21. Market Risk Management & Regulation

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21.1 Introduction

The general definition of market risk used by the Basel Committee and national supervisors is:

"Market risk is defined as the risk of losses in on and off-balance-sheet positions arising from movements in market prices. The risks subject to this [the market risk capital] requirement are:

(1) The risks pertaining to interest rate related instruments and equities in the trading book;

(2) Foreign exchange risk and commodities risk throughout the bank."

APRA classifies market risk (in APS-116) into:

" general market risk - the risk of loss owing to changes in the general level of market prices or interest rates. It arises from positions in interest rate, equities, foreign exchange and commodities;"

and

"specific risk - the risk that the value of a security will change due to issuer-specific factors. It applies to interest rate and equity positions related to a specific issuer."

It defines a *TFC* (traded market risk, foreign exchange and commodities) capital requirement as regulatory capital required given the exposure to market risk (as calculated according to APS-116).

This is treated separately to interest rate risk arising from different interest rate characteristics of liabilities and assets in the "banking book" (IRRBB). In large banks the ALCO or other relevant committee will assess IRRBB and if outside of preferred range transfer that risk to the trading desk via an internal swap (or other) transaction. The trading desk will then manage that risk as part of the overall interest rate risk from activities of the bank.

While smaller banks may have trading desks and be exposed to TFC risks, most will not be in that situation. After a long period of consultation APRA released a revised (but not final) version of APS 116 (Capital Adequacy: Market Risk) which applies, from January 2023, only to larger ADIs which have trading book activities. Most smaller ADIs (with less than $20 billion assets for example) would not face a market risk capital charge. The revisions do not yet reflect changes arising from the Basel Committee's Fundamental Review of the Trading Book (FRTB, discussed in Chapter 21.4) and a revised version of its Credit Valuation Adjustment framework. APRA's 2023 Policy Priorities indicate that it will be consulting on further changes to APS 116 in 2024 for implementation in 2026. In the interim, while VAR remains a key component of the market risk framework (to be replaced by Expected Shortfall when FRTB changes are implemented) APRA has advised banks of its expectation regarding their treatment of modelling of risks not in VAR (RNIV).

21.2 Bank Management of Market Risk

To operate a trading book, a bank must obtain approval of a trading book policy statement from APRA, and must have a framework for prudent valuation of trading book positions.

Information about the approaches used by the major banks to manage market risk arising from trading book activities can be found in their Basel disclosures (with most information in the annual disclosure). For example, in its September 2020 disclosure, ANZ states that "market risk stems from ANZ's trading and balance sheet activities and is the risk to ANZ's earnings or economic value arising from changes in interest rates, foreign exchange rates, credit spreads, volatility, correlations or from fluctuations in bond, commodity or equity prices".[1]

ANZ's Board Risk Committee comprises only Non-Executive directors and is responsible for overall oversight of management's implementation of ANZ's risk management strategy, consistent with the Boards risk appetite statement. A group of senior executives comprises the Credit and Market Risk Committee (CMRC) which is responsible for the oversight and control of credit, market, insurance and material financial risks across the ANZ Group and is accountable to the Board Risk Committee and advised by the Market Risk function which is:

" a specialist risk management unit independent of the business that is responsible for:

- Designing and implementing policies and procedures to ensure market risk exposures are managed within the appetite and limit framework set by the Board.
- Measuring and monitoring market risk exposures, and approving counterparty and associated risks.
- The ongoing effectiveness and appropriateness of the risk management framework."

To manage traded market risk ANZ uses "A robust Value at Risk (VaR) quantification approach supplemented by comprehensive stress testing"

In addition to traded market risk banks also are exposed to *non-traded market risk* which is the balance sheet exposure to interest rate movements (IRRBB, see Chapter 22) and changes in the AUD value sensitivity of foreign currency capital and earnings to exchange rate changes.

Managing Traded Market Risk

A first step in managing traded market risk is to measure it. Banks will do this by attempting to estimate the probabilities of possible outcomes (gains and losses) that might occur over some relatively short time horizon from the current positions held by the bank's trading desks in interest rates, foreign exchange and commodities. (Equity trading desks would also be included where relevant).

[1] Note that earnings and economic value could give conflicting messages if mark-to-market accounting is not used. Consider a portfolio of long term bonds, half floating and half fixed interest rate, both currently trading at par and paying 4 per cent. If the interest rate increased to 5 per cent the coupon interest earnings of the portfolio would increase to 4.5 per cent. But the market value of the portfolio would decline (the floating rate bonds would remain at par but the fixed rate bonds would decline in value). However, if earnings also included the decline in market value (as well as coupon interest) earnings would also decline.

This involves: (a) being able to identify positions held; (b) assessing the likelihood of possible movements in interest rates etc and the sensitivity of the value of positions held to such movements; (c) summarising the range of possible outcomes in some standardised metric(s) useful for assessing risk and making risk management decisions.

These are not simple exercises. Consider interest rate positions. The bank's trading desks will deal in a wide range of securities and derivatives. The value of each will be most sensitive to interest rate changes at different maturities (such as duration for a fixed rate bond), but likely influenced by movements in the entire yield curve. It is necessary to develop scenarios about possible changes in the yield curve, calculate overall gains or losses in that scenario, and assign probabilities to those scenarios.

A common approach has been to use Value at Risk (VaR) methodology, and historical simulation has been one method used. In this method, the possible one day changes in the value of the current position is recalculated using the most recent 500 day history of daily changes in the yield curve. Those 500 hypothetical changes in position value are ranked from largest loss to smallest loss (ie largest profit). If it is assumed that each of those historical daily changes is equally probable looking forward, then there is a one percent probability of either the first, second, third, fourth or fifth largest loss occurring. The fifth largest loss thus indicates the size of the loss that there is only a one percent chance of equalling or exceeding (the 99 percent VaR figure)– if the past history of interest rate changes is a good guide to the future!

While the development of VaR was a valuable advance for risk management, it does have its weaknesses. One (but common to all approaches) is the problem of specifying the probability distribution of future interest rate changes. History is not necessarily a good guide, and other methods of forecasting will often be used. Second, it doesn't indicate whether losses might exceed the VaR number by a little or a lot. This has led to development and use of other metrics such as *Expected Shortfall* which, essentially, measures the average of those values exceeding the VaR number (the "mean of the tail" of the distribution). Third, what time horizon should be used? Ten days is often used as representing a period within which positions could be adjusted to remove excessive risk. Fourth, VaR numbers for different positions cannot be simply added to get an overall VaR number. One reason is that correlations between changes in value of different positions need to be taken into account (whenever asset A records a loss, asset B might record a profit, for example). But another more technical reason is that VaR is not "sub-additive" because of the way it is derived as a point on the support (range) of the probability distribution. One might think intuitively that VaR(A+B) < VaR(A) + VaR(B) because of the effect of correlation, but that is not the case.[2]

Banks and regulators are continuously striving to find better risk measures. And one basic lesson from finance is "don't put all your eggs in one basket" (ie diversify). So there has been increased use of additional approaches such as *stress tests*, such as by assuming some highly adverse scenario and assessing its consequences for the value of positions.

Of course, it is better to avoid being in positions where risk is larger than consistent with the bank's risk appetite. Hence, an important component of the risk management system is the imposition of position limits on individual traders and trading desks. By calculating the VaR arising from various positions, a limit can be placed on the maximum position allowed, so as to ensure that the VaR will always be no more than that desired.

Suppose, for example, the maximum VaR desired for a trader taking long and short positions in a particular asset is VaR*=100, and the profit (loss) on a position of X (where positive is long and negative is short) when the yield of the asset changes by Δr is:

Profit = 5X. Δr

Then if |Δr| = 2 is the change (positive or negative) in r which could occur or be exceeded 1 per cent of the time, then |X| = 10 is the maximum long or short position which gives a VaR of 100. (If Δr = +2 and the trader is short 10 (X=-10) the profit will be -100, and similarly if Δr=-2 and X=10). See the Appendix for more detail.

This leaves unanswered the question of how the maximum VaR for any trader should be determined. If, for example (unrealistically) the trader could virtually perfectly predict future price movements of the asset being traded, she would almost always make large profits and rarely make losses. So a large VaR limit would be desired – since setting a small position would reduce profits made (by preventing the dealer from taking large positions which in most circumstances yield large profits).[3]

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[2] Danielsson et al (LSE, 2005) discuss – but also show that in many cases, VaR is sub-additive

[3] Also, in setting limits based on the assumption that VaR's for individual dealers generate a desired VaR for the bank as a whole, there is the likelihood that individual dealers may operate inside the limits allowed, with the result that overall the bank is taking less risk than consistent with its risk appetite.

So, it could be expected that experienced traders would be given larger limits than novices – if it is assumed that they are better at "reading" the market or at exiting potentially loss-making positions. Likewise, a trader who consistently makes profits could expect to see an increase in the limits applied to them. However, the fact that there is little evidence of superior trading ability (achieving higher profits without commensurately higher risk taking) of individuals over the long run cautions against such strategies in setting limits. Most banks will also have some *loss limits* in place, such that continued losses will lead to suspension and review of the activity.

21.3 Regulatory Approach

The BCBS approach determines market risk capital requirements based on:

- Prudential regulation distinguishing between assets held in a "trading" book and those held in "banking" book.
- Capital for credit (counterparty) risk is required for the banking book and derivatives in the trading book
- Capital for market risk is required for trading book
  - Both general market risk and (for equity and interest rate positions) specific risk (associated with issuer). For example, the yield to maturity of a 3 year bond issued by Company XYZ might shift differently to the 3 year government or swap rate due to a change in the credit rating of XYZ, giving rise to a basis, or specific, risk.

In 2013 the Basel Committee began a *Fundamental Review of the Trading Book (FRTB)* regulation which was finalised in 2016 (https://www.bis.org/bcbs/publ/d352.pdf) with full implementation originally 2019 but deferred in December 2017 with the Basel 3 finalisation announcement until 2022. An explanatory note on main details is available at https://www.bis.org/bcbs/publ/d352_note.pdf

Pre implementation of FRTB Changes (until 2026 in Australia)

Pre FRTB (Fundamental Reform of Trading Book) revisions to regulatory arrangements, a specific risk capital charge substituted for a credit risk capital charge for items in trading book. For banks using the standardised[4] approach, the specific risk capital charge for traded debt securities was very similar to

[4] Note that the Basel Committee uses the term "standardised" whereas APRA has, until recent consultations, used the term "standard".

the credit risk capital charge (but a much lower effective risk weight (0.25% – 1.60%) for investment grade securities). That gave incentives for whether to put securities in the trading book or banking book. Consequently there were regulatory restrictions on interrelationships between the banking and trading books.

These restrictions are outlined by APRA in APS-116

"An ADI must allocate to the trading book positions in financial instruments, including derivative products and other off-balance sheet instruments, that are held either with trading intent or to hedge other elements of the trading book. Positions held with trading intent are those which:

> (a) are held for short-term resale; or
>
> (b) are taken on by the ADI with the intention of benefiting in the short-term from actual and/or expected differences between their buying and selling prices, or from other price or interest rate variations; or
>
> (c) arise from broking and market-making."

(Trading book positions must be marked to market (fair-value) daily and recognised in P&L)

Post implementation of FRTB Changes (to be reflected in APS 116 from 2026)

The **FRTB** – fundamental reform of trading book – led to the following changes:

- Revised internal models-approach (IMA)
- Revised standardised approach (SA)
- Shift from VaR to ES measure of risk under stress
- Incorporating risk of market illiquidity
- Revised trading-banking book boundary

The last of these was aimed at reducing scope for regulatory arbitrage via:

- Strict limits on movement between banking & trading book
- Applying an additional capital charge if the movement would reduce the capital charge (ie such that aggregate capital charge kept constant)
- Internal risk transfers from trading to banking book not recognised

- Specifying which instruments must be included or excluded, and those presumed to be included

As with all Basel changes there are long transitional arrangements – national regulators were to finalise new standards by Jan 2019 and implement by end 2019, (but subsequently delayed to end 2022, and then to end 2023 when the Covid-19 crisis struck). As noted above, as at 2023 APRA's APS 116 Standard retains the pre-FRTB approach, but is expected to shift to a post-FRTB approach in 2026.

21.4 Trading Desk (Book) Definitions, Treatment and Regulation

(a) A trading desk for the purposes of the regulatory capital charge is an unambiguously defined group of traders or trading accounts. Each individual trader or trading account must be assigned to only one trading desk.

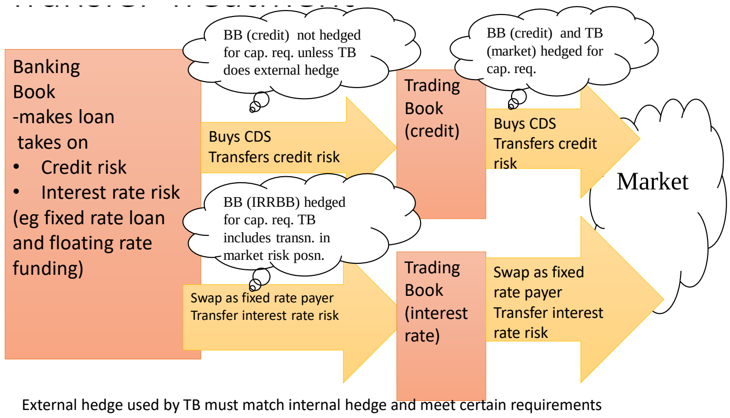
(b) The desk must have a clear reporting line to senior management and must have a clear and formal compensation policy linked to its pre-established objectives.

(c) A trading desk must have a well-defined and documented business strategy, including an annual budget and regular management information reports (including revenue, costs and risk-weighted assets).

(d) A trading desk must have a clear risk management structure. This must include clearly defined trading limits based on the business strategy of the desk. The desk must also produce, at least weekly, appropriate risk management reports. This would include, at a minimum, profit and loss reports and internal and regulatory risk measurement reports.

Source: Basel Committee

The figure below provides an overview of the treatment of risk transfer from the banking book to the trading book implied by APS-116.



External hedge used by TB must match internal hedge and meet certain requirements

21.5 Requirements for Accreditation to use Internal Models Approach

For a number of years, only the four majors and Macquarie had approval to adopt the internal models approach. The application of an “all or none” approach by APRA which prevented using internal models for some risks and the standard approach for others prevented the ability of smaller institutions to transition gradually to using internal models approaches. In 2015 (following a suggestion of the 2014 AFSI) APRA allowed ADIs to apply to use internal models for only some categories of risk. In 2018, ING received approval to use the internal models approach for market (and credit) risk. Other regional banks have been preparing for obtaining approval for internal models for several years.

Banks wishing to use their internal models, rather than the standardised approach, for determining capital required for market risk, require accreditation from the regulator. As part of that they must also be able to demonstrate that their models are robust, by subjecting them to “back-testing”. This involves, for example, calculating how many times over some past number of days the actual loss exceeded the estimated value at risk. If a 99 per cent confidence value is being used, then the VAR should be exceeded only once in every 100 days. So, using say 500 days of history, the number of actual violations could be compared to an expected number of 5 to assess how well the model performs.

Figure 1 (using the BCBS framework) sets out the steps involved in obtaining regulator approval for use of internal models for managing market risk.

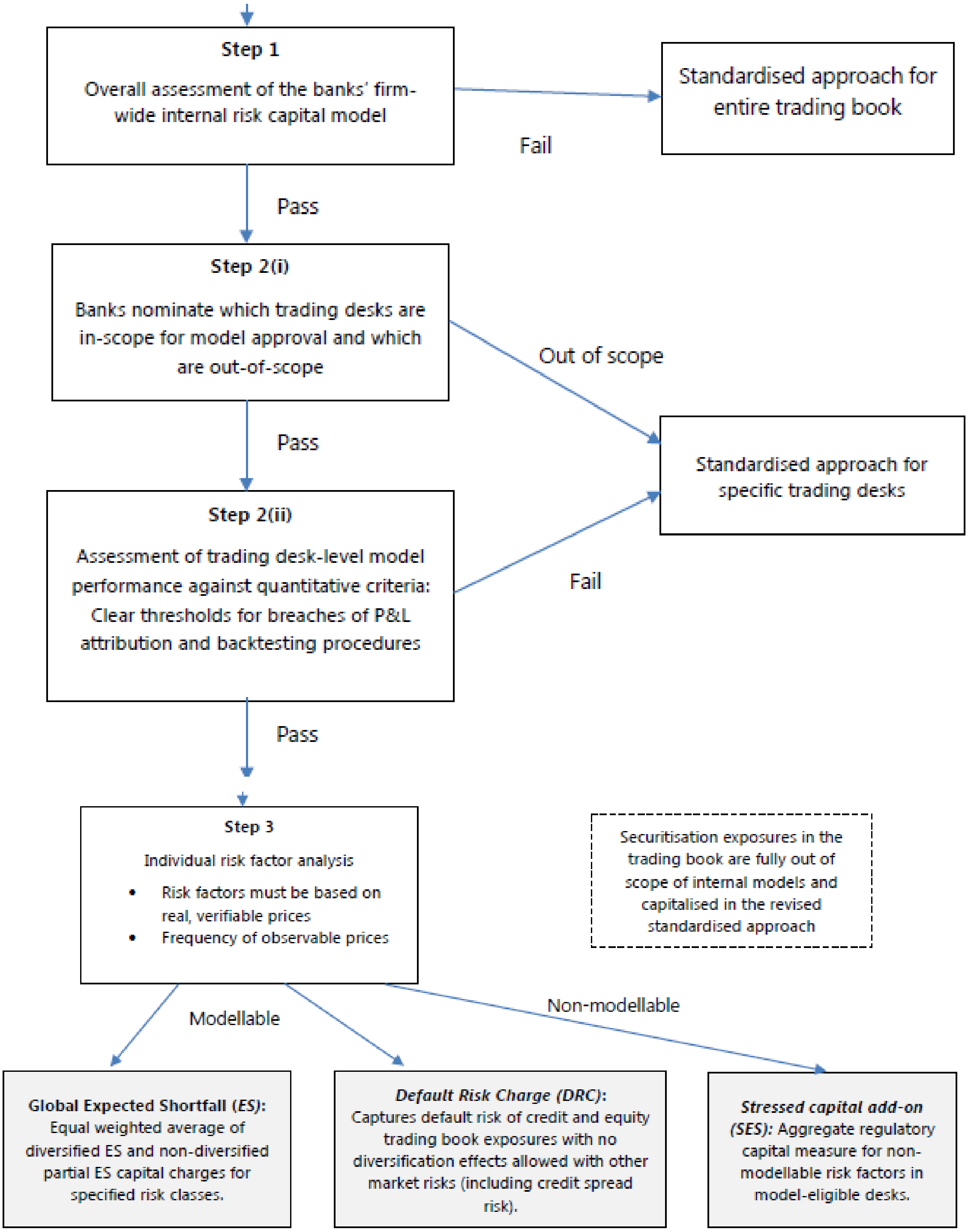


FIGURE 1: THE INTERNAL MODELS APPROACH FOR MARKET RISK: SOURCE: BASEL COMMITTEE

21.6 Internal Models Approach

Use of bank internal model may be approved, subject to:

- Risk management systems, skills, model accuracy, stress tested, positions held in "approved" trading desks
- Regulatory models may differ somewhat from those used for internal management

Prior to **FRTB,** the regulatory approach used value-at-risk from all market risks

- Calculated daily
- 99^{th} percentile, one tail confidence interval
- 10 trading days holding period
- Minimum historical data of 1 year used
- Could incorporate cross-asset category correlations

Post FRTB

- Compute Expected Shortfall (ES) daily, bank-wide and for each trading desk
- Use 97.5^{th} percentile, one tailed confidence level
- Calculate for 10 day liquidity horizon (holding period), and scale to other horizons (using complicated formula), eg
    - Major currency interest rates – 10 days
    - Credit spread: corporate – 40 days
    - FX volatility – 40 days
    - Equity price (small cap) - 20 days
    - Precious metals price – 20 days

Ideally each instrument can be expressed as a function of some limited number of risk factors for which correlations and covariances are known

For interest rates and equities models should capture both market risk and specific risk.

- Interest Rate Exposures

- Yield curve model with at least 6 factors (maturities)
- Ability to capture basis risk

- Equity Exposures
  - Market Index (at minimum) or Industry Indexes or individual stock volatilities
- Exchange Rates
  - Risk factor for each currency

Regulatory Formulas

Once internal models have been used to identify expected shortfall (or other risk measures), regulatory formulas incorporate those metrics to determine capital requirements. Because risk figures could vary substantially on a daily basis (and are potentially able to be manipulated) there is a "smoothing" type of adjustment, involving comparison with some historical average of the bank's risk figures. Figure 2 (drawn from Basel Committee publications) provides the definitions and algebra for those interested in such details.

$$IMCC(C_i) = ES_{R,S,i} \times \frac{ES_{F,C,i}}{ES_{R,C,i}}$$

$$IMCC = \rho\left(IMCC(C)\right) + (1-\rho)\left(\sum_{i=1}^{R} IMCC(C_i)\right)$$

$$IMCC(C) = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$$

IMCC is Internally modelled capital charge at bank-wide level

IMCC(C) – no constraints on cross-risk-class correlations

IMCC(C_i) – each risk class treated independently

ES_{RS} is ES based on stress case and reduced set of risk factors

ES_{RC} (ES_{FC}) is ES over 12 months using reduced (full) set of risk factors

ρ = 0.5

$$C_A = max\{IMCC_{t-1} + SES_{t-1};\ m_c \cdot IMCC_{avg} + SES_{avg}\}$$

Daily capital requirement (C_A) for approved desks is the higher of:

(i) its previous day's aggregate market risk capital charge.

(ii) an average of the daily capital charges for preceding sixty trading days, multiplied by a scaling factor (the total of a multiplication factor and a plus factor);

And also higher of same calculation using "stressed VAR" using multiplication factor (m_c) ≥ 1.5 and with

– ("plus" factor of up to 0.5 depending on the ex-post daily VAR model performance , as determined by "back testing")

The aggregate capital charge for market risk is:

$ACC = C_A + DRC + C_U$

DRC = default risk charge;

C_U is (standardised) charge for unapproved desks

FIGURE 2: MARKET RISK REGULATORY FORMULAE

Back Testing

Internal models will, hopefully, provide reasonable estimates of the risk taken by the trading desk. If, for example the models predict that daily losses greater than $X will only occur 1 per cent of the time, then in one year of (say) 250 trading days, then it would be expected that such losses would be observed only 2 to 3 times per year. Because models are imperfect, in some years more or less *exceptions* (losses greater than $X) might occur. But a much greater number of exceptions may signal that the internal model is not fit for purpose.

Regulators thus require periodic comparison of daily value-at-risk measure with the realised daily profit or loss ("trading outcome") for each desk

- Using at least one year of current observations
- Require at a 99 per cent level of confidence ≤ 12 exceptions and at 97.5 per cent level ≤ 30 exceptions

(Note that each day's VaR will vary depending on the trading desk's position, so each day a "back-test" of realised outcome must be done against the VaR previously estimated for that day).

If the required condition is not met, the bank must use the standardised calculation.

Also Various P&L metrics are to be used for assessing model robustness

- (Unexplained P&L) / (Std dev (P&L)) <(-10%,+10%)
- Var (unexplained P&L)/Var (hypothetical P&L) <20%

It is possible that the VaR calculation may be using models for pricing of securities and derivatives which do not capture all sources of risk. (Non-linearities in price-interest rate relationships, correlations and basis risk are expected to be included). APRA expects ADIs to recognise and incorporate such other sources of risk (risk gaps) in a RNIV (risks not in VaR) framework implying additional capital add-ons, until the risk gaps have been eliminated by modelling adjustments. Identifying omitted risks could be done by comparing actual profits implied by the trading desk pricing models with those implied by the bank's risk models.

21.7 The Revised Standardised Approach

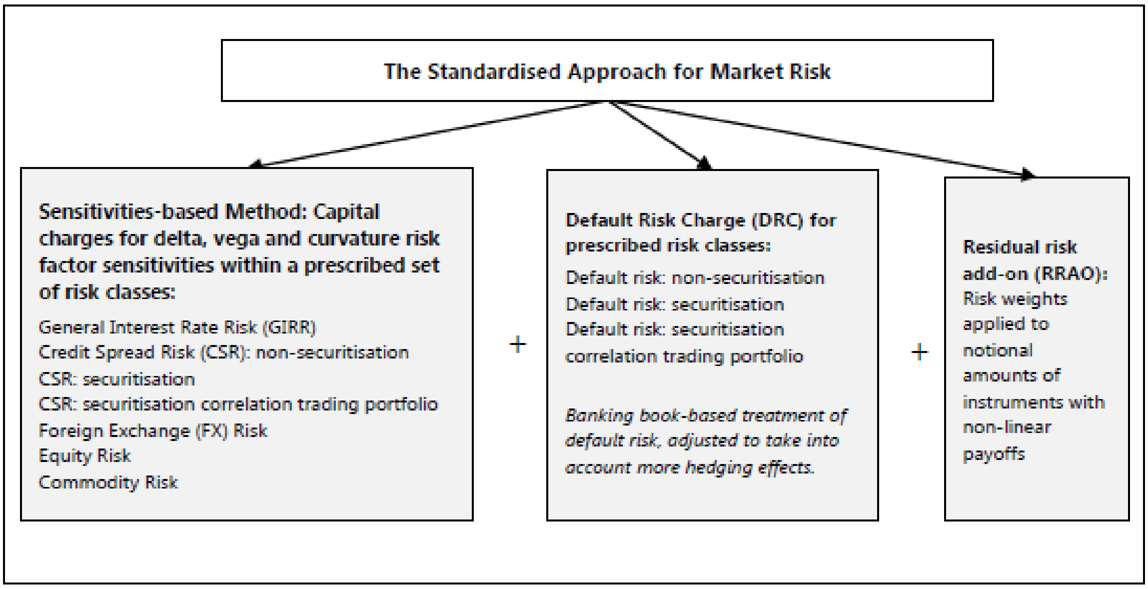


FIGURE 3:THE REVISED STANDARDISED APPROACH. (SOURCE: BASEL COMMITTEE, D352)

The basics of the standardised approach require for each "risk class" (eg FX, equity, interest rate) a calculation of the risk charge for the "Sensitivities" component, which involves:

- identifying positions in relevant instruments
- identifying risk factors (such as interest rates at different maturities) and sensitivities of positions to those risk factors

- calculating risk position based on position x risk factor
- calculating a "risk charge" (capital requirement)

- Specific approaches are specified for
  - traded debt securities and other interest rate related securities,
  - traded equities and other equity instruments,
  - foreign exchange,
  - commodities
  - and options on each of these asset classes.

An example for the current standardised approach (which is simpler) is given below. To this is added a "default risk charge" based on risk of loss from a "jump to default" situation. The "residual risk" add on attempts to cover missing considerations from the former two.

An Illustration of the Standardised Approach

This example is drawn from APRA's Prudential Practice Guide APG116

This example is "pre FRTB" but still relevant. APRA has advised it does not anticipate implementing new approach until 2024 at the earliest. It intends to implement FRTB for internationally active banks, but not yet decided on what, if any changes for others. https://www.apra.gov.au/sites/default/files/170321-letter-to-ADIs-FRTB.pdf

Consider the following portfolio of positions in the trading book(s)

- a qualifying bond, $13.33 million market value, residual maturity 8 years, coupon 8%;
- a government bond, $75 million market value, residual maturity 2 months, coupon 7%;
- an interest rate swap, $150 million, the bank receives floating rate interest and pays fixed, the next interest fixing occurs after 9 months, residual life of the swap 8 years. (This swap can be replicated as short an 8 year fixed rate bond and long a 9 month bond);
- a long position in interest rate futures of $50 million, maturing in six months time, life of underlying government security 3.5 years. (Interest Rate Futures and FRAs are entered into the template as equivalent long and short positions in different maturities of underlying instrument).

These positions are entered into the template as shown below. The approach is based on noting that if w_i is the dollar amount of gain per $1 long position in asset i (A_i) for some standardised change in the market interest rate for asset i, and if there is perfect positive correlation of the market interest rates then total possible gain/loss is:

Gain/Loss = $\sum w_i A_i$

Once the positions (A_i's) have been recorded, then the weights (w_i) can be attached and summed. However, there will be less than perfect correlation and hence some long and short positions will not necessarily offset each other (as assumed in the simple summation). So, there will need to be some "offsets" or "disallowances".

Illustration – Bank Interest Rate Trading Book Positions

a qualifying bond, $13.33 million market value, residual maturity 8 years, coupon 8%;

a government bond, $75 million market value, residual maturity 2 months, coupon 7%;

	Zone 1				Zone 2			Zone 3					
Time-band	0-1	1-3	3-6	6-12	1-2	2-3	3-4	4-5	5-7	7-10	10 - 15	15 - 20	Over 20
	Months				Years								
Position		+75 Govt	-50 Fut.	+150 Swap			+50 Fut.			-150 Swap +13.33 Qual.			

Illustration – Bank Interest Rate Trading Book Positions

an interest rate swap, $150 million, the bank receives floating rate interest and pays fixed, the next interest fixing occurs after 9 months, residual life of the swap 8 years

a long position in interest rate futures of $50 million, maturing in six months time, life of underlying government security 3.5 years.

	Zone 1				Zone 2			Zone 3					
Time-band	0-1	1-3	3-6	6-12	1-2	2-3	3-4	4-5	5-7	7-10	10 - 15	15 - 20	Over 20
	Months				Years								
Position		+75 Govt	-50 Fut.	+150 Swap			+50 Fut.			-150 Swap +13.33 Qual.			

The risk weights (w_i's) to be applied are shown in the following table and are based on a duration approach

Time Bands and Risk Weights

Risk Weights – increase with maturity time band implicitly based on
$\Delta P = - D \, \Delta r \, P/(1+r)$
What is an "unlikely" size change in interest rates at different maturities over (say) a 10 day period?

Maturity	Duration	Risk weight (%)	Assumed changes in yield (%)
	1 month or less	0.00	1.00
	over 1 and up to 3 months	0.20	1.00
	over 3 and up to 6 months	0.40	1.00
	over 6 and up to 12 months	0.70	1.00
	over 1.0 and up to 1.9 years	1.25	0.90
	over 1.9 and up to 2.8 years	1.75	0.80
	over 2.8 and up to 3.6 years	2.25	0.75
	over 3.6 and up to 4.3 years	2.75	0.75
over 5 and up to 7 years	over 4.3 and up to 5.7 years	3.25	0.70
over 7 and up to 10 years	over 5.7 and up to 7.3 years	3.75	0.65
over 10 and up to 15 years	over 7.3 and up to 9.3 years	4.50	0.60

The capital charge is calculated as the sum of :

(a) the net short or long weighted position across the whole trading book;
(b) a small proportion of the matched positions in each time band (the "vertical disallowance");
(c) a larger proportion of the matched positions across different time bands (the "horizontal disallowance"); and
(d) a net charge for positions in options, where appropriate

So the first step is to calculate (a) the net short or long weighted position across the whole trading book

	Zone 1				Zone 2			Zone 3					
Time-band	0-1	1-3	3-6	6-12	1-2	2-3	3-4	4-5	5-7	7-10	10 - 15	15 - 20	Over 20
	Months				Years								
Position		+75 Govt	-50 Fut.	+150 Swap			+50 Fut.			-150 Swap +13.33 Qual.			
Weight (%)	0.00	0.20	0.40	0.70	1.25	1.75	2.25	2.75	3.25	3.75	4.50	5.25	6.00
Position x Weight		+0.15	-0.20	+1.05			+1.125			-5.625 +0.5			

|Σ|=3

The change in portfolio value <u>if</u> the yield curve moves as specified (all rates in same direction and by more at long end

The risk weights used in this calculation increase with maturity time band and are implicitly based on

$$\Delta P = - D^* \, \Delta r \, P$$

They can be interpreted as representing what is an "unlikely" size change in interest rates at different maturities over (say) a 10 day period.

Calculation of Σ(Net Positions)x(Risk Weights) is an "approximate" VAR if all interest rates moved in same direction and by amounts supposed. This gives a capital charge for overall net position, but ignores possibilities of

(a) Within a time band, the risk of differential movements – this leads to a "vertical disallowance"

- Add 10% of smaller of net long and short positions in time band to capital requirement

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

To allow for possibility of different movements in e.g. swap and bond rates at the same maturity

(b) Across time bands, yield curve could tilt – hence "horizontal disallowance" of some part of offsetting net (ie matched) positions. Three zones are distinguished: < 1 year, 1-7 years, > 7 years and there are disallowances within and across zones

Table 3 Horizontal disallowances

Zones[27]	Time band	Within the zone	Between adjacent zones	Between zones 1 and 3
Zone 1	0 – 1 month 1 – 3 months 3 – 6 months 6 – 12 months	40%	40%	100%
Zone 2	1 – 2 years 2 – 3 years 3 – 4 years	30%		
Zone 3	4 – 5 years 5 – 7 years 7 – 10 years 10 – 15 years 15 – 20 years over 20 years	30%	40%	

e.g. 40% disallowance in zone 1 – add 40% of smaller of net long and short positions (ie the "matched" part of position) of time bands in zone 1 to capital requirement

	Zone 1				Zone 2			Zone 3					
Position x Weight		+0.15	-0.20	+1.05			+1.125			-5.625 +0.5			

Horizont. Disallow. 1	0.20 x 40% = 0.08	Smaller of shorts and longs in Zone
Horizont. Disallow. 2	Smaller of shorts and longs between zones 2 and 3	1.125 x 40% = 0.45
Horizont. Disallow. 3		1.0 x 100% = 1.0 Smaller of shorts and longs between zones 1 and 3

To allow for possibility of tilts or twists in the yield curve

The Total Capital Charge is then: (a) 3 + (b) .05 +(c) .08 + .45 + 1.00 = Total 4.58