

CAPITAL MANAGEMENT IN COMMERCIAL AND INVESTMENT BANKING

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ABSTRACT

This paper contains an overview of Capital Management techniques in a commercial and investment banking environment. By way of definition it explores some of the objectives of capital management, the background to capital management in commercial and investment banking, external regulatory drivers and internal approaches, key challenges faced by this practitioner and proposed next steps. This paper can be considered by actuaries interested in an overview of this wider field.

KEYWORDS

Internal Capital Adequacy; Risk Adjusted Performance Measurement; Regulatory Capital; Economic Capital

1. Introduction

1.0.1 Recent discussions of the Actuarial Society of South Africa revisited the concept of Enterprise Wide Risk Management (EWRM) and specifically the opportunities for actuaries in this field (Plenary session May 2009). The application of the techniques spans many different industries and are applied by different professions. This paper considers the application of a subset of EWRM, capital management in commercial and investment banking. All opinions expressed and mistakes included in this paper are those of the author and do not necessarily represent those of his employer, Absa Capital¹.

1.1 Layout of this paper

1.1.1 In the first section this paper explores the definition of capital management by way of its objectives. The second section provides background to the regulatory framework, the Basel Committee for Banking Supervisors (BCBS) as well as recent changes. The third section explores two views of capital demand and supply, namely those of regulators and the managers of the firm. This section also highlights key challenges in the approaches applied. The fourth section considers future steps and highlights some opportunities for actuaries.

2. Objectives of Capital Management

2.0.1 The list of objectives provided below is not exhaustive. It serves as an outline of the definition of capital management.

¹ The author wishes to express his gratitude to ABSA without whose assistance this paper would not have been possible. In addition he expresses sincere gratitude to the external reviewers at ASSA, KPMG and Absa Capital.

2.1 *Ensure Solvency*

2.1.1 The principles of ensuring solvency in commercial and investment banking are fundamentally the same as they are in insurance. Capital resources must exceed capital demand recognising that both can be subject to different valuation methods.

2.1.2 Two methods of assessing solvency are generally used. The first is a regulatory view which forms the minimum requirements for capital demand and capital supply and the second is the internal view based on the applied accounting standard. A view akin to embedded value has not yet been explored extensively for financial instruments held at amortised cost.

2.1.3 Capital demand is predominantly based on the risk based capital requirements for credit risk, market risk, equity risk, business risk and operational risk. The assessment methods are outlined and referenced later in this paper.

2.1.4 Capital supply is based on the permanence and loss taking capacity of capital. It is important to note that capital and liabilities are the sources of funding for all assets. This yields a different emphasis when considering banking asset and liability modelling to the insurance equivalent. The reason is that liabilities in banking are fairly certain compared to their insurance equivalent.

2.2 *Provide security to all stakeholders*

2.2.1 Bank Depositors require security that their deposits will be safeguarded². Capital resources are held for this purpose to meet losses and safeguard depositors. In the event of default bank depositors may only receive repayment once assets have been liquidated. Inadequate capital will result in losses to depositors.

2.2.2 The illiquidity and long term nature of bank assets provide the main reason why banks are so fragile. Banks can run out of funding before they run out of capital. As a consequence banks are seeking shorter term assets and exploring methods by which to sell off longer term assets, such as securitisation schemes.

2.2.3 Bank clients rely on banks for maturity transformation and primary financial intermediation. These activities are key to economic activity. When banks are constrained the economy is constrained as well.

2.2.4 The providers of funding expect a return commensurate with the risk taken. Though shareholders' return is the balancing result (i.e. there is no fixed cost of capital), shareholders expectations can be articulated through models such as CAPM.

² The application and merits of deposit protection schemes are not considered in this paper.

2.3 Align to treasury (funding) of the bank

2.3.1 Funding sources vary by term and loss absorption ability. As a consequence certain forms of funding are deemed to be liabilities and others equity. The bank's treasury is responsible for raising all sources of funding save retained earnings which are generated through banking activity. As a consequence the capital management team and the bank's treasury team combine to form the demand and supply side of capital management.

2.4 Provide a framework for performance measurement

2.4.1 The capital supply is used to support the capital demand arising from business activity. The question then arises as to what the contribution of each business activity is to the capital demand. The performance measurement framework follows directly as a corollary to the capital management framework once suitable return is compared to capital consumed.

2.4.2. Performance measurement presents results from a bank's perspective. This will not be consistent with market prices. Great care is required with the inference of performance measurement results. Many reasons for the differences to market prices exist including shareholder diversification benefits, frictional costs and market liquidity. Hard and soft insurance cycles provide actuaries with some insights into the constraints of these techniques.

2.4.3 Portfolio optimisation also follows as a corollary to the capital management framework. When optimising a portfolio it is useful to consider whether or not the exercise is realistic i.e. can a business enterprise be developed consisting solely of the elements being considered for optimisation?

2.4.4 The portfolio optimisation also allows for the assessment of new business opportunities.

2.5 Support incentive compensation structure

2.5.1 As noted above risk adjusted performance measurement results may not conform to market prices. Setting objectives based on risk adjusted capital measures can therefore result in considerable frustration with business line managers. Rather the results will provide an indication of relative results period on period which can be compared to external indices.

2.5.3 Using only performance measurement results based on capital management will not allow incentivisation of all necessary activities to optimise returns. As such the results should be used as part of a balanced scorecard or cross competency assessment process.

2.6 Provide management information

2.6.1 Management require timely, accurate and consistent management information from the capital management framework in order to optimise the returns for all stakeholders.

3. Background to capital management

3.0.1 Capital management in commercial and investment banking arose from a range of compelling factors. The regulatory agenda has been paramount throughout.

3.1 The Basel Committee of Banking Supervisors

3.1.1 The BCBS was tasked to improve the manner of oversight of banks following the economic crisis of the 70s. Subsequent crises have emerged since then resulting in an ever increasing focus on capital management. The following table provides a chronology of events including certain references to development in the insurance industry.

Year	Event
1974	Economic / Oil crisis leads to the formation of the Basel Committee;
Late 70s	Introduction of Risk Adjusted Return on Capital (RAROC);
1988	Basel Committee issues Basel Accord for banking supervision; The accord introduces the concept of Risk Weighted Assets; Capital = 8% x RWA;
Late 80s	Banks adopt the use of Value at Risk (VaR); (In Basel II RWA will be set at 12.5 x VaR to ensure Capital = VaR)
1990	Japanese financial crisis (outlined in BIS papers No 6);
1996	Basel Committee issues Capital Adequacy Directive for market risk (VaR);
1997	Basel Committee issues the key principles of banking supervision: Pillar 1: regulatory minimum requirement; Pillar 2: self assessment and regulatory review; and Pillar 3: public disclosure. (The same framework has been adopted for Solvency II) Asian financial crisis;
Late 90s	Introduction of Dynamic Financial Analysis within Reinsurance industry;
2004	Financial Services Authority introduces Internal Capital Adequacy (ICA) for insurers;
2006	Basel Committee issues final Basel II Accord (implementation start of 2008);
2007	Committee of European Banking Supervisors issues Internal Capital Adequacy Assessment Process for banks; The principles are similar to those of ICA;
2008	Financial Crisis commences (outlined in 79 th report of the BIS);
2009	BCBS issues updates on the market risk framework; and BCBS issues consultative documents to strengthen the banking sector and enhance liquidity risk management.

Table 1

3.1.2 Following the demise of Bear Sterns (March 2008), Lehman Brothers (September 2008) and others reviews (including Turner, Walker) of current capital adequacy frameworks highlighted the following:

- Accounting frameworks contain some deficiencies. In particular results based on marked to market results fail to consider the systemic impact of the number of market participants (which will increase or depress prices in times of exuberance and stress). In addition the question arises whether provisions akin to additional unexpired risk reserves (AURR) are required given the failure to recognise the value of subprime exposure;
- Cross border regulation is not consistent and not sufficiently robust especially in the instance of default. The need for a “living will”³ was raised which can be interpreted as the most extreme outcome of an internal capital adequacy assessment;
- Liquidity management does not adequately allow for extreme stresses;
- External ratings processes contain deficiencies;
- Remuneration approaches are not aligned and significant agency costs arise;
- VaR and other modeling techniques have significant inadequacies which are not properly challenged and communicated; and
- Proprietary trading activity must be restricted.

3.1.3 The Basel Committee of Banking Supervisors is awaiting feedback on two consultative papers issued in December 2009. Many of the recommendations in the reviews outlined in 3.1.2 have been incorporated. The first paper considers the quality, consistency and transparency of the capital base which in general are much more onerous than existing requirements. In addition it introduces a leverage ratio of assets to capital. The second paper introduces a liquidity coverage ratio and net funding ratio which is not risk based.

3.2 The South African Reserve Bank

3.2.1 The SARB is the regulator of banks in South Africa. The SARB adopted the Basel Accord in revised regulations to banks as required under the Banks Act of 1990. The regulations were promulgated through government gazette at the start of 2008.

4. Regulatory and internal views of capital management

4.0.1 From a regulatory perspective the business of a bank is considered in terms of banking business, which are the more traditional banking activities of deposit taking, loan origination, custody etc. and trading business which considers all transactions for which the intention is to trade. The latter includes most derivative transactions.

4.0.2 Different regulatory rules apply for banking and trading business.

³ A “living will” refers to the statement of management actions required in the event of bank closure.

4.1 The criticality of accounting standards

4.1.1 As noted in 2.1 the main objective of capital management is to ensure solvency. Solvency is a function of the accounting standards, and in particular the regulations request that the reporting standards be the basis from which regulatory reporting be performed. Accounting standards permit the use of both fair value and amortised cost in the banking book. As a consequence the bank needs to consider the accounting standards used in light of its business objectives.

4.1.2 Some banks aim to structure assets and liabilities on a floating rate basis thereby ensuring stability in the fair value. The bulk of banking business is, however, still considered on an amortised cost basis.

4.1.3 The accounting standards applied also impact the level of day 1 Profit and Loss recognised:

- Level 1 P&L is based on observable active market transaction prices for identical products (mark to market);
- Level 2 P&L is based on replication of all significant components of transaction prices being observable in active markets (mark-to-model with all significant inputs being observable);
- Level 3 P&L is based on replication of all significant components of transaction prices being unobservable in active markets (mark-to-model but not all significant inputs being observable);
- Under IFRS, if Day 1 P&L is classified as Level 3 P&L, Day 1 P&L cannot be recognised on initial recognition, but can only be recognised to the extent that there has been a change in a factor (including time) that market participants would consider in setting a price;
- Under US GAAP, if Day 1 P&L is classified as Level 3 P&L, Day 1 P&L can generally be recognised on initial recognition, but must be disclosed separately in the financial statement notes as level 3 P&L.
- If the required secondary market information is not available, more conservative accounting methods are applied

4.1.4 Profit recognition for trading business is mostly Level 1 and Level 2 P&L and for banking business mostly Level 3 P&L. Banks do not attempt to mark all financial instruments to market, especially not when active secondary markets do not exist.

4.2 Systemic risk

4.2.1 The recent financial shock has shown the interconnectedness of banks and economies world wide. In times of stress (and also exuberance) market value cannot always be described as fair. During such times the traditional assumptions regarding free entry and exit to markets do not hold and market prices can therefore divert from the

replicating portfolios for assets or liabilities, i.e. arbitrage opportunities arise with no players willing to seize the opportunities.

4.2.2 The regulatory response is to impose more security to avoid such times of stress or irrational exuberance. However, a requirement to force a cross comparison between market prices and replicating portfolios will be helpful. In insurance and credit markets the necessary information often does not exist and here traditional actuarial pricing tools are very useful.

4.3 The bank balance sheet

4.3.1 It can be argued that commercial and investment banks have a different view of the balance sheet compared to insurance companies. Insurance companies place significant emphasis on the balance sheet. This is required due to the uncertainties relating to liabilities entered into in the course of insurance business which directly impact the P&L.

4.3.2 From a commercial and investment banking perspective the focus historically has been more on revenue and less on balance sheet mainly because banks could fund themselves through significant levels of gearing and securitisation exercises. The financial crisis has changed the focus considerably.

4.3.3 The banking balance sheet is primarily asset driven and funded by liabilities and equity. This change in emphasis means that the distinction between liabilities and equity can become blurred to the extent that the funding is seen as a mezzanine structure instead of a clear demarcation between equity and liabilities. The sources of funding are instead evaluated in terms of their term and loss absorption capability. As such shareholder equity has the longest term and greatest loss absorption capability and is therefore a key component of capital supply.

4.3.4 This structure also implies the importance of the treasury function. Each asset will contribute to the earnings of the bank (negative and nil returns are possible) and each source of funding will contribute to cost of funding save for shareholders equity which will receive the retained earnings. The treasury function has to ensure that the interest income and the interest expense are managed properly. In order to do this all interest income is bought and all funding sold to business units in line with appropriate term structure. These back to back trades ensure that the interest rate profile is consolidated in the treasury team. The treasury team can then hedge the interest rate risk. One approach is to swap all interest payments and receipts to floating rates thereby ensuring a fixed margin (noting that an exact swap is not always feasible in practice).

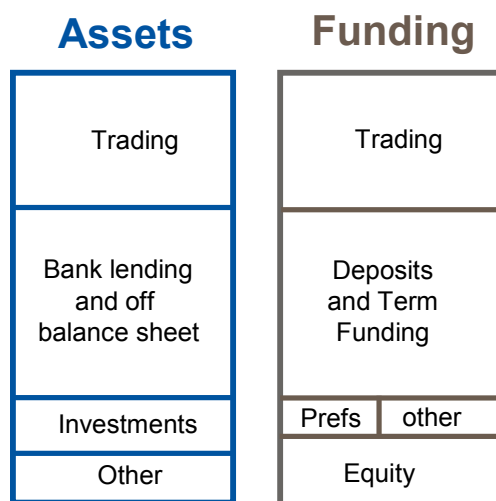


Figure 1

4.3.5 Trading assets and liabilities do not follow the exact same structure. Any trades will generate settlement balances which will be fairly short term in nature. Swaps and other commitments to purchase and sell at future dates will generate either an asset or liability contingent on market circumstances. Here it is important to note the risk management framework applied by the bank. In order to maintain low levels of risk, as measured by Value at Risk, equal and opposite transactions will be entered into to secure profit and reduce risk. Exchange traded trades will also have limited secondary counterparty credit risk. Nevertheless the balance sheet will grow in line with the number of trades and only reduce when the trade expires.

4.3.6 Extensive misunderstandings still exist regarding the balance sheet of investment banks. As a consequence it is often viewed the same as a commercial or retail bank in terms of leverage. The gross up of the balance sheet will force investment banks to reduce the term of trades and trading activity in general. Both these impacts will have serious consequences for the viability of banks' treasury needs as well as economic activity in general.

4.4 Capital supply versus capital demand – the regulatory view

CAPITAL SUPPLY

4.4.1 Capital supply from a regulatory perspective is provided by sources of funding with sufficient loss absorption capacity and/or tenure. The SARB have in the past requested levels of capitalisation higher than those proposed by the BCBS. Current BCBS consultation and conduct by banks indicate that capital supply requirements will be increased.

4.4.2 Tier 1 (also known as primary) capital supply includes equity, preference shares and perpetual non cumulative instruments. Equity and retained earnings are referred to as core Tier 1 capital and provides most security from a loss absorption perspective. The

SARB set the minimum Tier 1 capital requirement to 7% which contrasts to a requirement of 4% which was set by the BCBS.

4.4.3 Tier 2 (also known as secondary) capital supply includes perpetual cumulative instruments and dated instruments with a residual duration of more than 5 years. The SARB set a total capital requirement of 9.5% plus a bank specific loading which is based on the supervisory review and evaluation process. This requirement is based on the BCBS requirement of 8% plus a South Africa specific loading to allow for the lack of diversification benefit within the country.

CAPITAL DEMAND

4.4.4 The regulatory rules outlining the assessment of capital demand are included in the Basel II Accord⁴. The Basel II Accord was promulgated in South Africa through government gazette 30629⁵ and became effective 1 January 2008 in line with the Basel II Accord.

4.4.5 Various regulatory approaches are available to banks when assessing capital demand and in general the standardised approaches render higher levels of capital demand than the advanced approaches. These approaches are defined in what is referred to as the first pillar of regulation which refers to the rules based approaches used to assess capital demand. The application of more advanced approaches requires approval by the registrar of banks (the SARB).

4.4.6 The second pillar of regulation considers internal and supervisory review of the first pillar assessment. Here capital demand and capital supply is considered over a period of projection, normally 3 to 5 years. The third pillar of regulation considers public disclosure. The pillar one capital demand is based on the sum of credit risk, market risk, equity risk and operational risk capital demand. No allowance is made for inter risk diversification. Current proposals suggest significant increases to the market risk and credit risk requirements for counterparty credit risk in the trading book.

4.4.7 **Credit risk** capital demand is based on either a standardised (scalar of balance sheet value) or advanced approach. Different levels of sophistication in the application of the advanced approach are possible. Fundamentally the advanced approaches are based on the Value at Risk of the credit portfolio. This is calculated based on the single factor Vasicek model.

Consider a single normal factor Y and random error Z both independent normally distributed. A correlation of β will exist between a process X_i and Y when

$$X_i = \beta Y + \text{SQRT}(1 - \beta^2)Z. \quad (4.1)$$

⁴ <http://www.bis.org/publ/bcbs128.htm>

⁵ <http://www.reservebank.co.za/> select "Bank supervision" then select "Regulations relating to Banks"

In a homogenous pool of assets where the log of the asset returns are presented by X_i , X_i and X_j will have correlation of β^2 . However, the models used work on the premise that the correlation between pair-wise homogenous assets has been determined and is known, ρ . Therefore the following model is used:

$$X_i = \text{SQRT}(\rho) Y + \text{SQRT}(1-\rho)Z. \quad (4.2)$$

Considering the probability of default (PD) of a homogenous asset, where C is the default point for the asset return:

$$P[X_i < C] = \text{PD} = N(C)$$

$$C = N^{-1}(\text{PD})$$

The process Y can be viewed as the state of the economy measured by suitable index. For a sufficiently large portfolio the number of defaults divided by the number of assets will exhibit the same probabilities as X_i . That is to say it is the same as Z conditional on Y. So capital has to be held for an extreme outcome of the number of defaults conditional on Y. If no conditionality exists then this outcome remains PD. Consider if conditionality does exist:

$$P[X_i < C \mid Y]$$

$$\text{Which by substitution is } P[\text{SQRT}(\rho) Y + \text{SQRT}(1-\rho)Z < N^{-1}(\text{PD}) \mid Y]$$

$$\text{Considering the outcomes to } Z \text{ } P[Z < (N^{-1}(\text{PD}) - \text{SQRT}(\rho) Y) / \text{SQRT}(1-\rho) \mid Y]$$

$$\text{Which is } N[(N^{-1}(\text{PD}) - \text{SQRT}(\rho) Y) / \text{SQRT}(1-\rho) \mid Y] \quad (4.3)$$

Now it can be seen from 4.2 that a low value of Y would render a low value for X. So through symmetry 4.3 at for example the 99.9 level of confidence for Y is

$$N[(N^{-1}(\text{PD}) + \text{SQRT}(\rho) N^{-1}(0.999)) / \text{SQRT}(1-\rho)] \quad (4.4)$$

This extreme number of losses is then multiplied by the extreme loss given default⁶ (LGD) in order to calculate the unexpected loss. 4.4. provides the basis on which the Basel formulae are derived. Once multiplied by the LGD, the expected loss is deducted and allowances are made for maturity adjustments. Note that the frequency and severity of defaults are not convoluted instead the extreme loss is multiplied by the extreme number of loss events, a very conservative approach.

4.4.8 The approaches used for the calculation of credit risk capital in the trading book are slightly different given that derivative exposures are not the same as loan exposures. As a result different rules exist for the calculation of exposure at default and the maturity of those exposures. However, subject to these changes the calculation of the collective risk

⁶ The loss given default is evaluated at an economic downturn, deemed to have a return period of approximately 20 to 30 years.

model experience is the same as that outlined in the previous paragraph. Credit risk in the trading book is calculated daily while credit risk in the banking book is generally calculated monthly.

4.4.9 As noted in 3.1.1 above, the first Basel Accord introduced the concept of Risk Weighted Assets. The idea was to risk weight the assets on balance sheet and off balance sheet exposure instead of using asset values. The Basel II Accord introduced the concept of portfolio Value at Risk as outlined in 4.4.7 above. In order to retain the RWA concept the BCBS applied a multiple of 12.5 to the VaR estimates. The rationale for this was that at a capital supply requirement of 8% of RWA this would render the original VaR estimate. It follows that a target Tier 1 capital ratio of 10% would therefore be 25% higher than a 99.9% VaR. In addition the BCBS calibrated correlations for all assets worldwide.

4.4.10 Given such apparent conservatism in the capital assessment it begs the question why so many banks failed in the recent crisis. In the first instance, loss absorbing capital was diluted through second tier levels of capital. (For a normal distribution a 25%⁷ level of capital set at 99.9% renders a probability of default of 22%.) In the second instance significant capital supply buffers cannot withstand sustained incorrect risk assessment and pricing. The models are only as strong as their weakest link. In the case of subprime assets it was the assessment of the downturn probability of default of the exposures as well as the loss given default in the event of a severe house price collapse.

4.4.11 **Equity risk** can be assessed on a market value (scalar) approach or alternatively the approach applied for credit risk or alternatively a Value at Risk type approach. A key consideration is the marketability of the equity. Private equity exposures which are deemed to be illiquid have higher levels of capital demand. Equity risk is generally assessed monthly but more frequent assessments are conducted as and when required.

4.4.12 **Market risk** can be based either on a standardised approach or alternatively on an internal model. The internal models generally applied are Value at Risk type models. Consider the value of the traded portfolio V and the cumulative distribution function, $F(V)$. VaR evaluated at a certain level of confidence α , is then given by

$$F^{-1}(1-\alpha) \quad (4.5)$$

This method has been subject to significant criticism due to the methods used to calibrate $F(V)$. Historical simulation techniques with fairly short periods of history are often used which arguably do not allow for sufficiently extreme scenarios. Indeed historically a VaR based method for credit risk assessment yielded lower capital requirements due to the lack of defaults in the sample data. The BCBS has now introduced a VaR plus a stressed VaR thereby double counting the risk. Market risk is assessed at least daily.

⁷ Under the existing Basel II regulations, capital supply can consist of a range of instruments and pure retained earnings can be as low as 25% of the capital demand.

4.4.13 **Operational risk** demand is based either on the basic indicator approach which requires a flat 15% of gross annual income, the standardised approach which allows for a variation of the percentage required in line with type of business or the advanced measurement approach which is based on actual and inferred loss distributions. The loss distributions are based on internal data, external data, key risk indicators and scenario analysis. In principle the techniques used are similar to those used in the reinsurance industry for the assessment of collective risk models. Consider the total operational losses in the bank, S . The collective risk model for S can be presented as

$$\text{Sum to } N(L) \quad (4.6)$$

where N is a discreet distribution of number of losses, often Poisson and L is a fat tail distribution of size of losses, often Pareto. The operational risk is also a VaR based estimate derived from $F(S)$ as outlined in (4.5). Operational risk is often assessed quarterly or half yearly.

4.5 Capital supply versus capital demand – the internal view

CAPITAL SUPPLY

4.5.1 The internal view of capital supply is often based on the economic capital framework of the bank. The view on capital supply varies from one bank to the next. Generally economic capital supply is deemed to be the primary capital excluding preference shares. That is to say only the capital sources with complete loss absorption capability as a going concern are considered.

CAPITAL DEMAND

4.5.2 The starting point for the economic capital demand is similar to that of the regulatory capital demand outlined in 4.4. However, for economic purposes any rigid rules in the regulations are reviewed and alternatives incorporated. In addition the assessment aims to provide a more accurate view of the risk to the bank.

4.5.3 For **credit risk** the correlation assumptions are reviewed, empirical estimates are used and multi factor models are also used based on geography and industry. In addition the conservative multiplication applied in assessing the collective risk is relaxed and collective risk experience is based on a convolution of the expected number of defaults and the distribution of losses given default. In some instances all assets are evaluated at fair value in order to include not only the jump to default but also the change in the asset value in the risk assessment.

4.5.4 Similar approaches are applied for equity risk.

4.5.5 Similar approaches are applied for operational risk

4.5.6 **Business risk** also receives significant attention in an economic capital framework. This is based on the volatility of income (excluding risk already considered) compared to the flexibility of expenses. Numeric techniques are often used to project income and expenses and assess extreme shortfall outcomes. These outcomes are used to set the capital demand.

4.5.7 The list of risks considered here is not exhaustive. In particular liquidity risk and interest rate risk in the banking book is dealt with as part of the treasury activities. However, these are the primary risk categories generally considered from a capital demand perspective.

4.5.8 Intra risk correlation is often assessed via group wide stress testing which is discussed in 4.6 below. Somewhat arbitrary correlation estimates based on high, medium or low correlation are also often used. The author discourages the use of arbitrary correlation estimates.

4.5.9 The confidence level of the regulatory capital demand is set at 99.9 over a 1 year time horizon. The confidence level of the economic capital framework varies in line with the policy of the bank.

4.6 The Internal Capital Adequacy Assessment Process (ICAAP)

4.6.1 The ICAAP, similar to the ICA in the insurance industry, is one of the most critical components of the capital management process. However, it also poses extreme challenges to senior management and practitioners alike to ensure the output is timely and consistent with business views. The different components of an ICAAP are considered below.

4.6.2 The **planning and strategy** of the bank must align to the ICAAP process. The ICAAP must be based on the budget and longer term plan assumptions. The main strategy drivers are generally revenue growth and profitability. In the projection, the income statement as well as the corresponding change in the balance sheet forms the baseline for further risk and capital assessment.

4.6.3 The **risk assessment** must be obtained from this baseline. The risks inherent in the business (as articulated by the baseline) must be identified, measured and monitored through the process. The impact of each risk on the plan must be assessed. In particular this assessment will drive the capital demand to support the business as well as the funding profile required to support the business.

4.6.4 **Scenario analysis** is then performed on the baseline. The scenarios considered will include macro scenarios as well as micro scenarios applicable to specific business areas. These scenarios consider the impact on capital demand and capital supply from both a regulatory and economic perspective. A stochastic generation of scenarios will ultimately yield a dynamic financial analysis framework akin to those planned in the insurance

industry. Such a framework is not prevalent in banking yet. Significant emphasis is placed on the different scenarios and their impact on business instead.

4.6.5 **Management actions** are identified for implementation by the bank in the event of the extreme scenarios. The scenario of bank default will most likely form the basis of the newly proposed “living wills”. Management will consider revisions of plans and other corrective actions such as dividend retention, business contraction, product changes, operational efficiencies, etc. Based on the assessment the risks, the capital demand and consequential impact on economic profit will be assessed. Management can then revise plans to optimise strategy.

4.6.6 The results are critical to a number of stakeholders. Proper **reporting** is key. The results of the risk assessment, capital requirement assessment and consequential economic profit will be reported to the business areas.

4.7 Asset Liability management and alignment to treasury

4.7.1 The regulatory and economic capital environments have not traditionally required capital for asset and liability mismatches on the assumption that funding is available. Asset liability mismatches are, however, critical and treasury is responsible for raising residual funding requirements including capital. Given that assets will have a longer term than liabilities, the treasury team can run out of funding for the bank as was the case during the financial crisis.

4.7.2 The funding view is therefore a critical component that banks are now working on to include in their ICAAP. In addition banks are considering how to ring fence assets for potential sale and also shortening the asset profile in the event of liquidity constraints.

4.7.3 The term structure and loss absorption capacity of the funding is critical and is part of capital management. The capital management activities and the funding activities of the bank are therefore closely aligned. Given that treasury teams interact with the market on a daily basis, the capital management requirements are provided to the treasury teams.

4.7.4 Interest rate risk in the banking book arises when the interest income on assets is not of the same date and form as the interest expense on liabilities. The objective is to ensure a stable net interest income. In order to achieve this aim both asset returns and liability costs are sold and bought by the treasury team and swapped to floating rates. The residual income is then fixed. However, the market is not always available to hedge the entire book and some risk may remain. Such hedges also ensure balance sheet stability on a fair value basis as floating rate instruments do not deviate too much from par.

4.7.5 Trading business tends to be short term in nature and funding from a balance sheet perspective often follows from opposite trades intended to hedge the portfolio. Residual funding can be obtained or provided to the treasury team. However, the cash flows of the trades can generate potential open positions where cash is paid away before being received which is also a key consideration in liquidity risk management.

4.8 Performance measurement and incentive compensation

4.8.1 Performance measurement from a capital management perspective is part of incentive compensation. It should not be the sole determinant of performance given the range of requirements to achieve an appropriate return on capital. However, it is a critical component. In particular the return on capital from a regulatory and economic perspective is key in optimising the portfolio of the bank. The performance metrics are subject to minimum budget requirements to meet the cost and business risks of the bank.

4.8.2 Sophistication of the risk assessment is less important than consistency and stability. For example the one factor model used from a regulatory perspective provides these benefits. Performance measured must be controllable by the business area. This has significant impact for the allowance of diversification benefit as well as the allocation of expenses. In particular, diversification benefits that are not considered on an asymptotic basis, i.e. diversification only in the portfolio of the bank can change based on business strategies applied by different business areas. This results in changes in capital requirements for all business areas which cannot be controlled by them. As a result it is often necessary to use a more simplistic capital measure at business level and ensure that these demand requirements exceed the demand requirement set on an aggregate and potentially more sophisticated basis.

4.8.3 Return on risk adjusted capital provides a more equitable measure of return compared to revenue only. However, it should be noted that the market price of risk is not necessarily consistent with the price obtained through a risk based approach. The insurance cycle is well known in the insurance industry but not in the banking industry. The principles are, however, similar in that rates tend to be soft most of the time with oversupply of capital and hard when a loss of confidence occurs. It is therefore critical to constantly compare market spreads to those inferred by an economic capital framework.

4.8.4 When assessing risk based performance, proper allowance for expected loss is required. The current view of expected loss will differ from the long run expectation required under regulatory views as well as the provisions raised. It is necessary to consider the provisions raised versus the expected loss in the period of review and it may be necessary to replace provisions.

4.9 Portfolio optimisation

4.9.1 Portfolio optimisation is a key component for capital management. Portfolio management is normally a function within the bank similar to treasury. It can be structured as a credit treasury and as such sells credit protections to all business areas generating credit risk and then manages the book of credit risk.

4.9.2 Where concentrations exist in the portfolio or excess capital demand arises, the business areas will either be required to reduce exposure or protection will be bought through credit default swaps or credit linked notes. These instruments are analogous to

insurance contract with the difference that no insurable interest is required. The exposure can also be managed through securitisations.

4.9.3 A key aspect is the continual review of the exposure inherent in trade confirmations and terms. Cross checks are required to ensure that the different interpretations held from a credit risk and legal perspective are understood and maintained. For example, whether a facility is revocable or not has a different meaning from a legal and risk perspective. For capital management the risk perspective is used.

4.9.4 Many practitioners focus on the return per business area. Though important, this view does not encapsulate the main purpose of the bank, to serve its customers. A unique client view is required across all products to optimise return per client. However, client relationship management projects often fail as a result of too wide a focus. The requirements for stability and consistency noted in 4.8 are relevant here.

5. Lessons learnt, next steps and opportunities for actuaries

5.1 Lessons learnt

5.1.1 The capital management framework requires disproportionately more resource to implement in large organisations compared to smaller ones. The reason for this is that the level of consultation increases exponentially as different business areas implement their own methods for assessing capital demand resulting in difficulties of comparison. In addition the budgeting approaches become more complex yet detailed linkages to the budget are required. A solution often proposed is one of central command. Such a solution often struggles to present the granularity required by the business areas.

5.1.2 The budget must form the baseline for the projection of capital demand and capital supply. In addition the budget must be detailed enough to allow for this assessment to be done. An independent assessment cannot be incorporated into the objectives and incentives of business areas. In addition such assessments have no credibility with the business areas. The subsequent challenge arises from changes in budget. When projections for the remainder of the year vary from budget the framework must show the projected results and contrast these to budget. Regular and consistent feedback is key.

5.1.3 The solution must be as simple as possible to generate stable results. Significant volumes have been produced on risk assessment, risk measures and the quantitative techniques required to support assessment. Critical as proper risk assessment components are, simple approximations should be used as far as possible. This practitioner favours analytical solutions above numerical solutions for *all* output to stakeholders who do not have a risk training background. Most stakeholders do not understand (or do not want to understand) the consequences of random error. In other words the expectation is for the results of Monte Carlo simulation to yield the exact same point estimates of the distribution each time for every component of the distribution including marginal

contributions. This is not possible when using numeric techniques. Numeric techniques are best used for validation purposes.

5.1.4 The solution must be as simple as possible to generate consistency of message. The absolute number of capital demand is very difficult to determine as the confidence interval of a 99.9 or 99.95 point estimate shows. In addition, level of capitalisation is but one of a range of metrics relevant to the credit rating of the bank. (Other metrics include quality of management, sustainability of business etc.) However, the assessment must generate a consistent message and highlight riskier business areas compared to less risky areas.

5.1.5 The people tasked with capital management must have an understanding of the business processes over and above a good risk understanding. Actuaries can provide this skill but only after some exposure to the business process.

5.1.6 Business process documentation is key. Strong focus should be given to the governance structure as it relates to the inputs into the process, the suppliers of those inputs, the process itself, the outputs and the users of the outputs. In addition the validation of every step of the process must be clearly articulated. This component is generally weak or not done with sufficient consultation of the business areas.

5.1.7. The governance structure must support capital management at an Executive Committee level. Capital management must be a strategic agenda item of the board of the organisation as well. In the banking industry this is also achieved via the regulatory agenda as outlined in this paper.

5.1.8 Correlation assumptions in the capital demand assessment should be handled with great care. A standard rule is the square root rule based on the variance of correlated normal distributions. Simple calibration exercises show the difficulty in testing correlation hypotheses. Business areas also have little control over correlation between business areas.

5.1.9 Stress testing must be based on clearly articulated scenarios and in particular the risk factor changes resulting from the scenario.

5.2 Next steps

5.2.1 The tools and processes used for budgeting purposes will be further enhanced. The ease with which business can use these tools to set their projections as well as changes in projections during the year will continue to be a challenge and focus area for improvement.

5.2.2 Stress testing scenarios must be linked to the more detailed budget structures. Stress testing will always generate more granular challenges that can be address by the budget, however, the enhancement of the budgeting process will provide opportunity to make

more links to the ICAAP stress testing components both on a macro and business unit level.

5.2.3 As part of the ICAAP process the management actions applied will be revisited. An extreme outcome of this is the “living wills” referred to in consultation papers which refer to management actions required in the instance of bank closure.

5.2.4 Further enhancement of the budgeting and projection frameworks will lead to more performance measurement information available on the same basis. This will allow for more dynamic financial analysis (DFA) as the scenarios incorporate stochastic projections as envisaged under DFA and Financial Condition Reporting frameworks promoted by the Actuarial profession in the past.

5.2.5 More focus will be given to portfolio optimisation as well. In particular limiting capital demand compared to return.

5.2.6 The most significant next step will be the implementation of revised regulatory dispensations following the financial crisis. This will include further debate and work on accounting frameworks, liquidity management, remuneration approaches, and enhancements to risk assessment techniques such as VaR.

5.3 Opportunities for actuaries

5.3.1 The considerations below are not exhaustive but they do provide some ideas on areas where actuarial techniques can add value.

5.3.1 Capital Management. Asset liability techniques as well as risk assessment techniques used to contrast capital supply to capital demand are part and parcel of the actuarial toolbox. As a consequence actuaries can add value in the area of capital management as outlined in this paper.

5.3.2 Treasury and liquidity management. The interaction and overlap with the treasury team was highlighted in this paper. The challenge of interest rate in the banking book as well as the hedging thereof provides significant opportunities.

5.3.3 Product pricing and trading. Pricing techniques are relevant to shallow or ineffective markets as is price testing. The pricing techniques are also relevant in the retail environment. In addition, there is a need for embedded value techniques in a retail banking environment due to constraints in the accounting standards, analogous to the accounting constraints applied to liability valuations in an insurance environment.

5.3.4 Portfolio optimisation. The assessment of risk adjusted performance measures allows for the optimisation of the return on capital of the bank. In addition the capital demand side can be optimised through proper review of risk in all its constituent parts and the interaction and concentration of all assets on the balance sheet.

6. Conclusion

6.0.1 This paper contains an overview of Capital Management techniques in a commercial and investment banking environment. It explores some of the objectives of capital management, the background to capital management in commercial and investment banking, external regulatory drivers and internal approaches, key challenges faced by this practitioner and proposed next steps.

6.0.2 This overview shows that actuarial techniques are definitely relevant in a commercial and investment banking environment. In particular, asset liability modelling and internal capital assessment techniques applied in insurance companies are relevant to banks too. However, in order to contribute to this field a good understanding of the banking business process is required.

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