



Using Economic Capital to Manage a Bank and Beyond

Phillip Everett FIAA CERA
Sen Nagarajan FIAA

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1. Overview of capital in banking

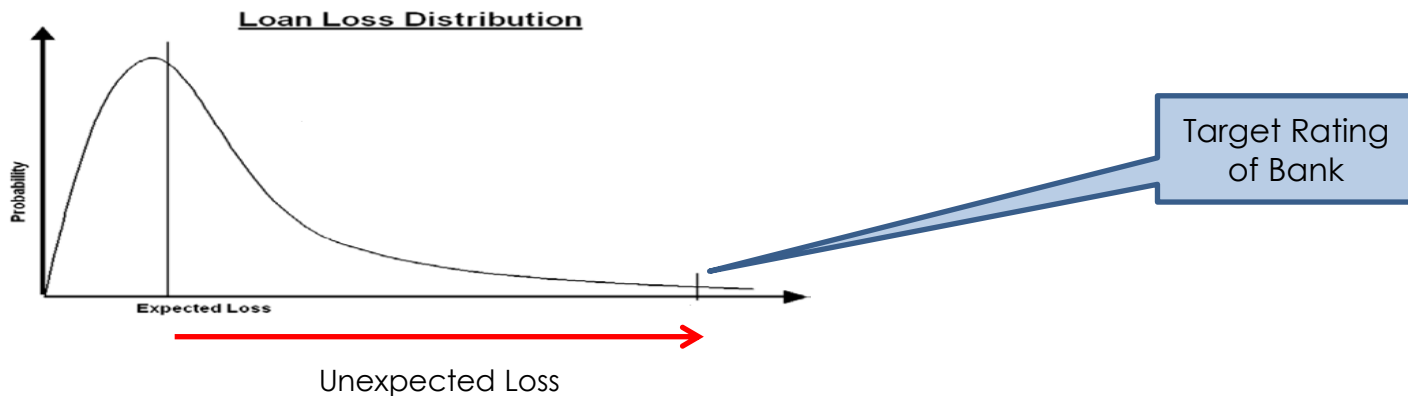
Overview of Capital in Banking

- Banks are very focussed on maintaining an adequate level of capital and earning a return on that capital.
- Return on capital measures are key metrics in pricing and business performance. Return of capital can be calculated in a number of ways , two examples are:
 - Return on Equity (ROE) or
 - Return on economic capital (ROEC).
- Capital ratios and are also a key focus.
- Banks have been using both economic capital and regulatory capital in ICAAP for many years.
 - Recently capital requirements based on stress / scenarios tests are also considered
- Capital is held to cover multiple risks, with credit risk being the largest risk.
- Many of the principles recently introduced to the insurance industry have been in place in banking for some time. There are some opportunities for insurers to learn from this (which is covered later in the presentation).

2. Introduction and definition of EC

What does Bank Capital Measure?

Economic Capital set to measure unexpected loss, with confidence interval for target rating of Institution. Note - Regulatory Capital assumes 99.9%

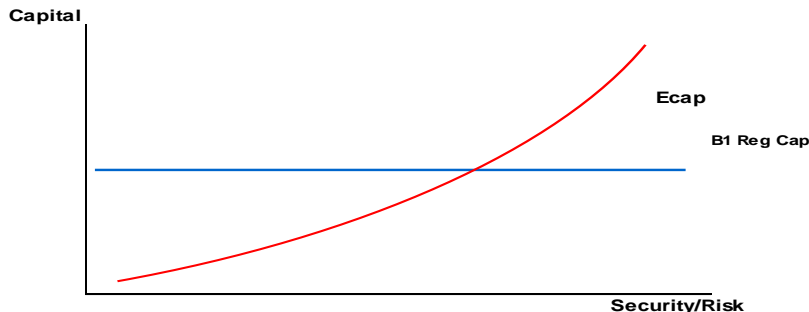


3. Regulatory capital in banking

Lets step back in time to 2005

- In 2005, there was a regulatory requirement to hold capital. This was known as Basel I.
- The calculation of capital was based on simple risk weights, such as 50% for mortgages and 100% for corporate or business loans. This was only partially risk based.
- Banks developed their own economic capital models. These captured how capital varied according to key risk drivers:
- Risk drivers for credit risk included:

Customer probability of default (PD)
Loss given Default (LGD)
Exposure at Default (EAD)
Concentration of the portfolio
Correlation of losses to the economy
Length of the loan



In 2008, Basel II Arrived

- Basel II introduced a more risk sensitive capital requirement framework. It reflected economic capital models being used by banks at the time.
- The regulatory capital requirement was also higher in many cases as the result of floors
- Regulatory capital requirements have increased capital requirements over time.
- As regulatory capital became the key driver of capital requirements for the bank, people saw this as the constraint to manage. Also the cost and effort of implementation of Basel II framework diverted the focus from Economic Capital models.
- This brought into question the need for economic capital models and a lot of focus was lost from them. Many banks questioned the need for economic capital and some even began using regulatory capital calculated under Basel II as a proxy.
- A religion of Basel II Regulatory Capital developed in some organisations.
- The next section of the presentation looks at the Basel II capital calculations for regulatory capital and discusses why economic capital remains a superior measure.

Basel II Credit Risk Capital Formula for Business Loan

- The foundation of the Basel II regulatory capital formula is the Vasicek one factor model for portfolio credit risk.
- The value of a company i 's asset value is based on a systemic factor (Y) and a idiosyncratic factor ε_i .

$$V_i(T) = \sqrt{R} \cdot Y + \sqrt{1 - R} \varepsilon_i$$

- In a large well diversified portfolio the idiosyncratic risk can be diversified away and the risk depends entirely on the systemic risk – the higher the systemic risk the greater the capital required at the 1 in a 1000 confidence level
- Systemic risk depends on the company's industry, geography and size
- In order to derive the analytical formula shown above a number of assumptions including a very large diversified portfolio, in practice banks will have exposure to large individual counter parties, this is know as single name concentration.

Basel II Credit Risk Capital Formula for Business Loan

Capital Ratio = Capital/Risk Weighted Assets (RWA)

$$RWA = 12.5 \cdot K \cdot EAD \cdot 1.06$$

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

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

$$R(PD, S) = \left\{ 0.12 \times \left(\frac{(1 - e^{-50 \cdot PD})}{1 - e^{-50}} \right) + .24 \times \left(1 - \frac{(1 - e^{-50 \cdot PD})}{1 - e^{-50}} \right) \right\} - \left\{ 0.04 \times \left(1 - \frac{(S - 5)}{50 - 5} \right) \right\}$$

PD = 1-year probability of default

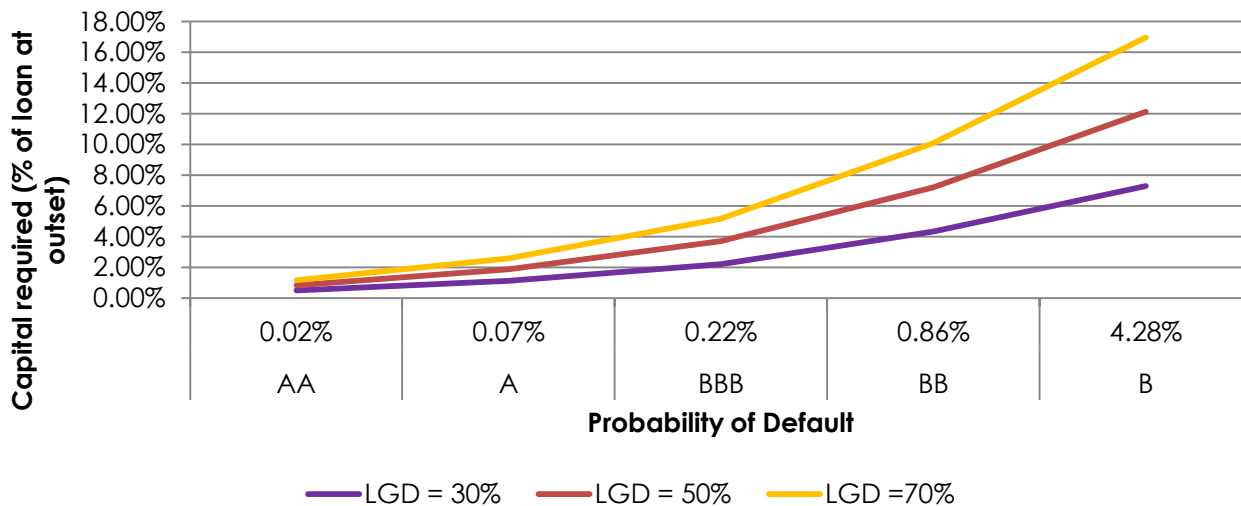
LGD = Loss-given default (downturn scenario)

S = 'size' of borrower (annual sales, \$m), where S between \$5 and 50m

M = maturity of loan in years, where M between 1 and 5 years

Basel II Credit Risk Capital Formula for Business Loan

Illustrative capital required for different S&P ratings grades



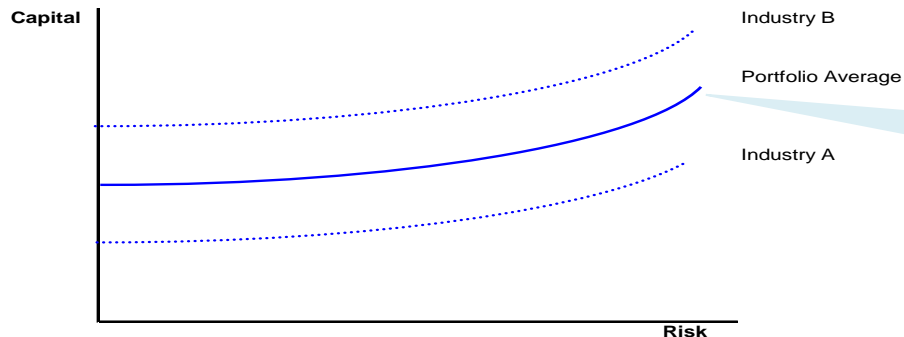
Notes:

1. Based on 8% capital ratio
2. Horizontal axis not to scale

4. Short comings of the Regulatory capital approach

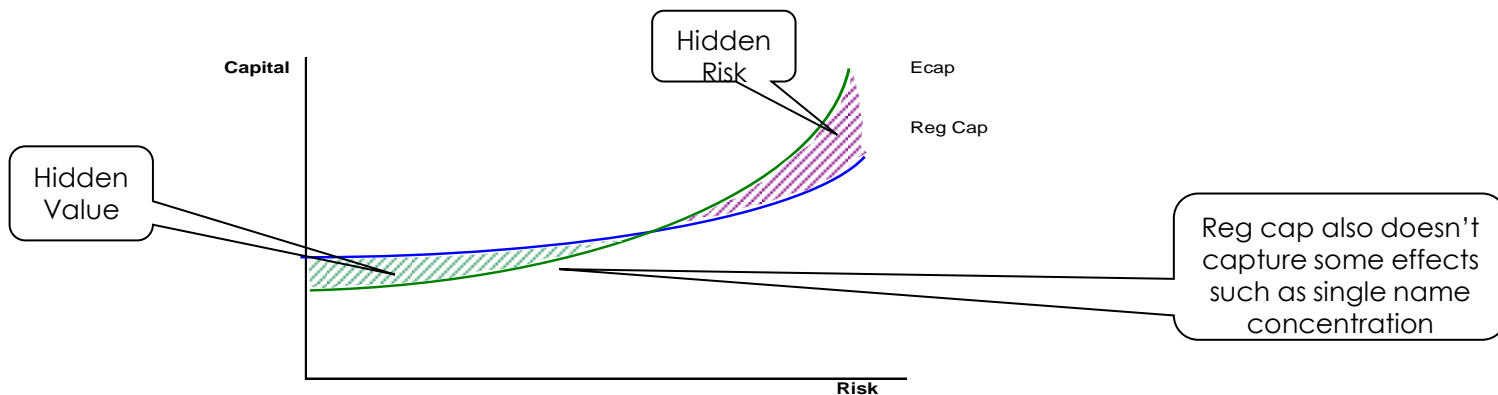
Despite looking sophisticated - there are shortcomings and differences to Ecap

- Term of the loan is capped at 5 years and also a 1 year floor applies. This provides a more blunt variation in capital than would apply in practice.
- The correlation for regulatory capital depends on size only, in practice this will vary by multiple factors including geography and correlation of the industry to the economy.
- Does not capture single name concentration
- The Basel II formula doesn't capture the concentration and diversification aspects of the portfolio.



The Basel II formulae is calibrated for an average portfolio

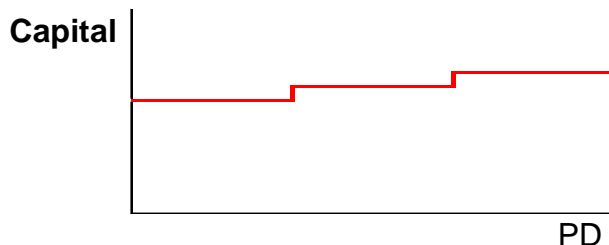
- The shape of the curve (by PD) tends to be relatively flat for regulatory capital.



- The confidence interval for Reg capital is 99.9%. When the confidence interval for economic capital will depend on the target credit rating of the institution.
- For the rated segments, the actual risks are varied due to numerous factors including single name concentration and systemic correlations.

For certain lending asset classes the Regulatory Capital formula has been modified

- For Commercial Real Estate, the treatment of “slotting”, results in a very crude risk weighting. The weightings tend to be higher than for the corporate calculations



- For Mortgages in Australia a 20% LGD floor is applied to protect from a downturn in house prices.
- In overseas jurisdictions such as NZ, overlays have been applied for agriculture (where dairy is concentrated) and higher correlations have been applied for mortgages. In certain cases, this will capture ecap signals. Ecap can provide a lead indicator of changes.
- Basel IV will be coming – which will provide a less risk based view of capital.

Beyond Credit – Economic Capital Differs from Regulatory Capital

- For Regulatory Capital, there is capital held for Credit, Operational, Market, and Interest Rate Risk in the Banking Book.
- Equivalent economic capital models exist for these risk types, the table below shows how what economic capital usually captures:

Risk Type	Economic Capital Risk Sensitivity
Market Risk	Diversification, own view of time to maturity reflecting the time to close out positions
Operational Risk	Economic capital can allow for mitigants which may not be allowed under Regulatory capital e.g. insurance policies
IRRBB	Economic capital can allow for diversification between IRRBB risks and also allow for the organisations own view of invested free capital rather than APRA's 1 year horizon

- Economic Capital usually includes additional risk types (known as Pillar 2 risk capital) – including Business Risk, Pension Risk and other Risk types appropriate for the organisation.

Beyond Credit – Economic Capital Differs from Regulatory Capital

- Critically, economic capital captures diversification between risk types. Recognizing that they do not all occur at the same time eg operational risk is partly correlated to credit risk.
- Economic capital is known as the “common currency of risk”
 - *\$1 of credit risk EC is considered equivalent to \$1 of market risk economic capital*
- It can be applied across all products and business units of a bank

5. Using EC to generate shareholder value

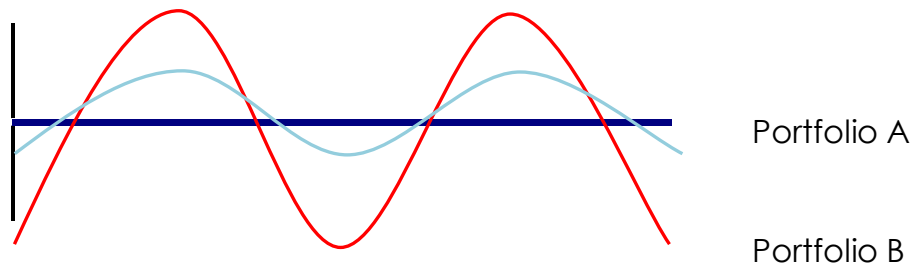
How does Using Economic Capital Improve Shareholder Value?

- RWAs and Regulatory Cap are designed to ensure that there is adequate capital in the system and to ensure capital is captured in a uniform way between banks.
- This is not designed as a predictive mechanism for the risk of the portfolio and selection of risks.
- We have seen from prior slides where there is extra information about the risk of the portfolio, Economic Capital (i.e. Pillar II) captures the specifics of the organisation and its risk.
- Using economic capital in addition to ROE, will enable us to determine how the risk will emerge over time and the actual experienced ROE of the book, e.g. via the credit migration, the actual provisions and BDD outcomes.

	Measured at Today	Outcome over Time
Portfolio A	ROE = 12% ROEC = 15%	ROE = 13.5%
Portfolio B	ROE = 12% ROEC = 10%	ROE = 10.5%

- When making business decisions at different levels and incentivising performance, risk must be considered.
- At this granular level the bank's best view of risk based capital must be used, and this is Economic Capital by definition.
- Implications of using regulatory capital could result in over concentration in risky loans where regulatory capital does not capture the risk e.g.
 - Long term loans
 - Sovereign loans with high systemic risk
 - Large concentrations in a few large counter parties
- Alternatively the bank may not actively pursue potentially profitable sectors e.g.
 - Short term loans
 - Mortgages (given LGD floor)
 - Highly rate commercial property borrowers (which would be affected by "slotting")

- Economic Capital captures concentration and diversification.
- This manifests itself in terms of volatility of losses and earnings and also concentrated portfolios suffer more extreme losses in times of stress.



- Shareholders and rating agencies value stability of earnings and reduced loss in stressed times. As a result, there should be pricing for concentration and diversification to ensure required portfolio returns are delivered. Portfolio A would therefore be worth more than Portfolio B (for the same average earnings), or alternatively a higher return would be demanded for Portfolio B.
- Ratings agencies will have views on the concentration, which would be incorporated in the rating for the they provide.

“That’s all great – but at the end of the day we need to hold regulatory capital”

- On the face of it that is a pretty sensible statement.
- Banks are aware of this, but also know that using economic capital to select risks and the signals it sends adds value and have designed a number of pragmatic solutions to reconcile the differences.
- Use of a single metric without regard for the other can be sub-optimal.

Using Economic Capital to Manage a Bank

Economic Capital is useful in a number of aspects:

- Risk Adjust Concentration – concentration using exposure or loan balance does not capture factors such as probability of default, maturity, etc.
- Performance measurement – using return on EC gives a common measure of risk adjusted performance between different business units e.g. Wealth Management, Business Banking and Retail Banking
- Product pricing – Pricing for individual transactions can be set to earn the target return on EC. Also return adjusted return metrics can be used for pricing delegations
- ICAAP
- Strategic Analysis – Return on EC can be used in the strategic planning process to assess strategies and targets for different business units
- Investment Decisions
- Risk Appetite Setting: - In particular, as EC is a common currency of risk it can be used to set limits between different risk types, products or operations.

5. Economic Capital beyond banking

There are parallels to LAGIC here

- The new LAGIC framework aligns more closely with the banking framework.
- LAGIC prescribes a standardised set of calculations to determine the capital requirement. Does this capture the risk of the organisation.
- The LAGIC framework does allow companies to develop internal models to calculate capital requirements subject to APRA approval.
- How widely are Economic Capital calculated for insurance companies and how are they used (outside of measuring capital adequacy)?
- Has LAGIC diverted focus from ecap – due to efforts, cost and focus required in implementing LAGIC.
- Will those insurers who have good ecap models have an advantage.

Use of Economic Capital in Insurance Companies

- Some insurers use Economic Capital to help set the Target Surplus (i.e. buffer above the Regulatory Capital). This is consistent with APRA guidance in relation to setting target levels of capital:
“While APRA does not require an economic capital model to be used, a more sophisticated institution may choose to use such a model as well as stress testing” (CPG 110)
- To our knowledge very few companies use economic capital in pricing. Regulatory capital tends to be the key driver for capital, particularly for retail business.
- Insurance companies who are subsidiaries of a major banks or large global insurance groups may be required to calculate Economic Capital and maybe measured on a risk adjusted basis using Economic Capital.