

Credit Unions and Capital Adequacy: Managing Growth and Risk

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ABSTRACT

In this paper we argue that a financial institution needs to continuously monitor and assess its risk exposure in the context of capital requirements and available growth opportunities. Judicious management of the interaction between these three elements is crucial to the long term survival and growth of such an institution. We highlight different approaches to risk analysis, beyond stress testing, such as, Value at Risk and Monte Carlo simulation. We recommend that the board of directors establish a sub-committee of its directors to oversee risk management and capital control functions, and to monitor a credit union's asset liability management activities on an ongoing basis. Efforts should also be made to increase the level of internal expertise regarding risk management and analysis with the full participation of the board, a function that should not be outsourced. In an increasingly regulated financial industry environment it is imperative that a financial institution seeks out growth opportunities while maintaining the balance between capital and risk exposure for long-term business continuity.

Keywords: Credit Unions, Risk Management, Stress Testing, Monte Carlo Simulations, Value at Risk, Capital Adequacy, Growth, Basel Accord

1. Introduction: Changing Face of Credit Union Industry

Over the years the credit union industry has undergone a significant change, both in terms of the number of credit unions as well as the asset mix of their portfolios. This has brought about both threats and opportunities and the future destiny of this industry depends upon its ability to generate sufficient income to support growth while maintaining adequate capital in the context of increasingly tightening reserve requirements.

Table I: (a) Change in Number of CUs Over Time		
(Based on Asset Size)	2000	2011
Number of credit unions ¹	10,316	7,339 ²
Total Assets	\$438.2 billion ⁶	\$963.0 billion ⁷
Average Assets	\$42.5 million ⁶	\$132.0 million ⁷
Table I: (b) Summary Financial Statistics		
Capital ratio ^{7,8}	11.4%	10.2%
Loan split (Real Estate/Vehicle) ⁶	39%/40%	55%/30% ⁹
Total delinquencies ⁶	0.74% (0.42%) ¹¹	1.73% (1.15%) ^{9, 11}
Return on Average Assets ^{6, 10}	1.07% ¹²	0.62% ⁹

¹U.S. Census Bureau, Statistical Abstract of the United States: 2012. Table 1183: Federal and State-Chartered Credit Unions – Summary 1990 to 2010. <http://www.census.gov/compendia/statab/2012/tables/12s1183.pdf>

² As of December 2010.

³Based on FICU data only. Source: The Department of the Treasury, Comparing Credit Unions with Other Depository Institutions, January 2001. <http://www.treasury.gov/press-center/press-releases/.../report30702.doc>

⁴ Source: Credit Union Times. Small Credit Unions: Can They Survive and Thrive? June 2007. http://www.cutimes.com/_assets/pdfs/CUT_SmallCreditUnions.pdf

⁵ Source: Federal Register, Vol. 77, No. 22, February 2012. Interest Rate Risk Policy and Program, Agency – NCUA.

⁶Based on FICU data only. Source: NCUA Issues and Outlook, August 2010, Tim Segerson. <http://www.creditunions.com/downloads/PDF/CUBAE-Sacramento-Chapter-NCUA-3.pdf>

⁷Source: Credit Union National Association. Commercial banks and credit unions: Facts, fallacies, and recent trends. 3d Qtr. 2011. Mike Schenk, Economics and Statistics Department. http://www.cuna.org/download/combanks_cus.pdf

⁸ Regulatory minimum is 6%.

⁹Based on data as of June 2010.

¹⁰ Before NCUSIF impairment and recovery.

¹¹ Figures in parentheses represent charge-offs.

¹² As of 2002.

As Table I(a) shows, the U.S. credit union industry has been undergoing a significant change. The total number of credit unions declined from 10,316 in 2000 to 7,339 in 2011, a drop of 28.9% whereas larger credit unions, whose assets exceeded \$50 million, increased from 1,544 to 2,188.¹ While total assets in the industry grew from \$438.2 billion to \$963.0 billion over the same period, representing an increase of 119.8%, the average assets of a credit union almost tripled from \$42.5 million to \$132.0 million, an increase of 210.6%. Wheelock and Wilson (2011) find empirical evidence to support the hypothesis of economies of scale among credit unions, and argue that further industry consolidation and growth in the average size of credit unions is likely to continue. In this paper we argue that while this trend may be irreversible due to increasing returns to scale as a result of the existence of substantial infrastructure related fixed costs, all credit unions – small, medium and large – need to anticipate the changing conditions in the financial services industry at large, including the impact of The Dodd–Frank Wall Street Reform and Consumer Protection Act(2010). Financial institutions in general and credit unions in particular need to focus on general principles of risk management and modeling for risk as they relate to growth.

Table I(b) presents the changing product mix of the credit union industry. In 2000, the overall split between real estate loans and auto loans was about even – 39% against 40%. This changed in 2010, with the mix tilting in favor of real estate loans which overtook auto loans 55% to 30%. Since mortgage loans have longer maturities and are subject to vagaries of the housing and commercial real estate markets, they are generally riskier, both in terms of interest rate risk (shifts in the Treasury yield curve) as measured by duration, as well as default risk. This is evident from a lower rate of return on average assets (ROAA) for the industry which declined from 1.07% in 2000 to 0.62% in 2010. The declining ROAA trend was already in place before the mortgage crisis beset the U.S. economy in 2008, and was exacerbated by the crisis with the last two years showing a recovery in the ROAA from a low of –0.04% recorded in 2009 (not shown). Taken together the change in the asset mix and the decline in ROAA highlight the need for greater risk management as credit unions develop growth strategies which require additional capital. Ironically, the credit union industry had a near record level

¹These data are from multiple sources and the numbers are only indicative. Asset sizes are not adjusted for inflation.

of capital at 10.2% in 2011, a slight decline from 11.4% in 2000 over a decade earlier. In light of the regulatory requirement of 6%, the industry is well capitalized in excess of the minimum level which raises an important question, “can the capital be put to greater use within acceptable levels of risk, properly managed, for credit unions to grow organically and remain independent?” Considering that the credit unions represent only 6.76% of \$14.8 trillion in total assets² held by all financial institutions including mega banks, regional banks, and thrifts, there exist opportunities for growth of credit union activity.³

2. Exposure to Risk

Risk is inherent in most human endeavors and financial risk is embedded in all lending and trading transactions entered into by a financial institution. Since such institutions are heavily funded by customers’ deposits and maintain a small fraction of their assets in the form of equity capital, they are extremely leveraged and even small fluctuations in the value of their asset portfolio can erode their capital, limiting their growth opportunities and perhaps exposing them to insolvency. In short, adequate capital enables a financial institution to grow and keep insolvency or regulatory intervention at bay. Furthermore, such institutions are highly regulated and need to comply with federal and state level capital and risk standards.

The concept of risk spans a myriad of risk types. It includes economic risk, counterparty risk, default risk, interest rate risk, inflation risk, unemployment risk, prepayment risk, reinvestment rate risk, GDP (business cycle) risk, political risk, regulatory risk, market risk – demand and sales, input factor risk, operational risk, technology risk, risk due to natural disasters etc. While insurance may be purchased as indemnification against some of the risks, it covers few, if any, of the risks noted. A financial institution remains exposed to several of the risks mentioned which impact its ability to maintain adequate capital ratio to meet its survival and business goals. A common technique that is employed for the estimation of the impact of unfavorable events on an institution’s profitability and balance sheet, hence its capital, is called “Stress Testing.” This idea is not new and has been used in banking, and before that in engineering for centuries as manifested in the design of buildings and load bearing structures. An engineer may phrase a question in the following way: How much load or physical stress can a beam withstand without buckling under pressure? As in any situation, the design of a load bearing member requires a tradeoff between cost and the desired strength. For example, construction of a building in Dallas against hurricane strength winds is certainly possible but too costly and perhaps unnecessary given the low likelihood of a hurricane striking Dallas. However, in case of a building in Miami, it is a necessity and a foregone conclusion. The desire to incur the cost of strengthening the load bearing capacity is directly proportional to the probability and severity of potential losses caused by an adverse event.

Similarly, a financial institution may wish to estimate the likelihood of erosion of its capital given the severity of certain events. How much capital is necessary to protect the institution from failing since capital is the last line of defense against the impact of adverse events? Similar to the load bearing example, an institution can assess its ability to withstand financial “stress” with the aid of computer

²Credit Union National Association. Commercial banks and credit unions: Facts, fallacies, and recent trends. 3d Qtr. 2011. Mike Schenk, Economics and Statistics Department.
http://www.cuna.org/download/combanks_cus.pdf

³The authors recognize that banking institutions oppose credit unions’ expansion and strongly lobby with the US Congress to limit the scope and lending operations of credit unions. In spite of this constraint, the credit union industry has shown an ability to increase total assets at an annualized rate of 8.2% over the last decade.

modeling and intensive data analysis. It may be asked, if all institutions are required to maintain the same minimum level of capital, why is such an analysis necessary? Such a question can be answered in two ways: (1) First, even if the base percentage is same for every institution, given the portfolio of assets and their risk profile, the minimum level of capital may be inadequate to protect an institution from failing. In other words, minimum standards may be insufficient for that institution. (2) Second, even if an institution can survive with minimum capital requirements, its asset risk profile may be such that the required level of capital is excessive given its business strategy. The institution may be able to increase the level of risk it undertakes and increase its profits as well as capital for greater growth. In general, stress analysis enables an institution to align its capital with the risk profile of its assets and continuously examine its compliance with the regulations as well as maximize the return on its capital by not 'idling' it and wasting its earning power.

The idea of balancing risk with capital is captured in Figure 1 below. The see-saw configuration lends itself to capturing the leverage effect of equity capital with deposits and borrowings. The closer the risk exposure is to the center of the distribution, the lower the capital requirement, and greater the exposure to risk, the greater the level of capital required. If one measures the risk profile of the financial institution in terms of the distance from the center or the "fulcrum," then by pushing risk further to the right raises the need to increase capital. The fulcrum (risk – return tradeoff) of the balancing equation is determined by the business strategy of the institution – mix of its asset classes: auto loans, mortgages, credit cards, personal loans, business loans, short-term money market deposits (including counterparty solvency); and, trading exposure.

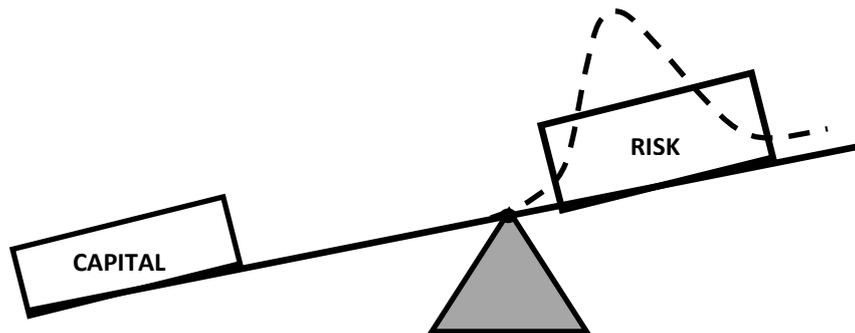
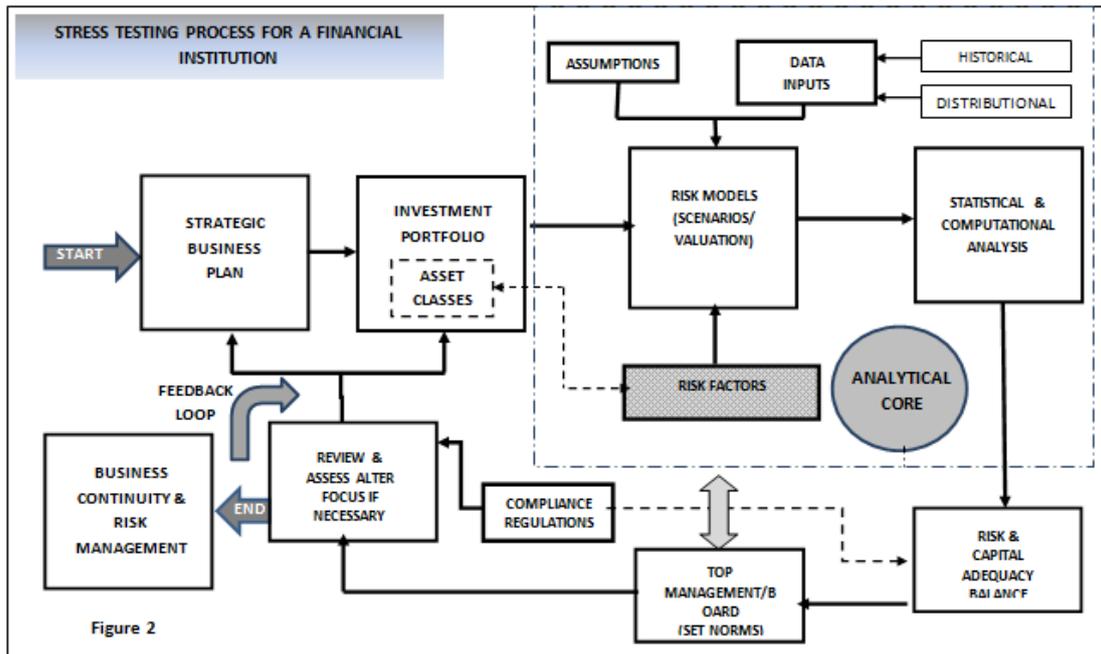


Figure 1: balancing risk with capital

3. Strategic Business Plan and Growth – Planning for Risk and the Role of Top Management

Risk must be recognized during the earliest stages of planning and creation of a business strategy. Once a financial institution selects its target asset portfolio – both the asset classes and the weights, it locks in a risk profile that can only be changed by changing one or both of these elements. A review of the business risk profile of a financial institution should include a review of its business strategy. The relationship between the risk management process within an organization and its business strategy is captured in Figure 2 which lays out the risk analysis process, including its analytical component.

A risk review would typically begin with a directive from the top management and they, along with the board, should be included in setting the acceptable risk parameters for the institution. The analytical team should assess the impact of risk on capital adequacy and present the results to the top management. This process should trigger a feedback loop requiring assessment of the investment portfolio and its asset classes, and possible reweighting or rebalancing of its loan portfolio to align capital with risk and vice-versa. This may require pruning of some asset classes and increasing capital allocation to other classes. The resulting portfolio will reflect a refocused business strategy and a



better alignment of risk and capital, not only from a regulatory but also from a business perspective. The latter is often crucial for survival and growth since any opportunities foregone by one institution become a competitor's opportunities to gain market share and enhance its surplus/capital.

The impact of an institution's preferred asset classes, as embedded in its business strategy, on the drivers of risk, or "risk factors" cannot be minimized. There are generally two categories of risk factors that drive institutional risk exposure: (1) macro drivers such as business cycle risk, general interest rate levels, unemployment rate in the economy, political and regulatory conditions, inflationary outlook and other macroeconomic factors; (2) risk drivers that are specific to an asset class, such as automobile loans, mortgages, business loans, and personal loans etc. These factors are peculiar to the local market conditions and are influenced by borrower and industry characteristics. It should be noted that some or a substantial portion of the asset class-specific risk can be diversifiable by exploiting the correlation structure of asset classes.

Identification of risk factors is a very important first step in risk analysis. Risk analysis is only as useful as the identified risk factors and is at the mercy of ignored factors, albeit unintentional. Getting a good grasp on risk factors, which are an offshoot of the asset classes, is crucial for an accurate and realistic view of the institutional risk profile. A risk ignored is a peril befriended.

It should be reiterated that a financial institution needs to integrate its growth strategy and capital adequacy because: (a) greater capital is required to support higher business growth which emphasizes focus on surplus and profitability if internal accruals are the primary source of capital; and, (b) growth places a strain on the risk profile of the financial institution. Balancing these two opposing forces to ensure business continuity is a fine art which highlights the critical role of the top management and the board of directors.

4. Capital Adequacy: Basel Standards

While Basel standards are not directly applicable to the Credit Union industry, it is necessary to understand them as the capital standards creation process for the Credit Union industry is influenced by the Basel standards.⁴The Basel accords were hammered out by the Bank of International Settlements initially in 1988, later enforced by the G-10 countries in 1992. The Basel (Switzerland) Committee on Banking Supervision was established earlier in 1974 by the group of G-10 countries in response to the collapse of a German bank and the perceived need for uniform risk standards.

As a result of the three Basel Accords (I, II and III), an industry shift has occurred toward minimum capital standards that are based on risk, i.e., risk-based or risk weighted capital. The idea behind this notion is that if an asset class has greater risk it should be allocated more capital to withstand an adverse outcome and protect the institution against a potential capital shortfall. While the idea is simple to understand it is hard to quantify without statistical techniques and probabilistic assumptions. The Basel accord recognizes the portfolio approach which exploits cross-correlations among asset classes and incorporates them in a risk measure known as Value at Risk ("VaR"). This measure simply states the magnitude of potential loss at a pre-specified probability level (risk tolerance) given distributional assumptions and risk factors identified. For example, a chief executive officer of a financial institution may wish to know what is the maximum amount of loss the financial institution may be exposed to, say, no more than 1% or 2.5% of the time due to a certain asset class, such as auto loans. The maximum loss thus estimated is termed VaR and is aggregated across all asset

classes to arrive at the minimum capital requirement. Stress analysis techniques can reveal if risk exceeds return from a certain asset class as reduction in exposure to that asset class could release valuable capital that could be better employed elsewhere, improving the risk-return tradeoff for the institution. While Basel accords I and II have been implemented, the stricter Basel III standards are scheduled to be implemented in the near future.

Basel Accord (II) for capital adequacy has three pillars as its foundation: (1) minimum capital standards, (2) supervisory review process, and (3) market discipline. While the third is obvious, we will briefly discuss the first two. According to Basel I, minimum Tier 1 capital requirement, consisting of equity, including preferred, common and disclosed reserves is 4%. It is defined as the ratio of a financial institution's core equity to risk weighted assets. Tier 2 capitals includes supplementary capital consisting of hybrid (debt/equity) capital instruments, undisclosed reserves, general loan-loss reserves, revaluation reserves and subordinated debt. Along with Tier 2 capital, the total capital is set to a minimum of 8%, with at least 4% representing Tier 1 capital. Note that these are minimum standards and institutions are free to exceed these requirements.

Basel II further categorizes the three major risks under regulatory capital that a financial institution faces as: credit risk, operational risk, and market risk. The second pillar provides for the regulatory response to the first pillar, giving national regulators new financial and statistical tools to monitor financial institutions. It also defines the remaining risks, clubbed as residual risk which includes: liquidity risk, systemic risk, concentration risk, strategic risk, pension risk, legal risk and reputational risk. The Basel standards recognize risk in a portfolio context, allowing for offsets among different asset classes within a financial institution's portfolio.

Furthermore, since Basel accords use specific risk weighted capital in the measurement of capital ratios, by weighting capital according to risk, capital required to be allocated to more risky asset classes is increased in the calculation. As a result, the adjustment of risk based capital limits business

⁴See also: Basel II, Why it is important to your credit union.
www.woccu.org/functions/view_document.php?id=Basel_II

growth and requires careful attention on the part of the top management if its lending practices are primed for future growth and attainment of greater market share. It should be noted that country regulators can adopt more stringent standards than those enshrined in the Basel accords and/or use different methods from among those approved by the Committee for computation of capital ratios.

A simple way to look at the role of capital in the banking and financial institution industry is to wear the lens of a stock trader. Often times, a trader may borrow money against capital (or “margin”) to gain leverage and trade larger amounts of stock to increase the return on equity. However, if the market moves in the opposite, i.e., unfavorable direction, it can heap losses on the trader’s position, diminishing equity as a percentage of the total value of the position. When it drops below a certain minimum level, the broker makes a “margin call” to the trader who has to deposit additional capital to meet the minimum margin requirement.⁵ A financial institution is also faced with the same risks as the stock trader. If its asset portfolio declines in value while its liabilities (customer deposits and other borrowings) remain unchanged, the institution’s capital may decline below the minimum capital requirement with the institution being required to add more capital to meet the regulatory minimum. Thus, a financial institution is in a position very similar to that of the stock trader, and gets a “margin call” from the regulator to comply with capital standards through infusion of new capital, perhaps at a time when it is least able to raise additional capital.

While adhering to minimum capital standards and balancing its capital, risk and growth targets a financial institution needs to focus on the time dimension of risk as well. For example, risks in the short run differ from those in the long run and as the planning horizon expands the uncertainty level also increases. This means probability distributions get wider and penalize long-term assets accordingly in the risk weighted calculation. However, there is a flip side to this. It is possible that there is greater volatility in the short term due to macro-economic factors with asset values fluctuating wildly and depleting capital which may push the institution into the red zone. This could result in liquidity problems even though the longer term forecast looks healthy. If the capital cannot be shored up in the short-term due to volatile market conditions, a financial institution may have a liquidity crisis on its hands unless it has excess reserves as a buffer to offset unforeseen short-term volatility. Basel III requires banks to maintain 2.5% (Capital Conservation Buffer) and 0–2.5% (Counter Cyclical Buffer).⁶ This concern for short-term survival in order to minimize disruptions to the long-term business strategy dictates that close attention be paid to the capital ratio in excess of minimum standards. Basel III capital requirements go into full effect in 2015 and get more restrictive over time according to a predetermined schedule.

While credit unions do engage in Asset-Liability Management (“ALM”) exercises, they are primarily driven by regulatory considerations and revolve around “shock testing” for worst case scenarios. We suggest that a financial institution go beyond the regulatory motive and analyze risk in the context of growth, and conduct simulations and VaR type analyses as an ongoing process to manage its business. While shock testing considers a handful of scenarios, other techniques simulate several hundred thousand scenarios and provide probability estimates of stressful events and the magnitude of their impact on the capital reserves of a financial institution.

⁵Incidentally the minimum margin requirement in the equity markets is also set in the US by the Federal Reserve and is known as Regulation T.

⁶The two buffers are laid out in the Basel III framework (June 2011).

5. Assessing Risk: Multi-factor Stress Testing

While stress testing generates notions of worst case scenarios, it is also useful for gauging normal business risk exposure. For example, if the default rate on mortgages is related to the business cycle, an average correlation between the two over the business cycle can be estimated and used for projecting losses. However, correlations are likely to fluctuate during the course of a business cycle. Correlations by sub-periods can be used to model risk exposure beyond the average correlation coefficient. One can view this application of risk analysis as a normal ongoing process. The analyst can further stress the model by tweaking the correlation for a deep recession in the economy. This means stepping outside the normal limits and assuming values that may not have been observed before in a reasonable period prior to the date of the analysis. While historical observations can certainly offer guidance, forward looking assumptions need to be made about events that rarely occur or have not yet occurred. This necessitates subjectivity beyond a certain point.

The first step in stress testing requires identification of risk factors which, as we have mentioned earlier, are tied back to the portfolio of asset classes. Second, these risk factors need to be combined with the valuation model or risk assessment model being considered. It should be noted here that inputs into the model can be handled in two ways: (1) under the assumption of the extreme case scenarios that are expected to produce the worst case outcomes and likely to “stress” the institution a great deal. The input variables as well as correlations among variables need to be tweaked so as to produce credible results. For example, the modeler would want to change the correlations to estimate their impact on capital adequacy as well as changes in volatility and liquidity levels in the market. This could be done in two steps. The first step requires analysis of historical data under different market conditions, including extreme conditions, and estimating normal as well as perturbed market condition relationships. After gaining an understanding of such relationships, the modeler needs to project the future conditions and, if necessary, tweak variables beyond the ranges observed in the past. This requires expertise and in-depth understanding of economic conditions and their interrelationships that may lead to extreme stress on the financial institution; (2) conduct Monte-Carlo type simulations where prior data analysis assists the modeler in estimating the probability distributions that drive the underlying variables of a model and their correlations, and use empirical distributions to draw different scenarios and estimate their impact on capital. This process usually draws several hundred thousand random observations and computes the probability of “shortfall” with a more quantitative emphasis on likelihood. As a result, the modeler can make a statement such as “the bank’s capital will stay within Tier 1 guidelines no less than ninety-five percent of the time.” Furthermore, this process can also quantify the risk (probability) of maximum loss based on assumptions made regarding the future.

Both of these approaches, stress testing and Monte Carlo simulation, outlined above require extensive data, financial and economic expertise as well as an understanding of statistics and computer simulation techniques. This is captured in the box marked “Analytical Core” in figure 2. The process should include the following steps: (i) inventory of types of risk – economic, default, liquidity, market, fraud, and operational risks; (ii) development of expectations based on historical data and forward looking projections and assumptions made with caution so as to minimize modeler’s biases and subjectivity inherent in the process. Participation by senior executives can act as a check without an attempt to steer the process to produce unrealistic and desired outcomes; (iii) development of distributional assumptions regarding probability supplemented by economic assumptions regarding macroeconomic factors as well as local market conditions, (iv) creation of valuation models and their implementation in the software environment; (v) generating simulation and VaR output for assessment of capital adequacy; (vi) benchmarking of output against regulatory and compliance needs and reworking the models, if necessary, to identify factors responsible for violations of standards, also known as reverse stress testing; (vii) presentation of results to the board and top management to assess the appropriateness of the business strategy as part of the feedback loop and

restart the process all over again to bring the business strategy into compliance with capital adequacy standards. This requires reassessment of portfolio weights for different asset classes emphasized by the financial institution.

Under Basel II the first pillar risks – credit, market and operational, can be measured with the help of approaches prescribed by the accord. Credit risk can be assessed with the help of the following four techniques: standardized approach, foundation IRB (internal ratings based), advanced IRB, general IB2 restriction. The VaR approach is recommended for market risk, and operational risk can be assessed with basic indicator approach (“BIA”), standardized approach (“STA”), and the internal measurement approach – an advanced form (“AMA”). It should be noted that risk projections are fraught with model risk, i.e., dependence upon the model chosen to quantify risk and establish the relationship among risk factors. While this risk can be minimized over time, it is impossible to eliminate such risk. Back testing can be employed to assess the historical accuracy of the model’s predictability but some model risk is always inherent in forward looking analysis. Models should be periodically reviewed for their relevance and accuracy over time.

5.1 Examples of Risk Modeling

Example 1: We model Liquidity Coverage Ratio (LCR) based on two variables that covary according to a bi-variate normal distribution. Selected balance sheet data is given below.

Net High Quality Liquid Assets	2,510,042,130
Total Cash, Reserves & Securities	2,911,206,377
Liquidity Coverage Ratio	0.8622

Monte Carlo simulation based on bivariate normal distribution assumption for the two variables - Net High Quality Liquid Assets and Total Cash, Reserves and Securities, generates a distribution for LCR based on one million scenarios is shown in Figure 3 below.

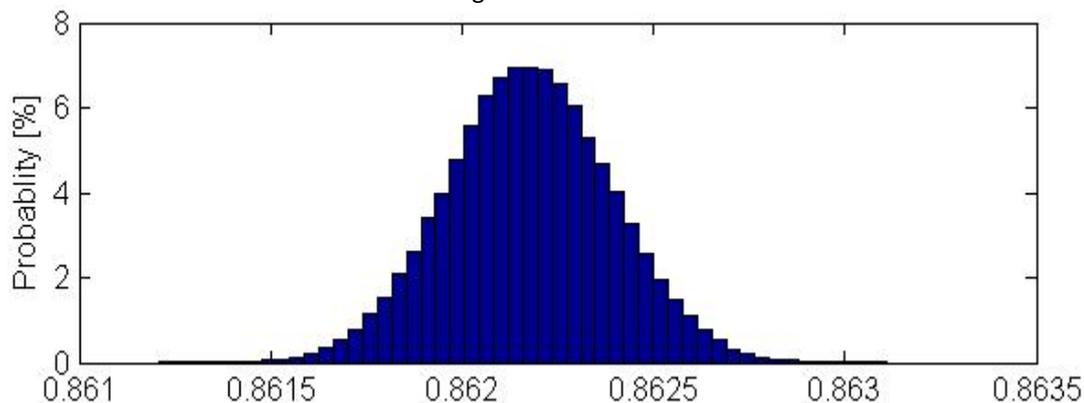


Figure 3 – Probability Distribution for LCR

The probability distribution for LCR provides information about the confidence level of LCR remaining in a specified range as well as the probability of it falling outside a range. This information aids in decision making by assessing risk in a quantitative manner. For example, a decision maker can say that the ratio will not fall below a certain level more than 5% of the time.

Example 2: Planning exercise for loan portfolio weights and risk assessment. In this case we model interest rate scenarios with the help of *beta* distributions. The risk profile of the existing loan portfolio is compared with the values of projected/planned portfolio with altered weights, along with the distribution of capital under current and planned portfolios.

Loan Type	Existing Portfolio	Existing Weights	Additional Loans	Planned Portfolio	Planned Weights
Auto	10,132,000	20%	55,000,000	65,132,000	28%
Real Estate	39,198,000	77%	99,000,000	138,198,000	59%
Credit Cards	1,498,500	3%	27,500,000	28,998,500	13%
Total	50,828,500	100%	181,500,000	232,328,500	100%

The resulting distributions for total portfolio are shown below, based on the assumption that changes in interest rates follow a beta distribution, skewed to the right, to reflect the greater possibility of rising rates. Figure 4 (a) presents a possible shift in the interest rates in the future. Since current interest rates are low, observed negative values for interest rates are truncated to zero during calculations.

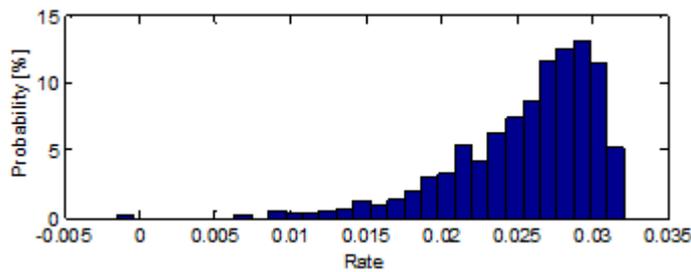


Figure 4 (a): Projected Shift in Interest Rates (*beta*)

Figure 4 (b) presents the projected values of the current portfolio with probabilities derived from the beta distribution. As shown, the portfolio values are skewed to the left since interest rates are skewed to the right and asset values for fixed interest loans move inversely with interest rates.

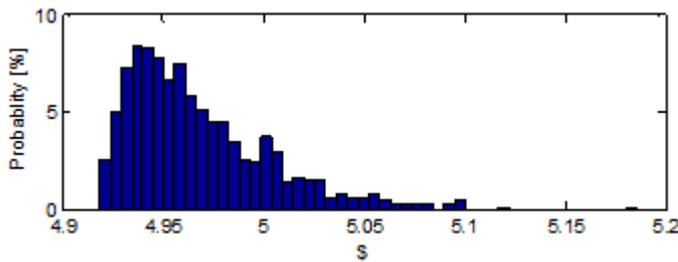


Figure 4 (b): Projected Values of Current Portfolio

Figure 4 (c) presents the probability distribution for financial institution’s capital under different interest rate scenarios. With the current capital at \$5,184,500 it may drop to \$5,020,000 or increase to \$5,250,000 within a 99% confidence level.

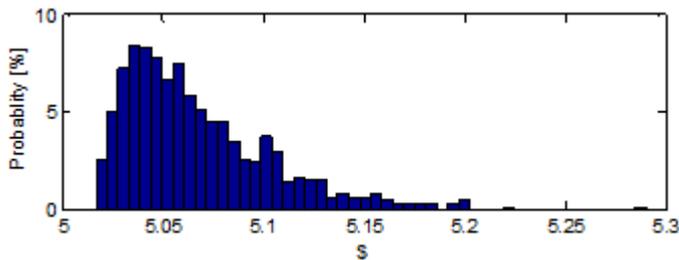


Figure 4 (c): Projected Capital – Current Portfolio

Figure 4 (d) projects values of the planned portfolio which is aligned with the credit union industry average weights for different types of loans: auto, real estate and credit cards.

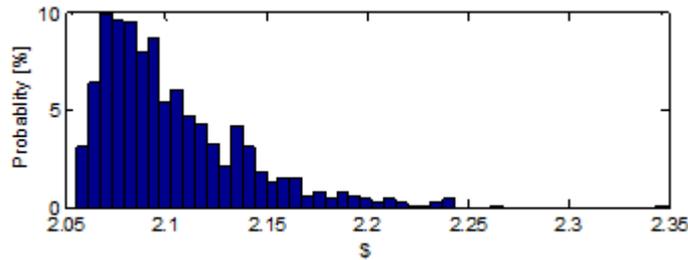


Figure 4 (d): Projected Values of Planned Portfolio

Figure 4 (e) presents probability distribution of capital under the planned portfolio. The capital is projected to fluctuate between \$29,650,000 and \$32,400,000 spanning a 99% confidence interval.

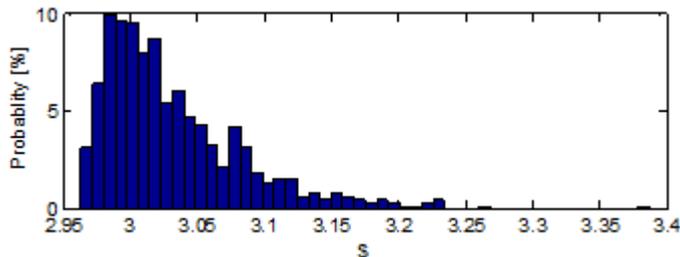
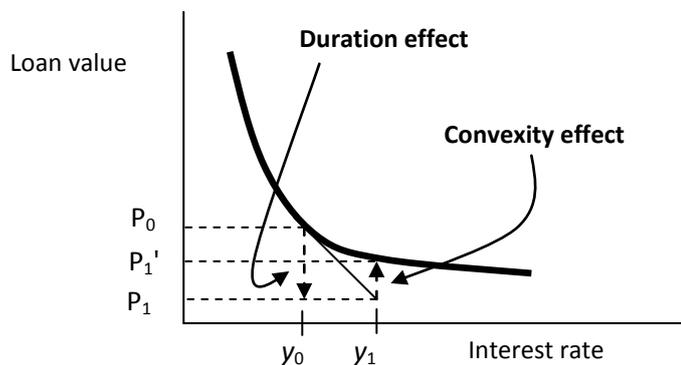


Figure 4 (e): Projected Capital – Planned Portfolio

The decision maker can assess the new distribution and adjust new loans to achieve a desired risk profile. This is very helpful in responding to interest rates. For example, in a low interest rate environment, a financial institution may be hesitant to lend on a long term basis and if its portfolio is dominated by longer maturities, it can assess the interest rate risk on its current portfolio and alter it by tilting new loans to shorter maturities to achieve a more balanced risk profile.

5.1 Impact of Loan Maturities on Capital

It is well known that asset values for fixed rate loans fluctuate inversely with interest rates. This relationship is depicted in Figure 5, which shows two concepts: duration and convexity.



Duration measures the sensitivity of a loan to underlying interest rates. From the previous graph it is evident that duration is higher at low interest rates and vice-versa. Given the current low interest rate environment if interest rates increase long-term loans (real estate) with fixed interest rates will drop

in value more than short-term loans (auto). Also note that duration declines with rising interest rates and this decline in duration is known as the convexity effect, which captures the curvature of the non-linear relationship. Convexity acts as a cushion on falling loan values with rising rates. Both duration and convexity, collectively known as interest rate risk, depend upon the general level of interest rates, fixed interest rates on outstanding loans, and term to maturity among other things. Longer term fixed rate loans are more susceptible to higher interest rates as they experience a greater drop in value when rates rise. This impacts a financial institution's capital to a far greater degree than short-term loans.

As part of its risk analysis process, a financial institution needs to also manage its portfolio's average maturity by altering portfolio weights to protect itself from interest rate risk. Interest rate risk has also been recognized by NCUA through its Interest Rate Risk Policy and Program (Federal Register, 2012) directive.

6. Assessment Process – Regulation and Compliance

The regulatory and compliance functions are the responsibility of the top management and the board and require their continuous oversight. From a practical standpoint, a financial institution should create a sub-committee to include board members and have a designated Risk Officer within top management that is charged with the responsibility of risk oversight and capital adequacy and would be in a position to guide the risk management process including stress testing. The committee may be named Risk Management and Capital Control Committee. We believe that the responsibility for capital adequacy and risk management function is critical to the survival of a financial institution and cannot be delegated or outsourced. It needs to be highlighted at the level of the board in terms of its importance and potential impact on the survival of the institution. To ensure some degree of independence, the risk officer would be directly supervised by this committee. It is acknowledged that credit unions are driven by regulatory requirements which differ between federal level and states.

As mentioned elsewhere, mere outsourcing of the ALM function for compliance needs is not enough. A credit union needs to create an internal watchdog in the form of the suggested sub-committee to continuously set risk standards and monitor the risk profile of the institution. The risk sub-committee would bring a forward looking outlook to the process which is rooted in the institution's growth as embodied in its business strategy. In other words, the risk management process should take the form of a planning tool for achieving the desired growth, and not just remain as a defensive compliance activity, performed once or twice a year. The process should assist in development of future lending strategies with adjustments to the asset portfolio under a forward looking emphasis.

7. Feedback and Monitoring

After receiving the results of the risk analysis process the board needs to assess the ongoing business strategy even if the institution is currently in compliance with regulations. This is necessary due to the forward looking assumptions made during the analysis that may raise red flags and forewarn the management of potential dangers lurking ahead. While stress testing is driven largely by survival needs and regulation, it can also be used to review the long-term business strategy. Essentially, there are two benefits of risk analysis: (1) compliance and regulation related, and (2) identification of industry risk trends and business opportunities with obvious competitive implications.

The monitoring and feedback loop should include comparison of business risk and growth indicators with internally established key performance indicators ("KPI"s) to gauge the success of the business strategy as well as assignment of responsibility for success or lack thereof to the associated team or

department. The risk measurement process aids business continuity by meeting the regulatory guidelines and maintaining the level of risk consistent with the risk appetite of the institution – also a part of the KPIs. The institution is not only able to create adequate loss reserves but is also able to proactively alter its business strategy to counteract and potentially offset such losses with an appropriate capital ratio.

8. Summary

A risk management and assessment exercise should begin with directives from the board and top management of a business organization. The final responsibility for the success or failure of an institution lies with the board and the executive management. This responsibility is further highlighted in the case of financial institutions which are highly regulated and face a myriad of credit, market, liquidity and operational as well as systemic risks.

In order to grow and stay independent in the face of a shrinking credit union population, we recommend that credit unions should (1) use their risk management process as a tool to grow while managing the impact of growth on their capital ratios, (2) move beyond stress or shock testing for compliance and ALM to VaR and Monte Carlo simulations to make business decisions and estimate their impact on the risk profile of the institution with the help of probabilistic estimates, (3) incorporate Basel methodologies into their risk models to improve risk management activities and integrate them into their decision models for ongoing review, beyond compliance, and (4) create a risk and capital control sub-committee which includes board members and is responsible for risk control functions. The chief risk officer should report to the board sub-committee while receiving direction from the chief executive officer. In an ideal world, the board sub-committee would possess skill, expertise, industry experience and knowledge of the risk management process and be familiar with regulations prevailing at all times. This ideal structure may be easier for large banks to implement. In case of credit unions, we recognize that given the composition of their boards this may not be feasible. However, efforts should be made to increase the level of internal expertise in risk management with the active involvement of the board.

The risk assessment process begins with a review of the strategic business strategy of an institution with its mix of asset classes representing the institution's lending operations. Risk modeling incorporates risk factors associated with the asset classes embedded in the business strategy and these risk factors need to span both micro and macro drivers of the institution's business. Back-testing, stress analysis and simulations should be performed regularly as part of a continuous program of risk audits to ensure business alignment with long-term objectives as well as capital adequacy requirements under the regulatory framework. Any deviations from business goals and regulatory standards should be addressed in the framework of the institution's business strategy and its risk bearing appetite. Adequate capital ensures business continuity and enables exploitation of growth opportunities available to a financial institution. While recognizing the benefits of diversification – across asset classes and borrower types – as a hedge embedded in the business strategy, interactions between growth and risk exposure and their impact on capital should be continuously monitored.

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