the mid-point of market bid and offer rates applying at the close of business on the relevant day.

Guidance: To calculate the value of **derivatives** other than options and the value of other recognised **financial instruments** specified in B1.3(3)(b) and (d), banks may refer to the BCBS's MAR20.31.

Appendix 1 contains an example which illustrates the methodology for the **interest rate risk** capital calculation set out in Part B.

B1.4 Treatment of derivatives other than options

1. For the purpose of allocating **derivatives** to time bands, including **interest rate derivatives** that have a foreign exchange component such as cross-currency basis swaps, a bank should have regard to subsection (2) and to the following guidelines–

   a. an interest rate swap in which the bank agrees to swap fixed rate interest payments (or receipts) for floating rate payments (or receipts) should be treated as–

      i. a **financial asset** (or liability) with a maturity equivalent to the term of the underlying fixed rate agreement; and

      ii. a **financial liability** (or asset) with a maturity equivalent to the term of the underlying floating rate agreement; and

   Guidance: The principal amount of the notional **financial asset** and **financial liability** for an interest rate swap agreement is the notional value of the swap contract.

   b. a **forward rate agreement** under which a bank agrees to invest (or borrow) funds for a fixed term, at an agreed interest rate, after a specified elapsed time (spanning today and the agreed future start date) should be treated as–

      i. an interest bearing **financial asset** (or liability) with a maturity equal to the fixed term plus the specified elapsed time; and

      ii. an interest bearing **financial liability** (or asset) with maturity equal to the specified elapsed time; and

   Guidance: The principal amount of the notional **financial asset** and liability underlying a **forward rate agreement** should be the contract amount.

   c. a compound or hybrid **financial instrument**, comprising more than one notional underlying **financial instrument** of any of the types specified in this subpart or an option, should be decomposed into separate **financial instruments** and treated in the manner applying to the instrument in this Subpart, or in the case of an option, as specified in Section B1.5.

2. Where different components of a **derivative** are in different currencies, each component must be allocated to the time band and currency applicable to that component, and then included in the calculation of the capital charge for **interest rate risk** for that currency.

Guidance: For the treatment of **derivatives** other than options, banks may refer to BCBS's MAR20.30 to MAR20.35 which includes guidance on decomposition and offsetting for all **interest rate derivatives** and off-balance-sheet instruments which react to changes in interest rates, (e.g., **forward rate**

agreements, other forward contracts, bond futures, interest rate and cross-currency swaps and forward foreign exchange positions).

For options and any instruments with optionality (e.g., barrier options), banks should have regard to B1.5 Treatment of **interest rate risk** on options in this document.

The Reserve Bank does not give **registered banks** the option of becoming approved to use their own internal models for market risk, as provided for in the Basel approach.

B1.5 Treatment of interest rate risk on options

A bank may either–

a. separately determine the **interest rate risk** in a single currency arising from options using its own methodology and add this risk to the total **interest rate risk** in that currency; or

b. use one of the methods for measuring risk on options contained in the Basel Committee's January 1996 document Amendment to the Capital Accord to Incorporate Market Risks https://www.bis.org/publ/bcbs24.pdf, and incorporate that measure of risk on interest rate options into its calculation of total **interest rate risk** in accordance with the chosen methodology.

Guidance: Banks that trade significantly in options should use the Basel "delta-plus method" to capture gamma and vega risks.

B2 Exclusion of matched positions

B2.1 Criteria for exclusion

A bank may exclude a matched long and short position from the calculation of the capital charge for **interest rate risk** in this Part if the matched position–

a. relates to **financial instruments** with the same **issuer**, coupon, currency, and maturity; or

b. is–

i. of a kind referred to in section B2.2, B2.3, or B2.4, as the case may be; and

ii. meets the conditions specified in whichever of those sections applies.

B2.2 Futures

A bank may exclude a matched position in futures from the calculation if the underlying **financial instruments** to which the futures relate–

a. are for the same product; and

b. have the same value or notional value; and

c. are denominated in the same currency; and

d. mature within seven days of each other.

B2.3 Swaps and forward rate agreements

A bank may exclude a matched position in swaps (including separate legs of different swaps) or **forward rate agreements** from the calculation if the underlying **financial instruments** to which the swaps or **forward rate agreements** relate–

a. are for the same product; and

b. have the same value or notional value; and

c. are denominated in the same currency; and

d. have reference rates (for floating rate positions) that are identical; and

e. have coupons that are either–

i. identical; or

ii. do not differ by more than 15 basis points; and

f. have future **interest rate repricing dates** that differ by no more than the limit specified in column 2 of Table B2.3, in the row corresponding to the shortest time that any of the instruments has until its next repricing date specified in column 1.

Table B2.3

Swaps and forward rate agreements

Shortest time to next repricing date of any of the instruments	Maximum permitted gap between next repricing date of all instruments
one month or less	on the same day as each other
more than one month and less than one year	within seven days of each other
one year or more	within thirty days of each other

B2.4 Forwards

A bank may exclude a matched position in forwards from the calculation if the underlying **financial instruments** to which the forwards relate–

a. are for the same product; and

b. have the same value or notional value; and

c. are denominated in the same currency; and

d. have maturity dates that differ by no more than the limit specified in column 2 of Table B2.4, in the row corresponding to the shortest residual time to maturity of any of the instruments specified in column 1.

Table B2.4

Forwards

Shortest residual time to maturity of any of the matched instruments	Maximum permitted gap between maturity dates of all the matched instruments
one month or less	on the same day as each other
more than one month and less than one year	within seven days of each other
one year or more	within thirty days of each other

B3 Allocating instruments to time bands

B3.1 Use of interest rate repricing schedules

1. A bank must allocate **financial instruments** to specified time bands in accordance with this subpart, and in a manner that reasonably reflects its assessment of the **interest rate repricing date** of those instruments.

2. This subpart provides separate methods of allocation to time bands for–

   a. **financial instruments** that are determined to be rate-insensitive, provided in sections B3.2 and B3.3; and

   b. other **financial instruments**, provided in sections B3.4 and B3.5.

B3.2 Determination of rate-insensitive products (RIPs)

1. A bank must treat as a **rate-insensitive product** (**RIP**) any **financial asset** or **financial liability**, or part thereof, on which it considers that it does not have to promptly adjust the interest rate it earns, or pays, to maintain customer balances in response to a change in the general level of interest rates.

> Guidance: RIPs comprise mainly retail savings and transaction accounts with zero or near-zero interest rates, for example, cheque account balances or saving accounts earning, say, 0.5 per cent interest or less. RIPs can also include zero or low interest lending, for example credit card balances.

2. A bank may allocate–

   a. up to 20% of its total **rate-insensitive assets** in a given currency to the **seasonal rate-insensitive asset** category; and

   b. up to 20% of its total **rate-insensitive liabilities** in a given currency to the **seasonal rate-insensitive liability** category.

> Guidance: A seasonal RIP is an RIP that is sensitive to intra-year seasonal patterns, for example, tax or Christmas flows. Observed variations in RIPs over

more than one year, or expected variations in RIPs arising from future marketing strategies or technological change, are not seasonal variations.

3. Any asset or liability (or part thereof) that the bank has determined to be an RIP but not a seasonal RIP must be treated as a core RIP.

B3.3 Time bands for rate-insensitive products

1. A bank must allocate the aggregate value of all **core rate-insensitive assets** and of all **core rate-insensitive liabilities** to the time bands specified in Table B3.3 in accordance with the percentages set out in that Table.

2. A bank must allocate the aggregate value of all **seasonal rate-insensitive assets** and of all **seasonal rate-insensitive liabilities** to the time bands specified in subsection (3), with the percentage allocated to each time band reflecting the dates on which the bank expects seasonal increases and decreases to occur.

3. The time bands referred to in subsection (2) are as follows:

   a. 1 month or less:

   b. 1 to 3 months:

   c. 3 to 6 months

   d. 6 to 12 months.

Table B3.3

Allocation of value of core rate-insensitive products across time bands

Time bands	Percentage of aggregate value
1 month or less	5
more than 1 month but not more than 3 months	2.5
more than 3 months but not more than 6 months	2.5
more than 6 months but not more than 1 year	10
more than 1 year but not more than 2 years	20
more than 2 years but not more than 3 years	20
more than 3 years but not more than 4 years	20
more than 4 years but not more than 5 years	10
more than 5 years but not more than 7 years	10

B3.4 Interest rate repricing bands for rate-sensitive instruments

For any **financial instrument** not excluded from the **interest rate risk** calculation in accordance with subpart B2, and not a **rate-insensitive product**, a bank must allocate the value of the instrument, or a proportion of it, to one of the time bands specified in Table B3.4–

a. in a manner that reflects the date on which the interest rate applicable to the **financial instrument**, or part of the **financial instrument**, can be reset, or the date at which the principal, or a part of the principal, will be paid; and

b. following the principles set out in section B3.5.

Table B3.4

Interest repricing time bands

1 month or less
more than 1 month but not more than 3 months
more than 3 months but not more than 6 months
more than 6 months but not more than 1 year
more than 1 year but not more than 2 years
more than 2 years but not more than 3 years
more than 3 years but not more than 4 years
more than 4 years but not more than 5 years
more than 5 years but not more than 7 years
more than 7 years but not more than 10 years
more than 10 years

B3.5 Principles for allocating financial instruments to time bands

1. A bank is generally free to allocate instruments to the relevant time bands according to its assessment of the **interest rate repricing dates** of those instruments but, in doing so, is expected to comply with the guidelines set out in subsection (2).

2. The guidelines are that–

a. a security should receive the same treatment regardless of whether it is held for trading or held to maturity; and

b. a bank may treat an impaired asset as non-interest bearing, and may make its own judgement about the time band for the asset; and

c. subject to subsection (d), the time band for an asset that is not impaired should generally be determined by its contractual repricing date or residual maturity, whichever is the earlier; and

d. despite subsection (c), if a bank has an element of discretion in applying interest rate changes to an asset, it can make its own judgement about the effect that any lag in adjusting the interest rate has on the time band for the asset; and

e. a bank should not generally take embedded options into account, except that if a bank has hedged an embedded option, it may treat the overall hedged position as the contractual position; and

f. a bank should treat term deposits and other term liabilities (other than those that are rate-insensitive) according to their contractual term.

3. If a bank's systems allocate **financial instruments** to a different set of time bands than those specified in Table B3.4, it may use its own systems and re-allocate instruments to the time bands in that table on a pro-rata basis.

4. If a bank has a near-hedge arrangement, whereby an asset and liability are in adjacent time bands in Table B3.4 and their repricing dates are at most seven days apart, it may allocate the asset and liability to the same time band by carrying whichever of the two is in the nearer time-band forward to the longer time-band.

5. A bank may allocate **financial instruments** to the above time bands after adjusting the actual duration of the instrument using the assumed change in interest rates shown in Table 4.1.

B4 Directional interest rate risk in each currency

B4.1 Calculation of net open interest rate exposure (directional interest rate risk)

1. The net asset (positive) or net liability (negative) position in each time band for a given currency is calculated by summing–

a. positive values for the value of each asset instrument or portion of an asset instrument allocated to that time band in accordance with subpart B3; and

b. negative values for the value of each liability instrument or portion of a liability instrument allocated to that time band in accordance with subpart B3.

2. The ***risk-weighted net position*** in each time band is calculated by multiplying the net asset/liability position in each time band calculated in accordance with subsection (1) by the percentage risk-weight for the time band given in column 3 of Table B4.1.

3. The net open **interest rate risk** exposure in the currency is the sum across the 11 time bands of the risk-weighted net position in each time band calculated in accordance with subsection (2).

Guidance: The time-bands in Table B4.1 allocate the price sensitivity factors (risk weights) to interest rate changes. This measure of interest rate exposure is based on the assumed set of interest changes shown in Column 2 of table B4.1. The risk weight for each time band in Column 3 approximates to the duration of a **financial instrument** in that time band given the assumed change in interest

rates. The result of this is that the risk-weighted net open position estimates the change in a bank's net **financial assets** for the assumed change in interest rates.

As the net asset/liability position in each time band can be positive or negative, the net open interest rate exposure can also be positive or negative.

Table B4.1

Risk weights for applicable time bands

Time bands	Assumed interest rate changes (%)	Risk weights (%)
1 month or less	1.0	0
more than 1 month but not more than 3 months	1.0	0.2
more than 3 months but not more than 6 months	1.0	0.4
more than 6 months but not more than 1 year	1.0	0.7
more than 1 year but not more than 2 years	0.9	1.25
more than 2 years but not more than 3 years	0.8	1.75
more than 3 years but not more than 4 years	0.75	2.25
more than 4 years but not more than 5 years	0.75	2.75
more than 5 years but not more than 7 years	0.7	3.25
more than 7 years but not more than 10 years	0.65	3.75
more than 10 years	0.6	4.4

B5 Basis risk in each currency

B5.1 Calculation of basis risk exposure

1. The total figure for exposure to basis risk in each currency is calculated by summing across all time bands the basis risk figure calculated for each time band for that currency in accordance with section B5.2, and changing the sign of the total if necessary in accordance with section B5.3.

B5.2 Calculation of basis risk in each time band

1. The basis risk exposure in each time band is calculated using the vertical disallowance methodology set out in subsections (2) and (3).

2. A bank must determine in each time band–

a. the matched position, defined as the lesser of the sum of the absolute values of the **financial assets** in the time band, and the sum of the absolute values of the **financial liabilities** in the time band; and

Guidance: This corresponds to the amount that is netted off in calculating the net open position for the time band in subsection B4.1(1).

b. the absolute value of the **rate-insensitive products**, defined as the sum of the absolute values of the **rate-insensitive assets** in the time band, and the absolute values of the **rate-insensitive liabilities** in that time band.

3. The vertical disallowance amount for the time band is calculated by multiplying the risk weight for the time band from Table B4.1 by the sum of the following:

a. 20% x the absolute value of **rate-insensitive products**; and

b. zero, or 5% x (the matched position less the absolute value of the **rate-insensitive products**), whichever is greater.

Guidance: The measure of directional **interest rate risk** calculated in subpart B4 matches off assets and liabilities in each time band to leave only the net open interest rate exposure. The calculation in this subpart accounts for the possibility that interest rate movements may not be perfectly matched, even for similar maturities, because of basis risk. Hence the calculation "disallows" a portion of the matching from subpart B4. The disallowance factor is significantly higher for **rate-insensitive products**, since they are by definition unlikely to change value much when interest rates generally change.

B5.3 Basis risk to have same sign as directional interest rate risk

If the net open interest rate exposure number calculated in Subpart B4 is negative, the measure of basis risk calculated in sections B5.1 and B5.2 must be given a negative sign.

Guidance: The figures calculated in sections B5.1 and B5.2 are always positive, but basis risk should not offset the directional **interest rate risk** in a given currency. Hence, the basis risk measure in a currency must be given the same sign as the net open interest exposure calculated for that currency.

B6 Yield curve risk in each currency

B6.1 Yield curve risk: horizontal disallowance in single currency

1. This subpart sets out the horizontal disallowance methodology, which is used to calculate the component of **interest rate risk** arising from yield curve risk, that is, changes in interest rates that differ at different maturities along the yield curve (non-parallel yield curve shift).

2. For the purpose of calculating the horizontal disallowance, the eight time bands from Table B4.1 are grouped into three wider time zones in accordance with Table B6.1.

Table B6.1

Time zones

Time bands (from Table B4.1)	Time zone
1 month or less	zone 1
more than 1 month but not more than 3 months	
more than 3 months but not more than 6 months	
more than 6 months but not more than 1 year	
more than 1 year but not more than 2 years	zone 2
more than 2 years but not more than 3 years	
more than 3 years but not more than 4 years	
more than 4 years but not more than 5 years	
more than 5 years but not more than 7 years	zone 3
more than 7 years but not more than 10 years	
more than 10 years	

3. The total horizontal disallowance in a single currency is calculated by–

a. summing the ***within-zone disallowances*** calculated for each of the three time zones in accordance with section B6.2 and the ***across-zone disallowances*** for each of the three pairs of time zones calculated in accordance with sections B6.4 to B6.6; then

b. giving the total calculated in subsection (a) the same sign (positive or negative) as the bank's directional **interest rate risk** in the currency calculated in accordance with section B4.1.

Guidance: The measure of **interest rate risk** in a single currency needs to be adjusted to account for yield curve risk, that is, imperfect correlation in interest rates across different time horizons.

The measure of directional **interest rate risk** calculated in subpart B4 adds the net positive and negative positions across time bands. The implied assumption in fully offsetting these amounts is that interest rate movements in each of the time bands are perfectly correlated with each other: that is, a constant yield curve shift. The treatment in this subpart accounts for yield curve risk by disallowing a portion of those offset amounts. The method calculates standard horizontal disallowances.

The proportion of the offset which is added back varies according to the proximity of the time bands to one another. The further apart the time bands, the greater the add-on arising from imperfect correlation along the yield curve.

A within-zone horizontal disallowance is calculated for each of the three time zones to account for divergent yield curve movements across the time bands within that time zone. An across-zone horizontal disallowance is calculated between Zones 1 and 2, Zones 2 and 3, and Zones 1 and 3, to account for divergent yield curve movements across time zones.

The total calculated in this way is given the same sign as the directional **interest rate risk** position, which can be a net long (positive) or net short (negative) position in a given currency. This is to ensure that yield curve risk always increases the absolute value of the **interest rate risk** in each currency.

B6.2 Calculation of amount of within-zone disallowance

1. The amount of the ***within-zone disallowance*** in each time zone in a single currency is calculated in accordance with subsections (2) to (6).

2. The ***aggregate risk-weighted long position*** for the time zone is the sum of the ***risk-weighted net positions*** for each time band within the time zone for which that net position is a long position (positive number).

3. The ***aggregate risk-weighted short position*** for the time zone is the sum of the risk-weighted net positions for each time band within the time zone for which that net position is a short position (negative number).

Guidance: The ***risk weighted net position*** in a time band is the figure calculated in section B4.1(2).

4. The ***risk-weighted matched position*** in the time zone is the lesser of the absolute value of the ***aggregate risk-weighted long position*** for the time zone and the absolute value of the ***aggregate risk-weighted short position*** for the time zone.

Guidance: The matched position represents the amount that has been offset, within the time zone, between time bands with long positions and time bands with short positions. If the net positions in the time bands are all long, or all short, there is no offsetting, and the matched position for the time zone is nil.

5. The ***residual position*** in each time zone is the sum of the ***aggregate risk-weighted long position*** (positive) and the ***aggregate risk-weighted short position*** (negative) in that time zone.

Guidance: The residual position is the amount left over after any matching. It can be a positive (long) or negative (short) amount. It is used to calculate the across-zone disallowances, as provided for in sections B6.4 to B6.6.

6. The amount of ***within-zone disallowance*** in a time zone is the value of the ***risk-weighted matched position*** in that time zone calculated in subsection (4), multiplied by the disallowance factor for that time zone specified in Table B6.2.

Table B6.2

Within-zone disallowances

Time zone	Disallowance factor
zone 1	40%
zone 2	30%
zone 3	30%

B6.3 Order of calculation of across-zone disallowances

1. The across-zone disallowance factors that must be used to determine the across-zone disallowance amount are those specified in Table B6.3.

Table B6.3

Across-zone disallowance factors

Time zones	Disallowance factor
zone 1 and 2	40%
zone 2 and 3	40%
zone 1 and 3	100%

2. Across-zone disallowances must be determined in the following order:

   a. disallowance across zones 1 and 2; then

   b. disallowance across zones 2 and 3; then

   c. disallowance across zones 1 and 3.

3. The methods for calculating the across-zone disallowances between each of the three pairs specified in subsection (2) are set out in sections B6.4 to B6.6.

4. The ***residual position*** in each time zone that is used for calculating the across-zone disallowances in each currency is the amount calculated in subsection B6.2(5).

B6.4 Zone 1/Zone 2 disallowance

1. If the Zone 1 ***residual position*** and Zone 2 ***residual position*** have the same sign, the ***matched position*** between Zones 1 and 2 is nil (no matching) and the Zone 1/Zone 2 ***across-zone horizontal disallowance*** is nil.

2. If the Zone 1 ***residual position*** and Zone 2 ***residual position*** have different signs, the Zone 1/Zone 2 ***matched position*** is the lesser of the absolute values of the two ***residual positions***,

and the Zone 1/Zone 2 ***across-zone horizontal disallowance*** is the ***matched position*** multiplied by the applicable disallowance factor from Table B6.3.

3. The Zone 1 ***net residual position*** is calculated by taking the difference between the absolute value of the Zone 1 ***residual position*** and the Zone 1/Zone 2 ***matched position***, and giving the answer a minus sign if the Zone 1 ***residual position*** is a short position (negative number).

4. The Zone 2 ***net residual position*** is calculated by taking the difference between the absolute value of the Zone 2 ***residual position*** and the ***matched position*** between time zones 1 and 2, and giving the answer a minus sign if the Zone 2 ***residual position*** is a short position (negative number).

Guidance: The Zone 1 and 2 ***net residual positions*** are the amounts left over after matching between Zones 1 and 2, and are carried forward for the Zone 2/3 and Zone 1/3 disallowance calculations.

B6.5 Zone 2/Zone 3 disallowance

1. If the Zone 2 ***net residual position*** and the Zone 3 ***residual position*** have the same sign, the ***matched position*** between Zones 2 and 3 is nil (no matching) and the Zone 2/Zone 3 ***across-zone horizontal disallowance*** is nil.

2. If the Zone 2 ***net residual position*** and the Zone 3 ***residual position*** have different signs, the Zone 2/Zone 3 ***matched position*** is the lesser of the absolute values of the Zone 2 ***net residual position*** and the Zone 3 ***residual position***, and the Zone 2/Zone 3 ***across-zone horizontal disallowance*** is the ***matched position*** multiplied by the applicable disallowance factor from Table B6.3.

3. The Zone 3 ***net residual position*** is calculated by taking the difference between the absolute value of the Zone 3 ***residual position*** and the Zone 2/Zone 3 ***matched position***, and giving the answer a minus sign if the Zone 3 ***residual position*** is a short position (negative number).

Guidance: The Zone 3 ***net residual position*** is the amount left over after matching between Zones 2 and 3, and is carried forward for offsetting against the Zone 1 ***net residual position***.

B6.6 Zone 1/Zone 3 disallowance

1. If the Zone 1 ***net residual position*** and the Zone 3 net residual position have the same sign, the ***matched position*** between Zones 1 and 3 is nil (no matching) and the Zone 1/Zone 3 ***across-zone horizontal disallowance*** is nil.

2. If the Zone 1 ***net residual position*** and the Zone 3 ***net residual position*** have different signs, the Zone 1/Zone 3 ***matched position*** is the lesser of the absolute values of the Zone 1 ***net residual position*** and the Zone 3 ***net residual position***, and the Zone 1/Zone 3 ***across-zone horizontal disallowance*** is the ***matched position*** multiplied by the applicable disallowance factor from Table B6.3.

Part C: Capital requirement for currency risk

C1 Aggregate capital charge for currency risk

C1.1 Capital requirement for currency risk

1. The exposure to **currency risk** in a single foreign currency is determined by subtracting the aggregate value of **financial liabilities** in the currency from the aggregate value of the **financial assets** in the currency.

2. The capital requirement for **currency risk** is calculated by–

   a. summing the currency exposure across all foreign currencies for which the exposure is a net long position (positive number); then

   b. summing the currency exposure across all foreign currencies for which the exposure is a net short position (negative number); then

   c. taking the greater of the amount calculated in subsection (a) and the absolute value of the amount calculated in subsection (b) and multiplying the result by 0.08.

3. For the purpose of the capital calculation in this section, a bank must include all foreign currency assets and liabilities within the scope of calculation set out in section C1.2, and must value foreign currency assets and liabilities following the valuation approach specified in section C1.3.

C1.2 Scope of currency risk calculation

1. The following items must not be included in the calculation of the **currency risk** capital requirement:

   a. a **financial instrument** that has been included in the capital of the **banking group** or issued by an associate of any member of the **banking group**; and

   b. an investment in premises; and

   c. any other structural position denominated in a foreign currency that is of a fixed long-term nature.

2. All **financial instruments** not covered by subsection (1) that give rise to an identifiable and definite **currency risk** should be included in the measure of exposure.

3. The following **financial instruments** should be included in the measure of **currency risk**:

   a. recognised **financial instruments**; and

   Guidance: This covers foreign currency assets and liabilities recorded in the bank's financial statements, including all foreign currency borrowings, deposits, loans, bills and investments, and liquid assets (including funds lodged with **overseas banks** and in money market securities).

   b. unrecognised **financial instruments**; and

Guidance: This covers foreign currency transactions not recorded or disclosed under conventional double-entry accounting procedures, but which entail an identifiable foreign currency commitment. Gross amounts of outstanding sale and purchase contracts must be included.

The risks subject to **BPR**140 include foreign exchange risk throughout the bank, regardless of whether it is allocated to its trading book or its banking book, or is on-balance sheet or off-balance sheet. For example, an off-balance sheet contingent liability (e.g., a guarantee or similar instrument) in foreign currency that is certain to be called and is likely to be irrecoverable should be included in the calculation for the exposure to **currency risk** in a single foreign currency.

4. For the purposes of subsection (3)(b), unrecognised **financial instruments** include–

   a. undelivered spot purchases/sales; and

Guidance: For the purpose of this methodology, a spot transaction is defined as one contracted for receipt or delivery within two business days from the calculation date. An undelivered spot transaction is an outstanding spot contract written but not delivered. This also includes forwards due to be delivered "within spot", all undelivered legs of "less than spot" swaps, and the undelivered "spot" legs of spot/forward swaps.

   b. forward purchases/sales; and

Guidance: A forward transaction is defined as one contracted for receipt or delivery beyond two business days from report date. Forward purchases/sales refer to the gross amount of outstanding forwards, other than those to be delivered "within spot". These instruments also include both legs of forward/forward swaps and outstanding forward legs of spot/forward swaps.

   c. futures/options contracts.

Guidance: This refers to all foreign currency futures and options contracts outstanding at the calculation date.

C1.3 Valuation of financial instruments for currency risk capital requirement

1. For an unrecognised **financial instrument**, a bank must use the face or contract amount of the **financial instrument** expressed in NZD.

2. For a **derivative** other than an option contract, a bank must use the market value of the principal amount of the underlying or of the notional underlying instruments expressed in NZD.

3. For an option contract in a single foreign currency, a bank must use the delta-equivalent value.

4. For any other recognised **financial instrument**, the value to be used is the principal amount of the instrument (or the underlying) or of the notional instruments (or the underlying instruments),

updated in line with the current market valuation of corresponding instruments if applicable, and expressed in NZD.

5. Despite subsections (1) to (4), if a bank has the capacity to value **financial instruments** on a present value basis, it may do so for the purposes of calculating its exposure to currency risk in a given currency.

6. To obtain the NZD value of a **financial instrument** for the **currency risk** calculation, the valuation of the instrument in its currency of denomination must be converted to NZD at the mid-point of market bid and offer rates applying at the close of business on the relevant day.

Part D: Capital requirement for equity risk

D1 Aggregate capital charge for equity risk

D1.1 Capital requirement for equity risk

1. The exposure to **equity risk** in a single currency is determined by subtracting the aggregate amount of the value of all of the **equity instruments** in that currency that are **financial liabilities** from the aggregate amount of the value of all the **equity instruments** in that currency that are **financial assets**.

2. The capital requirement for **equity risk** is calculated by–

   a. summing the **equity** exposure across all currencies for which the exposure is a net long position (positive number); then

   b. summing the **equity** exposure across all currencies for which the exposure is a net short position (negative number); then

   c. summing the amount calculated in subsection (a) and the absolute value of the amount calculated in subsection (b) and multiplying the result by 0.08.

3. For the purpose of the capital calculation in this section, a bank must include all long and short positions in **equity instruments** within the scope of calculation set out in section D1.2, and must value those positions following the valuation approach specified in section D1.3.

D1.2 Scope of equity risk calculation

1. (The following items must not be included in the calculation of the **equity risk** capital requirement:

   a. any structural position, such as an **equity** investment in an associate of any member of the **banking group**; and

   Guidance: For the solo capital calculation, any **equity** investment in a subsidiary of the **registered bank** should also be excluded as a structural position.

   b. non-convertible preferred shares that are included in the calculation of the capital requirement for **interest rate risk**.

2. The measure of **equity** exposure should include both recognised and unrecognised instruments that give rise to **equity risk** and that are not covered by subsection (1), including the following:

   a. voting and non-voting ordinary shares; and

   b. warrants that give the holder the right to acquire **equity instruments**; and

   c. convertible securities under the terms of which the holder has the right to convert the security into an **equity instrument** at a fixed conversion price; and

   d. commitments and other rights or obligations to buy or sell **equity instruments**; and

e. **equity** futures; and

f. **equity** swaps (treated as two notional positions in the same manner as currency swaps); and

g. **equity** options.

D1.3 Valuation of equity instruments

1. The value of an **equity instrument** is, in the case of–

   a. an unrecognised **equity instrument**, the face or contract amount of the **equity instrument** expressed in NZD; and

   b. a net **equity** futures position, the marked-to-market value of the notional underlying **equity** position, expressed in NZD; and

   c. a net **equity** option position, the delta equivalent value, expressed in NZD; and

   d. an **equity derivative** not covered under paragraph (b) or (c), the market value of the principal amount of the underlying or of the notional underlying instruments, expressed in NZD; and

   e. any other recognised **equity instruments**, the principal amount of the instrument (or the underlying) or of the notional instruments (or the underlying instruments), updated in line with the current market valuation of corresponding instruments if applicable, and expressed in NZD.

2. The NZD value of an **equity financial instrument** denominated in a foreign currency is the value of that instrument converted to NZD at the mid-point of market bid and offer rates applying at the close of business on the relevant day.

Appendix 1

Interest rate risk calculation example

This appendix illustrates step by step the methodology for the **interest rate risk** capital calculation set out in Part B.

1. Scoping - All **financial instruments** within the scope specified in section A1.2, other than long or short positions in **equity instruments**, are included.

2. Decomposition – If applicable, **derivatives** are converted into positions in the relevant underlying in accordance with B1.3(2).

    a. Futures and forward contracts (including **forward rate agreements**) are treated as a combination of a long and a short position in a notional government security. 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.

    b. Swaps are 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.

3. Delta-equivalent value of options - If a bank uses the delta-plus method in accordance with B1.5(b), options are converted into the options' delta-equivalent value which will be then slotted into the interest rate time-bands. (Note that if a bank uses other methods, the positions for the options and the associated underlying, cash or forward, are subject to separately calculated capital requirements. The capital charges thus generated will be added on to the capital requirements at the end.)

4. Exclusion – In each currency, if the exclusion criteria in B2 are met, a bank may exclude a matched long and short position from the calculation of the calculation.

5. Rate Insensitive Products (RIPs) – A bank determines RIPs and allocates their values in an appropriate time band in accordance with B3.1 to B3.3.

6. Rate Sensitive Products – A bank allocates the values of rate sensitive products in an appropriate time band in accordance with B3.4 to B3.5.

7. Directional interest rate risk, basis risk and yield curve risk – In each currency, a bank calculates capital charges for these risks in accordance with B4, B5 and B6.

A worked example

Suppose that a bank has the following positions in New Zealand Dollar (NZD).

- Credit card balances, NZD100millions, treated as a **core rate-insensitive product**.
- New Zealand Government bond, NZD13.33million market value, residual maturity 8 years, coupon 8%

- Bond issued by a **MDB** listed in C2.4 of **BPR**131, NZD75million market value, residual maturity two months, coupon 7%
- Interest rate swap, NZD150millions, the 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 futures, NZD50millions, delivery date after 6 months, life of underlying government security 3.5 years

Please refer to the corresponding column numbers, 1) to 21), in this spreadsheet workbook. A workbook with formula behind can be provided upon a request.

A spreadsheet workbook for the worked example in the Appendix 1

		Time bands	-1m	1-3m	3-6m	6-12m	1-2y	2-3y	3-4y	4-5y	5-7y	7-10y	10y-
		Zones	Zone 1				Zone 2				Zone 3		
1)	Positions in New Zealand Dollar	Credit card balance - RIPs	5	2.5	2.5	10	20	20	20	10	10		
		New Zealand Government bond										13.3	
		Bond issued by a multilateral development bank		75									
		Swap				150						-150	
		Futures			-50				50				
2)	Net positions (B4.1(1))		5	77.5	-47.5	160	20	20	70	10	10	-136.7	0
	Risk weights (%) (Table B4.1)		0	0.20	0.40	0.70	1.25	1.75	2.25	2.75	3.25	3.75	4.40
	Risk-weighted net positions (B4.1(2))		0	0.16	-0.19	1.12	0.25	0.35	1.58	0.28	0.33	-5.13	0
3)	The net open interest rate risk exposure (B4.1(3))		-1.27										
4)	Basis risk exposures	Matched position (B5.2(2)(a))	0	0	2.5	0	0	0	0	0	0	13.3	
5)		Absolute value of RIPs (B5.2(2)(b))	5	3	3	10	20	20	20	10	10		
6)		Vertical disallowance (B5.2(3))	0	0	0	0.01	0.05	0.07	0.09	0.06	0.07	0.02	0
7)		Total basis risk (B5.1 and B5.3)	-0.37										
8)	Within zone disallowance	Aggregate risk-weighted long position (B6.2(2))	1.29				2.45				0.82		
		Aggregate risk-weighted short position (B6.2(3))	-0.20				0				-5.63		
9)		Risk-weighted matched position (B6.2(4))	0.20				0				0.82		
11)		Residual position (B6.2(5))	1.09				2.45				-4.80		
10)		Within-zone disallowance (B6.2(6))	0.08				0				0.25		
12)	Zone 1/2 disallowance	Zone 1/2 matched position (B6.4 (1))	0										
13)		Zone 1/2 across-zone horizontal disallowance (B6.4 (2))	0										
14)		Zone 1 net residual position (B6.4 (3))	1.09										
15)		Zone 2 net residual position (B6.4 (4))					2.45						
16)	Zone 2/3 disallowance	Zone 2/3 matched position (B6.5 (1))	2.45										
17)		Zone 2/3 across-zone horizontal disallowance (B6.5 (2))	0.98										
18)		Zone 3 net residual position (B6.5 (3))	-2.35										
19)	Zone 1/3 disallowance	Zone 1/3 matched position (B6.6 (1))	1.09										
20)		Zone 1/3 across-zone horizontal disallowance (B6.6 (2))	1.09										
21)	Total horizontal disallowance (B6.1(3))		-2.39										
	Total interest rate exposure in New Zealand Dollar (B1.1(a))		-4.03										

1) The bank's positions are slotted into the time-bands after following the Steps 1 to 6 above.

Net open interest rate risk exposure

2) For a currency x, the risk-weighted net position (asset or liability) in a time band t is calculated in accordance with B4.1(1) and (2) using the risk weights given in Table B4.1.

$$NA_t = rw_t \times \sum_i A_{i,t}$$

$$NL_t = rw_t \times \sum_j L_{j,t}$$

Subject to:

$A_{i,t}$ ≡ Position of an asset i in the time band t

$L_{j,t}$ ≡ Position of a liability j in the time band t

rw_t ≡ Risk weight for the time band t divided by 100

NA_t ≡ Risk weighted net asset position in the time band t

NL_t ≡ Risk weighted net liability position in the time band t

3) The net open interest rate risk exposure in a currency *x* (NE_x^{total}) is calculated according to B4.1(3).

$$NE_x^{total} = \sum_t (NA_t + NL_t)$$

In the worked example, the net open interest rate risk exposure is -1.27.

Basis risk exposure

4) The matched position in a time band t (MP_t) is calculated according to B5.2(2)(a).

$$MP_t = \text{Min}\left(\sum_i |A_{i,t}|, \sum_i |L_{i,t}|\right)$$

In the worked example, the matched position in the time-band 7-10 years is 13.3.

5) The absolute value of the **rate-insensitive products** in a time band t (RIP_t) is calculated according to B5.2(2)(b). Please note that **rate-insensitive products** are a subset of asset (or liability).

$$RIP_t = \sum_n |RIA_{n,t}| + \sum_m |RIL_{m,t}|$$

Subject to:

$RIA_{n,t}$ ≡ Position of a **rate-insensitive asset** n in the time band t

$RIL_{m,t}$ ≡ Position of a **rate-insensitive liability** m in the time band t

In the worked example, the absolute value of the rate-insensitive products in the time-band 5-7 years is 10.

6) The vertical disallowance in the time band t (VD_t) is calculated according to B5.2(3).

$$VD_t = rw_t \times [0.2 \times RIP_t + max\{0, 0.05 \times (MP_t - RIP_t)\}]$$

In the worked example, the vertical disallowance in the time-band 6-12 months is 0.01.

7) Total exposure to basis risk in a single currency *x* (BR_x^{total}) is calculated according to B5.1 and B5.3.

$$BR_x^{total} = \begin{cases} (-1) \times \sum_t VD_t \ \ for\ NE_x^{total} < 0 \\ \sum_t VD_t \ \ otherwise \end{cases}$$

In the worked example, the total exposure to basis risk is -0.37.

Within zone disallowance

8) The aggregate risk-weighted long and short positions in a time zone z are calculated in accordance with B6.2(2) and (3), respectively.

$$RwA_z = \sum_t^{t \in z} NA_t$$

$$RwL_z = \sum_t^{t \in z} NL_t$$

Subject to:

$RwA_z \equiv$ Aggregate risk-weighted long positions in a time zone z

$RwL_z \equiv$ Aggregate risk-weighted short positions in a time zone z

In the worked example, the aggregate risk-weighted long and short positions in Zone 1 are 1.29 and -0.20, respectively.

9) The risk-weighted matched position in a time zone z (MP_z^{within}) is calculated in accordance with B6.2(4).

$$MP_z^{within} = \text{Min}(|RwA_z|, |RwL_z|)$$

In the worked example, the risk-weighted matched position in Zone 1 is 0.20.

10) Within-zone disallowance in a time zone z (DA_z^{within}) is calculated according to B6.2(6) using the disallowance factor specified in TableB6.2.

$$DA_z^{within} = rw_z^{within} \times MP_z^{within}$$

Subject to:

$rw_z^{within} \equiv$ Disallowance factor for Zone z divided by 100

In the worked example, the within-zone disallowance in Zone 1 is 0.08.

11) A within-zone residual position in a time zone z (RP_z^{within}) is calculated according to B6.2(5). This will be used to calculate the across-zone disallowances at the next stage.

$$RP_z^{within} = RwA_z + RwL_z$$

In the worked example, the within-zone residual position in Zone 1 is 1.09.

<u>Zone 1/2 disallowance</u>

12) Zone 1/ Zone 2 matched position ($MP_{z1,2}^{across}$) is calculated in accordance with B6.4(1) and (2).

$$MP_{z1,2}^{across} = \begin{cases} 0 \ for \ RP_{z1}^{within} \times RP_{z2}^{within} > 0 \\ \min\left\{\left|RP_{z1}^{within}\right|, \left|RP_{z2}^{within}\right|\right\} \ otherwise \end{cases}$$

In the worked example, Zone 1/ Zone 2 matched position is 0.

13) Zone 1/Zone 2 across-zone horizontal disallowance ($DA_{z1,2}^{across}$) is calculated in accordance with B6.4(2) using an applicable disallowance factor in TableB6.3.

$$DA_{z1,2}^{across} = rw_{z1,2}^{across} \times MP_{z1,2}^{across}$$

Subject to:

$rw_{z1,2}^{across} \equiv$ Disallowance factor for Zone 1 and 2 divided by 100

In the worked example, Zone 1/Zone 2 across-zone horizontal disallowance is 0.

14) Zone 1 net residual position is calculated in accordance with B6.4(3).

$$NRP_{z1} = \begin{cases} (-1) \times \left(\left|RP_{z1}^{within}\right| - MP_{z1,2}^{across}\right) for \ RP_{z1}^{within} < 0 \\ \left|RP_{z1}^{within}\right| - MP_{z1,2}^{across} \ otherwise \end{cases}$$

In the worked example, Zone 1 net residual position is 1.09.

15) Zone 2 net residual position is calculated in accordance with B6.4(4).

$$NRP_{z2} = \begin{cases} (-1) \times \left(\left|RP_{z2}^{within}\right| - MP_{z1,2}^{across}\right) for\ RP_{z2}^{within} < 0 \\ \left|RP_{z2}^{within}\right| - MP_{z1,2}^{across}\ otherwise \end{cases}$$

In the worked example, Zone 2 net residual position is 2.45.

Zone 2/3 disallowance

16) Zone 2/ Zone 3 matched position is calculated in accordance with B6.5(1) and (2).

$$MP_{z2,3}^{across} = \begin{cases} 0\ for\ RP_{z3}^{within} \times NRP_{z2} > 0 \\ \min\left\{\left|RP_{z3}^{within}\right|, |NRP_{z2}|\right\}\ otherwise \end{cases}$$

Subject to:

$MP_{z2,3}^{across} \equiv$ Zone 2/ Zone 3 matched position

In the worked example, Zone 2/ Zone 3 matched position is 2.45.

17) Zone 2/Zone 3 across-zone horizontal disallowance ($DA_{z2,3}^{across}$) is calculated in accordance with B6.5(3) using an applicable disallowance factor in TableB6.3.

$$DA_{z2,3}^{across} = rw_{z2,3}^{across} \times MP_{z2,3}^{across}$$

Subject to:

$rw_{z2,3}^{across} \equiv$ Disallowance factor for Zone 2 and 3 divided by 100

In the worked example, Zone 2/Zone 3 across-zone horizontal disallowance is 0.98.

18) Zone 3 net residual position is calculated in accordance with B6.5(3).

$$NRP_{z3} = \begin{cases} (-1) \times \left(\left|RP_{z3}^{within}\right| - MP_{z2,3}^{across}\right) for\ RP_{z3}^{within} < 0 \\ \left|RP_{z3}^{within}\right| - MP_{z2,3}^{across}\ otherwise \end{cases}$$

In the worked example, Zone 3 net residual position is -2.35.

Zone 1/3 disallowance

19) Zone 1/ Zone 3 matched position ($MP_{z1,3}^{across}$) is calculated in accordance with B6.6(1) and (2).

$$MP_{z1,3}^{across} = \begin{cases} 0\ for\ NRP_{z1} \times NRP_{z2} > 0 \\ \min\{|NRP_{z1}|, |NRP_{z3}|\}\ otherwise \end{cases}$$

In the worked example, Zone 1/ Zone 3 matched position is 1.09.

20) Zone 1/Zone 3 across-zone horizontal disallowance ($DA_{z1,3}^{across}$) is calculated in accordance with B6.6(2) using an applicable disallowance factor in TableB6.3.

$$DA_{z1,3}^{across} = rw_{z1,3}^{across} \times MP_{z1,3}^{across}$$

Subject to:

$rw_{z1,3}^{across} \equiv$ Disallowance factor for Zone 1 and 3 divided by 100

In the worked example, Zone 1/Zone 3 across-zone horizontal disallowance is 1.09.

Total horizontal disallowance

21) The total horizontal disallowance in a single currency *x* (DA_x^{total}) is calculated in accordance with B6.1(3).

$$DA_x^{total} = \begin{cases} (-1) \times \left\{ \sum_{z=z1}^{z3} DA_z^{within} + \sum_{z=z1,2}^{z1,3} DA_z^{across} \right\} & for\ NE_x^{total} \times \left\{ \sum_{z=z1}^{z3} DA_z^{within} + \sum_{Z=z1,2}^{z1,3} DA_Z^{across} \right\} < 0 \\ \left\{ \sum_{z=z1}^{z3} DA_z^{within} + \sum_{Z=z1,2}^{z1,3} DA_Z^{across} \right\} & otherwise \end{cases}$$

In the worked example, the total horizontal disallowance in New Zealand Dollar is -2.39.

8. The total interest rate exposure in a single currency *x* (IRE_x) is calculated in accordance with B1.1(a). (Note that if a bank any methods for options other than the delta-plus one, a capital charge calculated separately for options should be added on at this stage.)

$$IRE_x = NE_x^{total} + BR_x^{total} + DA_x^{total}$$

In the worked example, the total interest rate exposure in New Zealand Dollar is -4.03.

9. Aggregate capital charge for interest rate risk is calculated in accordance with B1.1(b) to (d).

$$IRCC^{agg} = max\left[\sum_x IRE_x|_{IRE_x>0}, \left|\sum_x IRE_x|_{IRE_x<0}\right|\right]$$