

# 17. Bank Capital Regulation

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## 17.1 Introduction

The capital requirements imposed by prudential regulators are a major determinant of bank funding (capital structure) decisions. They also affect the attractiveness of different types of lending and investments, since bankers view the cost of equity as being higher than that of deposits or debt. A higher capital requirement for a particular category of loans is perceived as meaning that the cost of funding that category is increased. Different ways of setting capital requirements for different types of institutions can also cause a non-level playing field, if some institutions face higher capital requirements for otherwise similar loans, or their total capital requirement is higher.

While each national prudential regulator will determine its own standards, there are few who do not adhere (with differing degrees of compliance) to the capital requirements set down by the international standard setter known as the Basel Committee on Banking Supervision (BCBS). The capital requirements are not straightforward to understand, and have changed since the initial introduction of Basel 1. While the current setting of capital requirements under what is called Basel 3 is all that matters for understanding how regulation is currently affecting bank capital structure decisions, it is useful to have some knowledge of the historical development of the Basel Accord in order to understand why the regulation takes its current form. That can also help in thinking about what factors might lead to future changes in the Basel standards.

This chapter briefly provides an overview of the history of the Basel Committee and the prior versions of the Basel capital requirements. It then explains the current structure of the Basel 3 capital regulations and their effects.

It is worth bearing in mind that the Basel Committee is concerned about more than just capital standards. Providing guidance on effective bank supervision and improvements in banking practices (such as risk management and governance) are among the many of its activities.

## 17.2 Basel Committee History

It is useful to be familiar with the history of the Basel Committee and its previous approaches to setting bank capital standards in order to appreciate the structure of, and ongoing issues surrounding, the current regulatory standards applying to banks. As at mid 2021, the fundamental

structure of Basel 3 had been put in place – although some changes involve transitions to new levels yet to be achieved. The Covid19 crisis promises to test whether changes made, and reactions to the crisis, will ensure bank solvency and financial stability. The Basel Committee provides an overview and guided tour of the Basel Framework on its [website](#).

Fundamental to the current regulatory approach, and arising from that history are:

- the emphasis on a risk-weighted assets (RWA) measure to determine aggregate capital requirements for different types of risk and complications in setting risk weights;
- a “two-tier” system in which bank internal risk models can be used in conjunction with regulatory determined parameters in determining capital requirements of accredited banks, while other banks are subject to a standardised approach
- lower capital levels for accredited banks relative to “standardised” banks (partly to incentivise improvement in risk modelling and management to achieve accredited status).
- appropriate levels of capital requirements linked to RWA and the acceptability of certain types of non-equity hybrid funding instruments, able to be “bailed in” as regulatory capital
- A change in the focus of bank capital requirements from primarily “micro-prudential” (individual bank safety) to an increased emphasis on “macro-prudential” (systemic stability) issues, including higher regulatory requirements for Systemically Important Banks (SIBs).

The Basel Committee was established at the end of 1974 by Central Bank Governors of the G10 (later expanded to G20) countries as “a forum for regular cooperation between its member countries on banking supervisory matters”. ([BCBS](#)) It is not a formal supranational supervisory authority, but rather encourages convergence towards common regulatory “best practice” techniques and standards. Recognising the internationalisation and cross border activities of banks, it attempts to ensure that appropriate supervision of foreign banks occurs via agreed protocols between home and host country regulators. (Fundamental to those protocols is that host country regulators supervise foreign bank subsidiaries, while foreign bank branches are supervised by the home country). The Basel Committee meets under the auspices of the [Bank for International Settlements](#), and a brief history is available [here](#).

There was concern in the early 1980s about deteriorating capital ratios of banks, and the committee had the dual objectives of strengthening the international banking system and reducing competitive inequality between internationally active banks. This led to the July 1988 Capital Accord involving a capital requirement for internationally active banks based on risk weighted assets (RWA) for introduction by 1992 by G10 members. This Basel I capital accord (as it has become known) was subsequently adopted by most countries with internationally active banks – and also applied to banks operating domestically.

In Basel 1, risk weighting of assets and off-balance-sheet positions was based on credit risk using a small number of risk weights from zero to unity. The risk weighted capital requirement was set at 8 per cent which was largely based on an average figure across jurisdictions which it was felt was

politically achievable as a minimum requirement – rather than a specific number calculated as “optimal”. Allowable regulatory capital was divided into several “Tiers” incorporating some non-equity liabilities (which might absorb losses in a bank failure and help protect depositors) as well as equity. The capital requirement was that total capital was required to exceed 8 per cent of RWA and several restrictions applied to the composition of total capital to limit use of non-equity capital in meeting the requirements.

Subsequent developments have involved:

- In 1993 some attention was given to interest rate risk in the balance sheet book by both the US Federal Reserve and the Basel Committee – but no progress was made on creating regulatory standards at that time.
- In January 1996 an amendment to Basel 1 was made to incorporate capital requirements for market (trading book) risks. This saw the start of a two-tier approach – allowing for both a standardised approach and, for accredited banks, an *internal models* (VAR based) approach in calculating required capital.
- In 1999 a proposal was released for a new Accord (Basel 2) incorporating a “Three Pillars” approach based on capital requirements, supervision, and market discipline as necessary, complementary, ingredients in ensuring bank safety. This also allowed accredited banks to use their internal credit risk models (in conjunction with applying some specified regulatory parameters) for calculating risk weights and required capital. Capital requirements for *operational risk* were also introduced. To encourage banks to improve risk modelling and management, the capital standards provided the opportunity for accredited banks to operate with lower capital than if they had remained under the standardised approach. Capital requirements for interest rate risk in the banking book (IRRBB) were also produced – but as a “Pillar 2” (supervision) option for national regulators to consider for adoption.
- In 2006, Basel 2 was agreed upon, for introduction in (generally) 2008.
- In 2009 significant changes to the Basel 2 risk weights, referred to as Basel 2.5, were introduced following deficiencies identified in existing approaches during the global financial crisis.
- Further substantive changes were made in 2011, sufficient in scale for the Basel Committee to refer to the new standards as Basel 3. These involved requirements for higher and “better quality” capital (to be implemented gradually) as well as risk weight changes. Liquidity requirements were introduced (also for gradual implementation). Basel 3 also saw considerable emphasis placed on “macro-prudential” aspects of bank regulation supplementing an approach which had been primarily “micro-prudential” up until that time.
- Although “counterparty credit risk” (CCR) was included in Basel 1 and 2, in Basel 3 it was made more explicit as a separate category to “credit risk”. CCR “is the risk that the counterparty to a transaction could default before the final settlement of the transaction in cases where there is a bilateral risk of loss. The bilateral risk of loss is the key concept on which the definition of counterparty credit risk is based” [Basel Committee](#) (Section 51.2) For example, a bank may enter an interest rate swap with a counterparty where it may lose if interest rates move against it, or the counterparty might lose (and the bank gain as long as the counterparty doesn’t default) if interest rates move the other way.
- In 2014 and following years a number of further changes were proposed (and some implemented) which many commentators (but not the Basel Committee) referred to as

Basel 4. These include: requiring use of a revised standardised approach for credit risk for a number of asset classes rather than allowing use of the internal models approach ([2016 consultative document d362](#)); a fundamental review of the trading book (FRTB) capital requirements; removal of the internal models (advanced management) approach for operational risk capital requirements ([2016 consultative document d355](#)). These, and other, changes are [summarised](#) in a BCBS December 2017 document accompanying the “[Basel iii: Finalising post-crisis reforms](#)” document. The [finalised minimum capital requirements for market risk](#) were released in January 2019. Some of these are not due for implementation until 2022 or 2023 (with the previous expected completion dates having been deferred due to the Covid Crisis).

### 17.3 The 1988 Basel Accord (Basel I)

The initial approach was based on the view that a simple leverage ratio requirement (capital/total assets) was inadequate as a regulatory tool because it was not related to bank risk-taking and did not take into account off-balance sheet activities which could also be a source of credit risk. Hence, the approach related required regulatory capital to a bank’s (credit) risk, via risk weighting of assets and incorporated off-balance sheet credit exposures. The risk weighting structure also lowered disincentives to holding liquid low risk (but low yielding) assets.

There was some variation between countries in the way Basel 1 was implemented (including joint use of leverage ratio in some countries, particularly the USA). While Basel Committee members and most other OECD countries adopted Basel 1 quickly, take-up throughout the emerging and less developed nations was quite slow.

The fundamental basis of Basel I, which has remained in place through subsequent modifications, is the requirement for banks to have a risk based capital ratio (sometimes referred to as a “Cooke” ratio in reference to the then Chair of the Basel Committee) exceeding the required minimum of 8 per cent. The risk based capital ratio is calculated as Eligible capital base/Total risk weighted exposures, where eligible capital (a) incorporates some non-equity liabilities and (b) involves deduction of some amounts from reported balance sheet figures. Risk weighted exposures were credit (or counterparty) risk arising on-balance sheet (such as from loans and investments) as well as off-balance sheet from non-market related activities (such as provision of guarantees, credit facilities) or market related activities (such as trading book positions in swaps, FRAs, derivatives) where counterparties might default on their obligations to pay. While such OBS activities may involve no current credit risk, there is the potential that a credit risk could emerge over time (from a customer drawing upon a credit facility or a swap position becoming “in the money”) and the approach attempted to incorporate such potential exposures as well as actual exposures.

In Australia, APRA applied the risk weights shown in Table 1 to on-balance sheet items (and the lack of “risk sensitivity” involved – such as applying the same risk weight to any corporate or unsecured

personal loan – has been one of the drivers of subsequent changes). Risk weighted assets for on-balance sheet positions were calculated by multiplying dollar amounts in each category by the corresponding risk weight and aggregating.

**TABLE 1: APRA'S BASEL 1 RISK WEIGHTS**

Asset Category	Risk Weight	Examples
A1	0	Notes & Coin, Deposits at RBA, CGS, State Govt Debt
A2	0.2	Claims on local Govt., claims on banks
A3	0.5	Residential mortgage loans, Stockbroking positions
A4	1	Claims on non bank private sector, fixed assets

In addition, credit exposures from OBS items needed to be considered and described in RWA terms to be combined with the on-balance sheet RWA. To do this, types of OBS activities were listed and “credit conversion factors” prescribed to convert the dollar amount of an OBS position into an equivalent on-balance sheet amount, which could then be subsequently converted into a RWA amount by reference to the counterparty. The credit conversion factors for non-market related OBS positions are given in Table 2. Thus, for example a guarantee provided by the bank (a direct credit substitute) for an amount of \$1 million would be converted into an on-balance sheet equivalent of \$1 million. If it were a guarantee provided over a payment by a local government (in asset category A2), that would then be equivalent to \$200,000 RWA, but if it were over a payment by a company (category A4) it would equate to a RWA amount of \$1 million.

**TABLE 2: NON-MARKET RELATED (AND BASEL 1 CREDIT CONVERSION FACTORS)**

Off-Balance-Sheet Activity	Conversion factor
Direct Credit substitutes, Assets sold with recourse	1
Repos, Forward Asset Purchases	1
Performance related Contingent items	0.5
Note Issuance and Revolving Underwriting Facilities	0.5
S-T self-liquidating trade-related contingencies	0.2
Long term revokable commitments	0

For market related positions in futures, forwards, swaps, options etc on interest rates, FX or commodities etc., the current mark to market value (if positive, such that the bank was owed money

from the position) was the current exposure, and this was supplemented by a procedure for calculating a “potential exposure” amount. As with the non-market-related positions, the identity of the counterparty would determine the risk weight to be applied.

These capital requirements were applied to domestically incorporated ADIs (including subsidiaries of foreign banks), while branches of foreign banks were subject to regulations of their home country as provided for by the Basel Accord. The capital requirements were applied at three levels

- Level 1: stand alone ADI (and extended licence entities)
- Level 2: consolidated banking group (excludes insurance, funds management / trustee operations, non-financial subsidiaries)
- Level 3: conglomerate groups

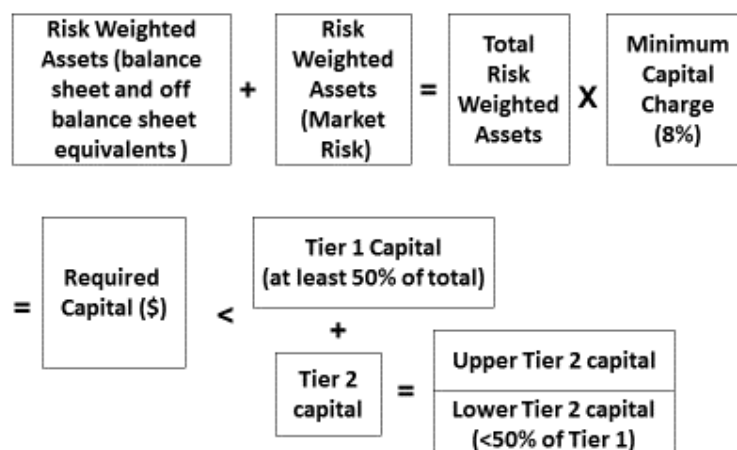
The 1996 introduction into Basel 1 of a market risk capital requirement was based on identifying the potential losses which might be suffered from a bank’s trading positions and requiring sufficient capital to absorb such losses (to some high level of confidence). As well as incorporating an additional type of risk into the RWA approach to capital requirements, this amendment also introduced the “two tier” approach which has prevailed since in which banks accredited by the regulator would be able to use their internal risk models for calculating the capital required. For those banks a “Capital Charge” (as a dollar amount) was calculated using the Internal Models Approach based on a VaR calculation for a specified holding period and confidence interval, and where banks were required to demonstrate the robustness of their models by “backtesting”. For other banks, the “Standardised Approach” provided a template into which positions were slotted and weights applied for calculating the capital charge. To convert this into a RWA equivalent (for ease of combining with the credit risk figure) the capital charge was multiplied by 12.5.<sup>1</sup>

Figure 1 shows the process by which the capital requirement was determined

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<sup>1</sup> 12.5 is the inverse of 0.08 which is the capital required per dollar of RWA.

FIGURE 1: CALCULATING THE BASEL I CAPITAL REQUIREMENT



The eligible capital was defined to include both “going concern” and “gone concern” liabilities which could be used to absorb losses and protect depositors. *Tier 1* (“going concern”) was meant to have the characteristics of being permanent, unrestricted in use, freely available to absorb losses, with no unavoidable servicing charges, and ranking behind depositors and other creditors. In practice this was the sum of equity, perpetual non-cumulative preference shares etc., less intangibles, future income tax benefits, and some equity investments etc. *Tier 2* (“gone concern”) were those liability items which would rank below depositors in the event of a liquidation of the bank. The Upper Tier 2 was essentially permanent items such as mandatory convertible notes etc plus revaluation reserves, general provisions for doubtful debts (<1.25% of RWA) etc. The Lower Tier 2 was non-permanent items such as term subordinated debt with initial life > 5 years (with amount amortised if remaining life < 5 years etc).

Investors in Tier 2 instruments were, according to the Basel approach, expected to bear losses if the bank failed – with this approach enabling banks to economise on use of equity capital as a loss absorbing buffer. The fact that during the GFC, governments felt obliged to “bail out” banks, including by providing guarantees and equity injections which prevented potential failures, and thus did not required Tier 2 capital instrument holders to incur losses, was a major factor in subsequent changes which have required greater use of “higher quality” capital.

## 17.4 Basel II

The Basel II Accord agreed in 2006 had a number of new initiatives. First it expanded the “two tier” system, involving use of an *Internal Models Approach* for accredited banks and a “template” *Standardised Approach* for others, to calculating capital requirements for credit risk. Second, it



introduced capital requirements for *Operational Risk*, and also applied the two tier approach. Third, it emphasized that capital requirements were only one ingredient in ensuring that banks behaved prudently and limited the risk of depositors suffering losses. This is the so called “Three Pillars” approach. As well as capital requirements, effective supervision and market discipline were seen as other pillars fundamental to limiting bank risk-taking.

Underpinning the changes to capital requirements for credit risk were the views that:

- Basel I risk weights did not have sufficient risk-sensitivity and were not appropriately calibrated across asset classes;
- large banks had developed sophisticated internal risk models which were thought to be better able to assess credit (and other) risks and determine appropriate capital levels than regulatory template models; and
- regulatory standards should be set to incentivize banks to improve internal risk models and risk management.

In introducing the new approach, the calibration of overall capital requirements was based on there being no planned change in aggregate capital requirements for the banking sector as a whole. (While credit risk capital charges would decrease, these would be offset by the new capital charges for operational risk). However, to provide incentives for banks to improve risk measurement and management, there would be lower required capital for accredited banks resulting from use of the internal models approach compared to the standardized approach.

This has had several consequences which have proven to be weaknesses of the two-tier approach. First, accredited banks had scope to “game” the system by internal calculation of risk weights which were low and led to reduced required capital. Subsequent *quantitative studies* by the Basel Committee found quite marked differences between bank assessments of the risk and required capital for specified hypothetical portfolios – not all of which could be adequately explained. A second consequence was the creation of a non-level playing field with banks operating under the standardized approach subject to higher capital requirements and a potential competitive disadvantage.<sup>2</sup>

To some extent the introduction of a “capital floor” for accredited banks specifying that their internally derived required capital could not be less than some specified percentage (eg 80) of what it would have been under Basel 1, limited the extent of these consequences. However, it has not prevented them, and subsequent Basel 3 changes replaced this with an “output floor” in which

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<sup>2</sup> However, it should be noted that if the risk modelling and management systems of accredited banks are sufficiently better, any competitive disadvantage of standardised banks could reflect that difference, rather than the lower regulatory capital ratios *per se*.

allowable, internally calculated, RWA could be no less than 72.5% of what would be calculated using the new standardized approaches.

The Basel 2 approach also allowed for capital requirements for interest rate risk in the banking book (IRRBB), but as a “Pillar 2” option for national regulators to consider (and which has been adopted in Australia for accredited banks by APRA). Figure 2 provides an overview of the Basel 2 capital requirements. Within the credit risk capital requirements there is provision for two forms of IRB (Internal Ratings Based) approaches. In the Advanced approach, banks could use their internal models to determine PD and LGD for input into Basel provided formulae for required capital, whereas the Foundation approach does not allow for bank determination of the LGD. Under operational risk, banks which were not accredited to use internal models had a choice between two approaches of differing levels of complexity of calculation.

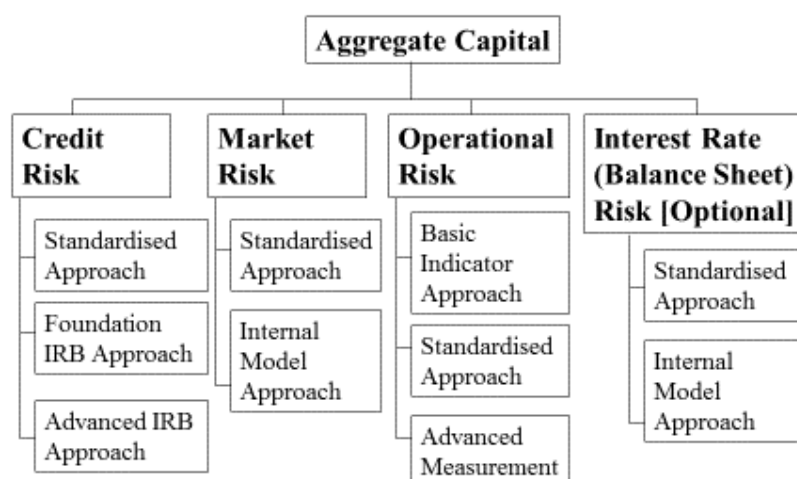


FIGURE 2; BASEL 2 CAPITAL REQUIREMENTS

While the Basel 2 approach was still based around the Risk Weighted Assets (RWA) approach, the mechanics of determining capital requirements is slightly different, because the operational risk calculation and internal model/advanced approaches calculate a dollar capital requirement directly. Then a risk weighted assets (RWA) amount is derived as

$$RWA = \frac{1}{0.08} \left( \sum_i k_i EAD_i + K_{MR} + K_{OR} \right)$$

where  $K_{OR}$  and  $K_{MR}$  are the required operational and market risk capital respectively,  $EAD_i$  is the credit exposure at default of exposure “ $i$ ” and  $k_i$  is the capital requirement for that exposure. (So the first term in brackets is the capital requirement for credit risk)

The changes to the credit risk standardised approach introduced by Basel 2 were quite substantial.

For banks, corporates and sovereigns, risk weights were to be related to external credit assessments by ratings agencies where those were available. Bank risk weights were to be lower than corporate risk weights for equivalent ratings. Risk weights for retail mortgage loans declined from 50% to 35%, while retail exposures (including SMEs) under 1 mill Euro declined from 100% to 75%. For loans past due (> 90 days) there was an increase in risk weight (amount dependent on specific provision made).

In the context of what happened in the global financial crisis which struck before Basel 2 was generally implemented, some of these changes appear anomalous. Credit ratings agencies lost much credibility, exposures to financial institutions were seen to be more of a threat to financial stability than exposures to corporates, and some sovereign exposures appeared to be high risk. Mortgage lending (subprime) became recognised as a potentially significant source of risk.

Pillar 3 of Basel 2 gave emphasis to the role of market discipline in limiting risk taking by banks. Recognising that market discipline requires access by market participants to information about bank activities and conditions, it required that banks should make regular public disclosure of the following information

- Capital structure and components of capital
- Accounting policies including valuation, income recognition, and provisioning
- Information about risk exposures and risk management strategies
- Capital adequacy position and measures of risk exposures
- Analysis of factors affecting capital adequacy position

APRA introduced requirements for such disclosure in [APS330](#) which took effect from 2008 (and subsequent changes were made with the introduction of Basel 3).

Credit Risk – for banks using the IRB approach

To be accredited to use the IRB approach, banks had to meet a range of conditions. These included not just having acceptable credit risk models, but also having information systems enabling calculation of risk and verification of model robustness, as well as risk management structures deemed suitable by the regulator. For the major Australian banks, the costs of enhancing their systems, practices and processes to gain accreditation were each over a hundred million dollars.

In terms of modelling requirements, different exposure classes such as corporate, sovereigns, banks, retail, had to be identified and credit risk models available for each category. Such models were required to be able to estimate:

- PD – probability of default (1 year horizon)
- LGD – loss given default (% of exposure)
  - For the Foundation approach, LGD = 45% if unsecured, 75% if subordinated

- EAD – exposure at default (e.g. loan size)
- M – maturity
  - For the foundation approach, M was set as 2.5 years

To derive the capital charge and RWA, for each asset category it was necessary to find  $k = \text{capital/exposure} = \text{VAR}(99.9\%)$ , and convert to  $\text{RWA} = k \times 12.5 \times \text{EAD}$ .

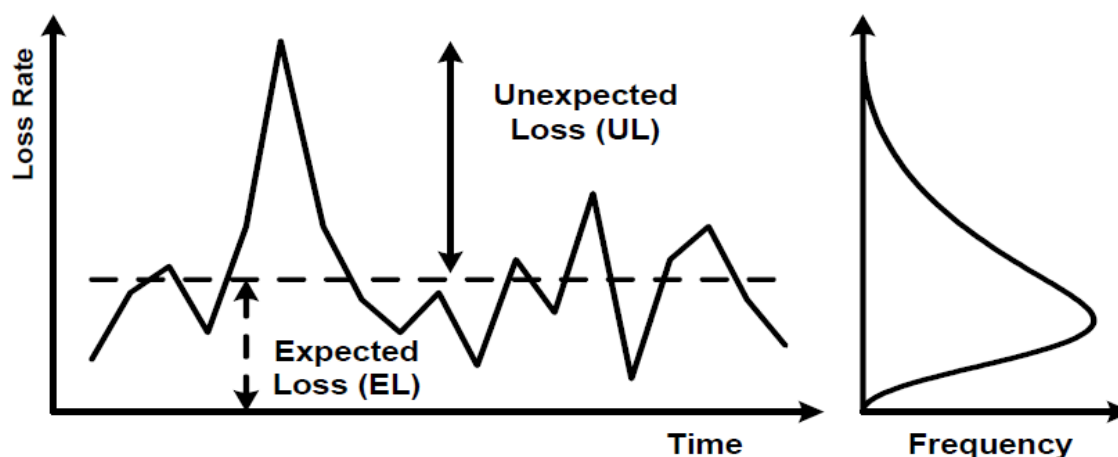


FIGURE 3: BASEL COMMITTEE DEPICTION OF CREDIT LOSS EXPERIENCE (SOURCE: [BCBS, 2005](#))

To calculate  $K$  for each portfolio (asset category), formulae were specified by the Basel Committee, and the basis for these is explained in an explanatory note produced by the Basel Committee.<sup>3</sup> Figure 3 shows how the concept of a loss probability density function, and a distinction between expected loss (EL) and unexpected loss (UL) forms the basis of the approach. Given a stochastic model which generates such a probability density function, it is possible to estimate how much capital a bank needs to absorb unexpected losses at some probability level (eg 99.9 per cent of the time) for a specified horizon (such as one year). This is a value at risk (VaR) approach as shown in Figure 4. Expected losses are assumed to be met by having provisions and pricing loans such that interest income covers the expected loss. At an aggregate (bank) level, the required (or economic) capital thus relates to achieving a specified maximum probability (eg 0.01 per cent) that the bank could become insolvent over a one year horizon. The complication then is how to link this to the composition of the bank's asset portfolio enabling an aggregation of required capital for each particular credit exposure to give the overall bank capital requirement for credit risk.

<sup>3</sup> In that document (page 2), the Committee makes the following statement that is, at best, misleading and could be interpreted as bank capital as being something held and not used for investments. "Banks have an incentive to minimise the capital they hold, because reducing capital frees up economic resources that can be directed to profitable investments." This only makes economic sense if interpreted to mean that shareholders could withdraw and allocate such capital to other more profitable investments outside of the bank.

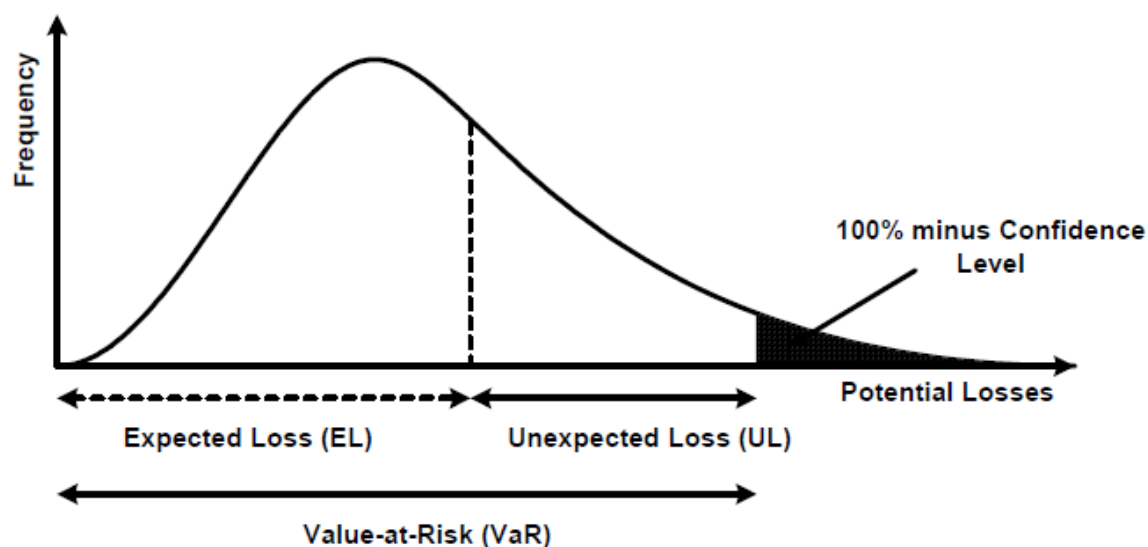


FIGURE 4: BASEL COMMITTEE DEPICTION OF REQUIRED CAPITAL DETERMINATION (SOURCE: [BCBS, 2005](#))

The approach is based on single factor model in which underlying asset values of obligors and thus ultimately default risk are all driven by one common factor and idiosyncratic risk. To ensure that the approach can be applied to any bank irrespective of its portfolio composition, it is assumed that the bank's credit portfolio is sufficiently well diversified such that the contribution of any individual loan to overall risk depends only on its characteristics and not on correlation with the specific features of a bank's (less well diversified) portfolio.<sup>4</sup> (Any consequences arising from lack of diversification are expected to be dealt with by supervisors under Pillar 2). The resulting approach to required capital determination is thus referred to as "ratings based" since it only depends upon particular characteristics of the obligor – specifically the PD, LGD and EAD. Notably, under the asymptotic single risk factor (ASRF) model, these parameters determine both EL and UL. In the formulae below, it can be seen that the principal ingredients are PD and LGD which banks use to determine EL for incorporation in loan pricing formula. (The other elements are a maturity (M) adjustment and a correlation factor (R) applicable to each class of assets). In the formula, it can be noted that the capital requirement involves subtraction of  $PD \cdot LGD$  (shaded in red) which is the expected loss amount, such that capital required relates only to unexpected loss.

In the Basel 2 approach, accredited banks calculate average PD's for loans using their own proprietary models and a LGD under the assumption that default occurs in an economic downturn. The Basel use of an ASRF model involves complicated formulae that convert the bank's PD estimates into PD's conditional on some adverse outcome of the single risk factor against which a capital

<sup>4</sup> The analogy with the market's required return of a stock depending only on its beta (covariance with the market portfolio) in the CAPM model and not on its idiosyncratic risk or its covariance with some investor's undiversified portfolio may be helpful for understanding.

requirement is calculated which is assumed appropriate for ensuring (at a high level of confidence) the bank's solvency.

The ASRF model is based on Merton, R. C. ([JF, 1974](#)) and Vasicek, O. ([RISK, 2002](#)) and developed specifically in Gordy, M. B. ([JFI, 2003](#)). It enables calculation, for each specified asset class, of the marginal contribution of any loan to the capital required irrespective of the rest of the bank's exposures. Perhaps the simplest way to interpret the formulae is as follows:

- Assume  $R = 0$  and  $M = 1$ , such that the formula becomes simplified to:  $K = LGD * N[G(PD) + G(0.999)] - PD * LGD$ .
- From Figure 4, the bank's expected loss is  $EL = PD * LGD$ , and the bank's estimate of PD is the area under the curve to the right of EL which is equal to the value of the cumulative standard normal distribution (CSND) function for some particular value of the single risk factor giving rise to that PD. To get that value of the risk factor use the inverse of the CSND ( $G(\cdot)$ ) and then add to that its value at a 99.9 per cent confidence value. The CSND of that single risk factor value is the probability of loss which multiplied by LGD gives the total loss at that confidence level. For calculating economic capital, which is related to unexpected loss, it is then necessary to subtract the expected loss ( $PD * LGD$ ).

The degree of correlation ( $R$ ) between asset values in a particular asset class implies correlation of default probability. Essentially, a high correlation will mean that the loss distribution will have a larger variance around a given expected loss, such that the UL will be higher for a given EL. The formula incorporates a maturity ( $M$ ) adjustment (relative to an assumed 2.5 years and shaded in gray) reflecting the fact that longer term loans are more risky such that a credit downgrade would have a larger effect on its MtM value. The single factor model has the property that the risk calculation for a particular asset is independent of other components of the portfolio, making the capital required not dependent on the composition of the bank's portfolio and thus applicable across all banks without need for modification.

#### IRB Capital Requirement Formula

$$K = \left[ LGD * N \left[ [(1 - R)^{-0.5} * G(PD) + \left( \frac{R}{1 - R} \right)^{0.5} * G(0.999)] - PD * LGD \right] * \frac{(1 + (M - 2.5) * b(PD))}{(1 - 1.5 * b(PD))} \right]$$

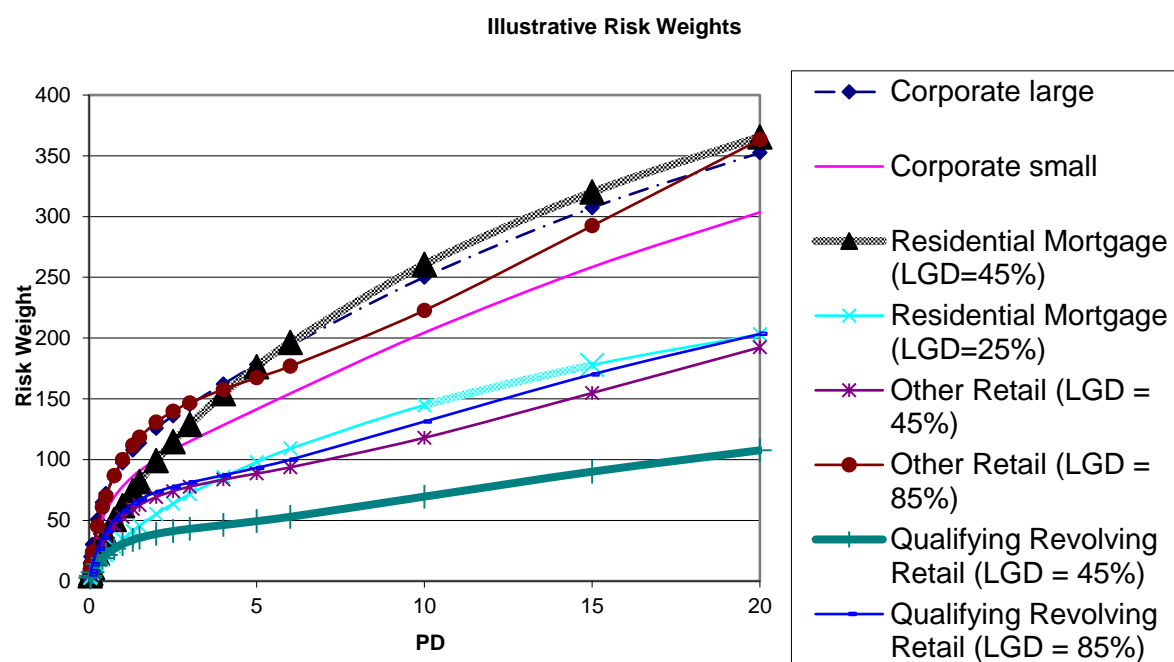
$$b(PD) = (0.11852 - 0.05478 \times \log(PD))^2$$

$$R = 0.12 * \left( \frac{1 - e^{-50 * PD}}{1 - e^{-50}} \right) + 0.24 * \left[ 1 - \frac{1 - e^{-50 * PD}}{1 - e^{-50}} \right]$$

$K$  is capital required as a percentage of EAD (exposure at default) – amount expected to be outstanding (incorporating repayments and drawdowns of limits) if borrower defaults within a year  
 $R$  is a correlation coefficient – the formula shown is for corporate exposures (ignoring an additional adjustment term for small exposures). For residential mortgages (qualifying revolving retail exposures) correlations of  $R = 0.15$  (0.04) were assumed, while for other retail exposures a similar formula for corporate exposures, but with different parameters is used implying a lower correlation of default.

B(PD) is a smoothing function relating the maturity adjustment to PD  
 N(.) is cumulative standard normal distribution  
 G(.) is inverse cumulative standard normal distribution

Figure 5 shows the illustrative Basel 2 risk weights (equal to  $12.5 \cdot K$ ) in relation to PD's for different asset classes



**FIGURE 5: BASEL 2 RISK WEIGHTS**

### Credit Risk Mitigation

One innovation in Basel 2 was to allow for credit risk mitigation, since there had been significant growth in techniques of credit risk mitigation and advances in credit risk management which created problems for the original Basel Accord approach which ignored this. There are a number of approaches to risk mitigation.

One was provision by a counterparty of financial collateral (such as in borrowing by way of a repo). A simple approach involves substitution of the collateral issuer's risk weight for collateralised part of the loan. The Comprehensive Approach was to apply "haircuts" and get an adjusted exposure or adjusted LGD (in IRB approach). Another form of risk mitigation is by way of netting out offsetting exposures (such as on a trading book of trades with a counterparty). Basel 2 recognised "netting" to some degree. Also counterparty exposures could be mitigated by use of guarantees or purchasing protection via credit derivatives. For the protected part of an exposure, under the Standardised Approach – use risk weight of guarantor, under the IRB (Foundation) approach – use PD of guarantor.

## Basel 2 consequences

In setting Basel 2 Capital Requirements, the stated aim was to maintain the current average capital levels for banking overall – after addition of capital for operational risk. This implies lower risk weights for credit risk for some counterparties. Consequences were that for banks on the Standardised Approach, the average capital requirement could increase, because of capital concessions for IRB banks. Foundation Approach bank capital ratios were expected to be around 90% of that for standardised approach. Advanced Approach banks would have a lower capital ratio – as low as 80% of standardised approach. (Even if the internal models suggested less, Basel 2 incorporated a “capital floor” which required capital for credit risk to be no less than 80 per cent of what would have been required under Basel 1. In deriving the new metrics, the Basel committee was aiming to provide incentives for banks to improve their risk management capabilities (by way of capital concessions) while limiting impacts on competitive neutrality and overall risk levels in banking.

## 17.5 Some GFC Bank Regulation Lessons and Basel 2.5

Basel 2 had barely been agreed when the GFC struck and the various explanations for its origins prompted a rethink of some of the approaches implied by Basel 2. In that regard however, it needs to be remembered that most banks were still operating under Basel 1, such that some of those causes of the GFC are more correctly directed at inadequacies in Basel 1.

The list of failings included

- Inadequacy of Value at Risk (VAR) – in trading books, VAR based on historical correlation structures proved inadequate as correlations changed in the crisis, and the sizes of losses were in the tail of the distribution were not considered.
- Incorrect risk weights (including securitisation) gave incentives for risk taking (and potentially mispricing of risks)
- Liquidity risks were not adequately captured, since they were not part of the Basel framework. Moreover, some liquidity risks, such as bank support to conduits and SIVs became credit exposures for the bank.
- Asset valuation problems – accounting practices and inadequate recognition of potential losses meant that capital was overstated. More generally mark to market accounting for some investments could exacerbate bank capital problems.
- Significance of collateralised financing
- Systemic problems from complex interdependencies due to bilateral exposures
- Market reactions inhibiting banks taking capital conservation measures – banks in stressed positions were often unwilling to take actions such as cutting dividends or attempting new issues of equity.
- Inadequacy of core capital – the Basel capital requirements enabled banks to operate with common equity capital as low as 2 per cent of risk weighted assets, which was inadequate to



absorb losses

- Ratings and model inadequacies – ratings of structured products by ratings agencies did not adequately reflect risk.

Regulatory Risk weight changes: Basel 2.5 (July & Dec 2009)

The first response to the crisis was to introduce a number of risk weight changes in 2009. These involved:

- an increase in the relative counterparty risk weights for financial institutions versus corporates, reflecting the increased concerns about interdependencies in the financial system and systemic risk
- Increased capital requirements for counterparty risk on derivatives, repo and securitization transactions.
- Lower relative risk weights for counterparty derivatives exposures to CCCPs versus bilateral exposures.
- Use of “downturn” PD estimates (and “downturn” LGD)
- Use of “Stressed” VAR in determining capital requirements
- Reduced reliance on ratings agency assessments
- Expected loss provisioning.

## 17.6 Basel 3 (2011)

The most fundamental changes occurred with the introduction of Basel 3 in 2011 which made substantive changes to the quantity and quality of required capital as well as further changes to risk weights. The key changes are shown in Table 3, and a comparison of total equity capital requirements under Basel 3 and Basel 2 shown in Figure 6.

**TABLE 3: BASEL 3 CHANGES**

Minimum Requirement	8% of RWA - <i>unchanged</i>
Capital Conservation Buffer	Additional common equity (2.5 % of RWA) - constraints on distributions (dividends, bonuses) if capital ratio < 10.5 % of RWA ( <i>new</i> )
Minimum Tier 1 Capital	6% of RWA ( <i>up from 4%</i> )
Common Equity Tier 1 (CET1)	> 4.5 % of RWA, plus conservation buffer ( <i>new</i> )
Quality of Capital	Fewer acceptable hybrids for Tier 1, greater deductions in calculating common equity. Tier 3 capital instruments eliminated, “bail-in’ requirements for additional tier 1 (AT1) and Tier 2.
Leverage Ratio	Minimum non-risk weighted ratio of common equity to exposures of, initially, 3% ( <i>new</i> )
Risk Weights	Increased weights for some activities
Countercyclical Buffer	Up to 2.5% ( <i>new</i> )

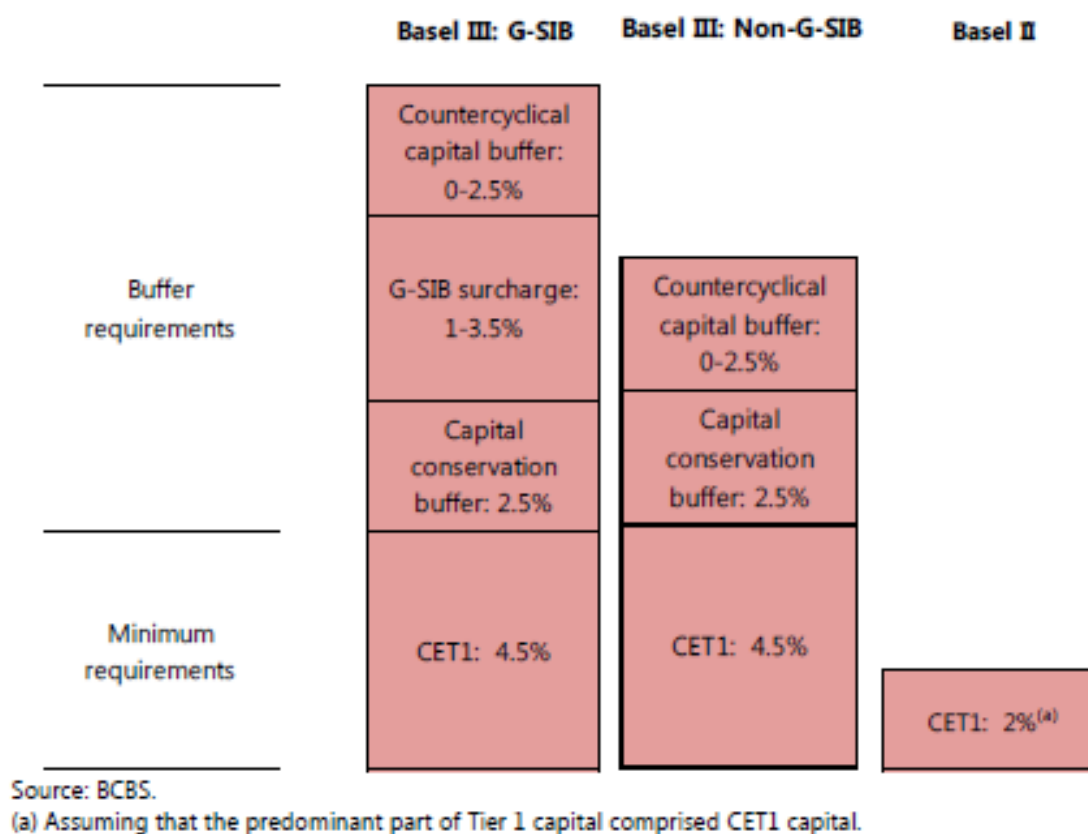


FIGURE 6: BASEL 3 V BASEL 2 CAPITAL CHANGES : SOURCE - [BASEL COMMITTEE](#)

### Measuring Capital

Capital is a balance sheet residual equal to the value of assets less value of (some) liabilities, and for regulatory purposes, certain assets will be excluded from the calculation or valuations limited in some way. In this regard, regulatory CET1 is the value of allowed assets less all other liabilities, while regulatory Tier 1 is the value of allowed assets less all liabilities other than CET1 and AT1 instruments. Total capital is allowed assets less liabilities other than CET1, AT1 instruments, and Tier 2 instruments. In calculating capital, however, some part of the AT1 or Tier 2 instruments might be given a “haircut” if, for example they mature within some specified time such as five years. In effect, some part of the amount outstanding is treated as other liabilities rather than capital.

Consequently accounting (valuation) matters, and in recent years there have been a number of significant accounting changes in progress. These include:

- Asset valuation
- Derecognition
- Netting/offsetting
- Impairment and provisioning

A fundamental issue has been International convergence on IFRS and with Basel and particularly a move to expected credit loss (ECL) accounting frameworks by accounting standard setters. This occurred with the introduction of IFRS9 ( See [BCBS December 2015](#)) for BCBS of the need for change).

### Higher Quality Capital

Basel 3 imposed requirements for “higher quality” capital, requiring: Tier 1 > 6% of RWA; Common equity > 4.5% of RWA; greater required deductions (of things like deferred tax assets, equity investments, goodwill etc) in calculating common equity; “bail-in” and other design requirements for non-common Tier 1(AT1) and Tier 2 instruments. The rationale for higher quality capital reflected the following considerations:

- Basel II could be met with equity/assets of 2 %
- Relevance of preference/hybrid instruments as a loss buffer irrelevant if TBTF means that is never used.
- Macro-prudential considerations
  - Higher ranking instruments create an impediment to raising new equity
    - Benefits accrue mainly to holders of those instruments

### Procyclicality of capital requirements and countercyclical capital buffers

There is inherent procyclicality in banking. In a downturn, loan losses reduce capital and prompt lending restraint, and PD's increase unless a “through the cycle” approach is applied. Asset bubbles increase measured collateral and thus lower estimated LGD

Basel 3 introduced the possibility of reducing procyclicality via a countercyclical capital buffer (CCyB) requirement, involving – at the discretion of the regulator - higher minimum (CET1) capital requirements in upswing and lower in downswing. In good times there would be a build up of capital buffers for use in poor times (when they could be reduced to reduce disincentives to credit expansion).

A difficult issue is how countercyclical buffers should be implemented – should there be specific rules, or should regulator discretion be applied. Basel 3 suggests basing decisions on (*et al*) deviation of credit/GDP from trend). There has been much subsequent discussion on potential indicators to use (see for example Tolo et al ([IJCB, 2018](#))). In practice, regulators may be hesitant to reduce required capital ratios in a downturn when bank strength might be weakening.

In Australia, the CCyB has, to date, been set at zero. However, with the advent of the Covid Crisis, APRA signaled to banks that some reduction in the buffers they maintained against minimum requirements and “exceptionally strong” targets would not be viewed askance.

### Capital Conservation Buffers (CCB)

A feature of the GFC was that many banks continued to make distributions to shareholders and pay

bonuses to staff at a time when their capital positions were weakening and they were unwilling or unable to raise new equity capital. The Basel 3 response has been to introduce capital conservation requirements which require that a ratio of Common equity/RWA  $> 7\%$  is needed to sustain dividend payout ratios. As CET1 ratios decline below that figure, the maximum allowable distribution rate falls and no discretionary distributions (dividends, bonuses etc) are permitted if the ratio falls to 5.125 per cent.<sup>5</sup> Figure 7 illustrates and shows that maintenance of pre-Covid Crisis dividend payout ratios for Australian banks require CET1 ratios in excess of 7 per cent. These changes took full effect in 2019 after a transition period (which commenced in 2016). If the countercyclical buffer is in operation the required CET1 ratios would be higher.

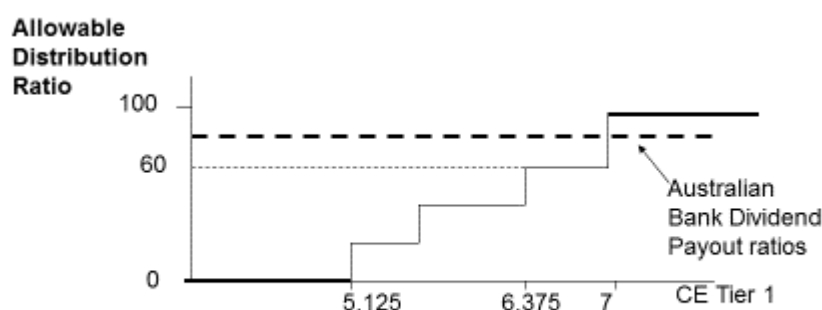


FIGURE 7: CAPITAL CONSERVATION BUFFERS AND PRE-COVID DIVIDEND PAYOUT RATES

### Leverage Ratio

Basel 3 also introduced a *Leverage Ratio* as a “backstop” to the risk weighted capital ratio. The rationale was (a) to constrain leverage and risk of a destabilizing leverage process (a macro prudential concern); (b) as an additional check against model risk and measurement error (non-risk based “backstop”)

The suggested minimum requirement was a ratio of Tier 1 Capital/Exposures  $> 3\%$  with a trial period of 2013-2015 prior to formal introduction. In calculating the ratio, Tier 1 deductions are also made for exposures, and there is a complicated measurement of exposures which might be described as Accounting and “Basel+” where for example there is a Credit conversion factor (CCF) of 100% for some OBS items applied).

Leverage ratios have been used in a number of jurisdictions such as the USA, Canada, Switzerland in conjunction with the risk weighted approach. In some cases, such as the USA, the leverage ratio has

<sup>5</sup> The minimum CET1 ratio is 4.5 so 5.125 involves a decline of  $\frac{3}{4}$  of the gap between the 7 percent figure and 4.5 figure.

been a binding constraint on banks rather than the risk weighted capital ratio. There is much ongoing debate about the merits of a leverage ratio and where it should be set relative to the risk weighted ratio. There have been a number of studies which suggest that the leverage ratio may have had more effect in constraining bank behavior, and that in the GFC counterparties paid more attention to leverage ratios than to risk weighted capital positions. One issue in interpreting that information is, however, that the comparison involves the Basel 1 ratios which were not very risk sensitive.

The problems with a leverage ratio requirement are that it does not adequately deal with off-balance sheet activities, does not explicitly incorporate market and operational risk, and downgrades the role of risk weighting. Australian banks and regulators were not generally supporters of a leverage ratio requirement other than as a “backstop”.

Leverage Ratio Calibration - calculation of how a specific value would relate to a risk weighted capital ratio is difficult due to accounting, exposure measurement, market/operational risk factors. Large Australian banks have been reporting their Basel leverage ratios since 2015, and the major banks currently have ratios in the order of 5 per cent or more. When the leverage ratio requirement was first mooted, Australian banks had lower levels of capital and a leverage ratio of around 3.5 per cent could have been a binding constraint. Figure 8 shows how the average risk weight is a key determinant of which capital ratio is the binding minimum. APRA set the minimum leverage ratio at 3.5 per cent for IRB ADIs (and 3.0 for standardised ADIs in a [draft APS 110](#) issued in November 2019, but in March 2020 announced deferral of its implementation (under APS 110) until January 2023 as part of the Covid Crisis response. The major Australian banks have for several years been operating with leverage ratios of 5 per cent or more.

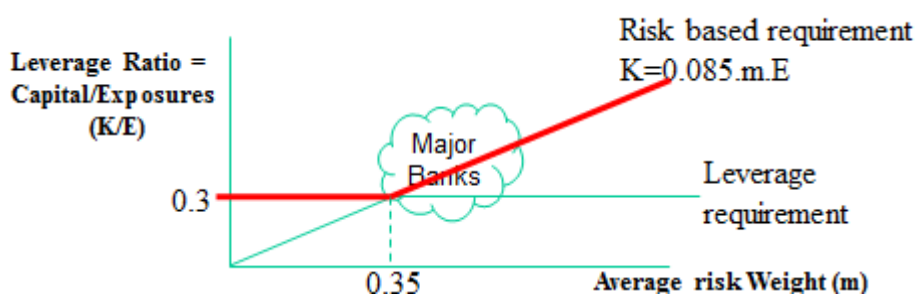


FIGURE 8: LEVERAGE AND RISK BASED CAPITAL COMPARISON

### International comparisons

There is much debate over the stringency of capital standards imposed by regulators from different jurisdictions, with comparisons clouded by different regulatory standards including :

- Different definitions/ rules re eligible Tier 1 capital
- Different risk weights
- Different deductions (such as for goodwill, equity interests in subsidiaries) from assets in calculation capital
- Different capital limits/ transitional floors

APRA Chair Wayne Byres in a [speech](#) in 2020 indicated that the aggregate CET1 ratio for the four major banks was 11.3% under APRA /Basel 3 rules, but in the order of 16% if measured using internationally comparable Basel 3 rules.

Australian banks have complained often about APRA's Basel III rules making them appear less strongly capitalized than overseas banks, asserting that this has adverse effects on their ability to raise capital. Sceptics respond by noting that skilled bank analysts should be able to estimate the effects of different rules and make appropriate cross-jurisdictional comparisons.

### Bank Funding/Intermediation Costs

There has been much debate about the effect on higher capital ratios on bank funding costs and thus potential implications for loan interest rates. The effects, however, are not as large as often implied (and would be much less if an MM perspective were adopted).

A ballpark estimates of the cost of an increase in equity/RWA ratio is 4bp for each percentage point. To see this consider an increase from 8 to 9 per cent in the required risk weighted capital ratio (and that required returns do not change). Assume that:

- $RWA/Assets = 0.5$
- Cost of equity = 15% p.a.
- Cost of Debt/Deposits = 7% p.a. (this includes associated operational costs)
- Assets = \$100

At an 8% ratio, equity = \$4, deposits = \$96, and the average cost of funds =  $4 \times 0.15 + 96 \times 0.07 = 7.32\%$

At a 9% ratio, equity = \$4.5, deposits = \$95.5 and the average cost =  $4.5 \times 0.15 + 95.5 \times 0.07 = 7.36\%$

### Increased capital levels

While there has been general agreement on a need for higher levels relative to pre GFC, an unanswered question is: how high?

Greenspan (2010) gives ballpark estimate of 14 per cent equity/assets ratio required for US Banks, which is based on CDS spread sensitivity to leverage (at 14 per cent, there is little sensitivity). Miles et al (Economic Journal, March 2012) attempt a social cost-benefit analysis and suggest minimum requirements of around 20% of RWA. Switzerland moved early to a 19% (risk weighted) requirement. In the UK, the Vickers Report suggested 17-20% for banks with RWA > 3% of GDP. [BCBS \(WP 30\)](#) summarises some studies.

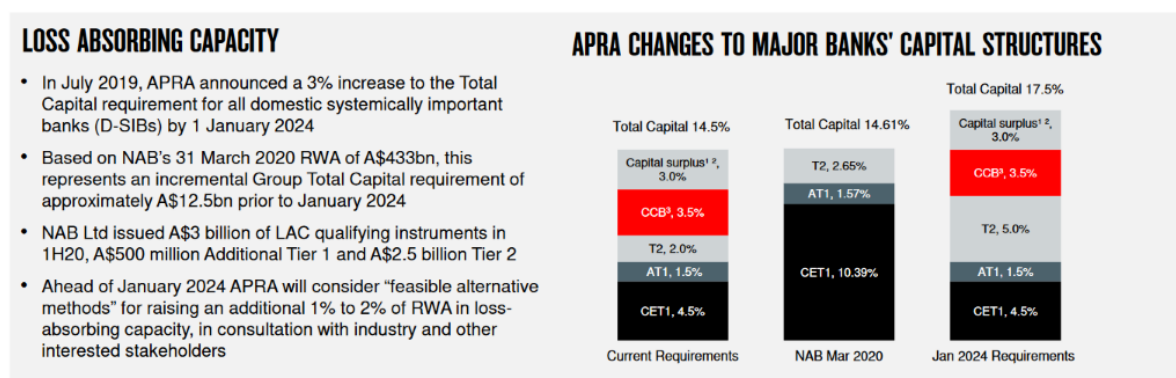
[Ambrocio et al](#) (2020) provide a summary of leading academic researcher's views on whether the

level of capital requirement is set optimally. On average, their views are for significantly higher capital requirements than implied by the Basel standards. Many would support incorporation of a “market-based” capital requirement (ie based on the market value of the bank’s equity).

### TLAC Total Loss Absorption Capacity

An important development has been the introduction of TLAC requirements by the FSB & Basel Committee, who in November 2014 issued a consultative document & terms sheet and in October 2016 BCBS issued a [final standard](#) for G-SIBs to take effect on January 1 2019 to complement the [FSB’s standard](#) issued in November 2015. These requirements are applicable to SIFIs (but not those headquartered in EMEs). They required a minimum TLAC from 2019 of the minimum of 16% of RWA or 6 per cent of the Basel III leverage ratio denominator, with both figures increasing in 2022 to 18% and 6.75% respectively. Contingent capital debt instruments are eligible, and there are requirements on placement of TLAC among the various entities within a G-SIB group.

Figure 9 shows NAB’s assessment of the effects of loss absorbing capacity requirement changes.



**FIGURE 9: NAB DEPICTION OF EFFECTS OF LOSS ABSORBING CAPACITY CHANGES**

### A “bigness” capital charge

Reflecting concerns over (a) – TBTF implications for competitive advantage and taxpayer subsidies and (b) – systemic risk concerns (large institutions (SIFIs) create systemic externalities due to risk concentration since their failure involves many counterparties and a scramble for liquidity creates pecuniary externalities) SIFIs have been subject to an additional capital charge.

A methodology for identifying G-SIFIs was introduced 2011, and revised in 2013, involving multiple indicators reflecting: size of banks; Interconnectedness; lack of readily available substitutes or financial institution infrastructure for the services they provide; global (cross-jurisdictional) activity; Complexity. A higher LAC (CET1/RWA) requirement applies ranging from 1.0 – 3.5% for the currently 29 G-SIBs. APRA applies a 1% requirement to D-SIBs

### Contingent (bail-in) capital

Basel 3 has introduced requirements for hybrid securities to be eligible for inclusion as regulatory capital (and TLAC) including automatic conversion into equity or write-off if some “trigger point” is reached. (See Chapter 18 for more detailed information).

### The change in emphasis

In Basel I the principal focus was on individual bank solvency. Basel III adds a system stability focus involving:

- Countercyclical capital buffers
- Incentives for use of CCCP's
- Higher capital for financial sector exposures
- G-SIBs

There is arguably less confidence in risk weighting approaches and this is reflected in a number of recent and proposed changes which commentators (but not the Basel Committee have referred to as Basel 4)

## 17.7 The Finalisation of Basel 3 (or Basel 4?)

The major changes under discussion for several years were finally agreed by early 2017 and summarised in the [BCBS paper](#) released in December 2017. In February 2018, APRA released a [discussion paper](#) outlining its proposed regulatory changes and their relationship to the BCBS changes. It also released [another paper](#) on its approach to implementation of a leverage ratio requirement.

### Operational Risk

Changes announced in 2016 ([BCBS](#), ) removed the “advanced management approach” (AMA), based around bank modelling of operational risk, in favour of a Standardised Measurement Approach (SMA).<sup>6</sup> This also replaced three alternative approaches which were available under the standardised approach. To many analysts, the demise of the “sophisticated” approach was hardly surprising given the complexities of reliably modelling the likelihood and scale of a wide range of operational events. And while “risk sensitive” capital requirements might induce management actions to mitigate such risks, the extent to which this would occur is unclear.

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<sup>6</sup> The SMA approach is built around a relatively simple concept of a Business Indicator (BI) whereby financial statement information about the mix of business and perceived operational risks of different business activities is combined with historical loss experience information of the bank. While formulaic, the approach is hardly non-complex (and the method of incorporation of historical experience hardly non-controversial), but is clearly simpler than the AMA reliance on complex statistical models!



## Credit Risk

A second change is the planned removal of certain asset portfolios from eligibility for the advanced internal models approach for credit risk, announced in <http://www.bis.org/bcbs/publ/d362.htm>. The internal models approach was seen to lead to significant differences between large banks in their assessment of risk (and thus capital requirements) of similar portfolios. Although some such differences were explicable, concerns arose about the veracity of relying on the robustness of reliance on bank internal models for determination of capital adequacy. This has prompted the introduction of constraints on model characteristics, and disallowance of model use for some types of risk.

Specifically, the BCBS has determined that capital requirements for credit exposures to banks, financials, large corporates, and equity portfolios will no longer be determined under the internal models approach, but must now use either the Foundation-IRB or the [Revised Standardised Approach](#) (and on the Standardised Approach for Equity portfolios). There are new constraints on use of internal models for specialised lending.

## Market Risk

In 2012 and 2013 the BCBS released consultative documents on a “Fundamental Review of the Trading Book”, which included increased risk sensitivity of the standardised approach. One key component of changes to the internal models approach was a move away from a Value at Risk (VaR) approach to use of an Expected Shortfall (ES) approach. VaR had been widely criticised as: not providing an estimate of how large the losses from extreme events might be; involving significant potential for mis-estimation (particularly if correlations change in extreme events); and not meeting the desirable statistical property of “sub-additivity”. These changes could be interpreted as primarily improving on the complex models being used, rather than moving towards simpler approaches. A major concern was that the existing regulatory framework did not adequately capture all the risks in the trading book.

In January 2016, the [revised standards for market risk](#) were published. Securitisation exposures in the trading book are to be treated under the revised standardised approach. Under the IMA approach, capital requirements based on ES involve add-ons related to a default risk charge (DRC) and a stressed capital add-on (SES).

The decision to permit regulators to approve or disallow IRB status at a trading desk level rather than at the bank level, is suggestive of concerns that risk modelling may be of variable quality for different types of exposures of individual banks. In June 2017, a [consultative document](#) was released proposing a simplified alternative to the market risk standardised approach, suitable for banks other than large, internationally active banks.

Two further changes to the Basel arrangements also involve simplified approaches. One is the introduction of a non-risk weighted CET1 leverage ratio as a backstop to the RWA approach. Although not yet finalised the indicative minimum requirement of 3 or 3.5 per cent means that it is unlikely to be binding for most banks.<sup>7</sup> The other development has been the [proposal](#) for application of “capital floors” to IRB banks set at an expected 70-75 per cent of the capital requirement the bank would face under the revised standardised approach.<sup>8</sup> The ultimate outcome was 72.5 per cent.

In general, these rules can be interpreted as conservative overlays, reflecting both concerns about the reliability of bank internal models due to potential regulatory arbitrage and ability of models based on historical data and relationships to perform adequately in future unknown crisis scenarios. The debate in this regard is about how much conservatism should be involved although some commentators have argued for the risk weighting approach to be largely abandoned.

Another important development has been the increased reliance on stress testing for regulatory purposes. Again, this provides a backstop to complex capital and liquidity regulation, and could be interpreted as less willingness to rely solely on complex rules-based regulation which, despite its complexity, is unable to adequately capture stresses in the financial system to which banks are exposed. Again, some commentators have argued that stress tests should become a “frontstop” rather than a “backstop”.

Accompanying these changes have been the introduction of macroprudential controls in a number of countries which have tended to be very simple, blunt, instruments such as minimum loan to valuation ratios (LVRs) or “speed limits” on certain types of lending.

Overall, this brief review of recent Basel changes suggests that there has been some shift away from reliance on complex regulatory approaches under Basel’s Pillar 1, although it has been selective. Some areas of risk assessment have been identified as unsuited to reliance on complex models, while concerns about the robustness of such models in dealing with unexpected financial stresses or being subject to potential manipulation, have led to use of “simple” supplementary regulatory measures as backstops or conservative overlays.

### APRA’s Recent Basel Changes

In June 2019 APRA [released](#) proposed changes to its Basel 3 implementation.

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<sup>7</sup> The Total Loss Absorbing Capacity (TLAC) requirements for G-SIBs also require eligible TLAC liabilities to exceed both a non-risk weighted benchmark (eventually 6.75 per cent of the leverage ratio denominator) and a risk-weighted benchmark (eventually 18 per cent of risk weighted assets). See FSB (2015).

<sup>8</sup> It has been suggested that these would have virtually no impact on Australian, US or Asian banks, but could require some EU banks to raise further capital.

- Objectives: “unquestionably strong”; addressing structural concentration in residential mortgages; better relationship between IRB and standardised capital outcomes; improving transparency
- Target of 150 (50) bp increase in capital ratios for IRB (standardised) banks.
- Draft versions of:
  - APS 112; (Standardised mortgage risk weights between 20 – 100 based on type and LVR)
  - residential mortgages section of APS 113,
  - APS 115 (Op Risk) adopting Standardised Measurement Approach (SMA) based on Business Indicator Component (BIC)
- Simplified framework for smaller, less complex ADIs
  - Op risk, Counterparty Credit risk, Leverage ratio, Disclosure

In March 2020 APRA announced defer of its planned implementation of Changes to Basel 3 reforms by one year due to the Covid19 crisis (see Figure 10). The proposed changes would have had little effect on aggregate capital requirements but more effect on allocation of regulatory capital across various portfolios.

REGULATORY CHANGE DATES		
Change	Original date	Amended date
APS 110 Capital Adequacy	1 Jan 2022	1 Jan 2023
APS 111 Measurement of Capital	1 Jan 2021	No change
APS 112 Capital Adequacy: Standardised Approach to Credit Risk	1 Jan 2022	1 Jan 2023
APS 113 Capital Adequacy: Internal Ratings-based Approach to Credit Risk	1 Jan 2022	1 Jan 2023
APS 115 Capital Adequacy: Standardised Measurement Approach to Operational Risk	1 Jan 2021 (AMA banks)	1 Jan 2023
APS 116 Capital Adequacy: Market Risk	1 Jan 2023	1 Jan 2024
APS 117 Capital Adequacy: Interest Rate Risk in the Banking Book	1 Jan 2022	1 Jan 2023
APS 330 Public Disclosures	1 Jan 2022	1 Jan 2023
Loss Absorbing Capacity	1 Jan 2024	No change

FIGURE 10: APRA'S IMPLEMENTATION TIMETABLE (SOURCE: [NAB MARCH 2020 INVESTOR PRESENTATION](#))